



# Environmental Impact Statement

## 132 kV Jerrabomberra Transmission Line

Evoenergy

13 September 2022

→ The Power of Commitment

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# Executive Summary

## Introduction

Jemena Networks (ACT) Pty Ltd and Icon Distribution Investments Limited trading as Evoenergy (Evoenergy), the ACT electricity distribution and transmission network provider, proposes to develop a 132 kV transmission line to provide increased power supply to HMAS *Harman* (*Harman*), in the Jerrabomberra district of the ACT.

The new transmission line would extend approximately 3.6 km from the existing East Lake to Gilmore 132 kV transmission line west of Monaro Highway, along the southern road reserves of Hindmarsh Drive and Canberra Avenue to *Harman* ('the Project').

## Need for the proposal

The Department of Defence (Defence) has requested a large step increase in electricity supply to support operational requirements at *Harman* to support Defence's mission and purpose to defend Australia and its national interests. The existing electrical infrastructure is inadequate to support the load required for Defence capability.

## Statutory and planning framework

Under Schedule 4 Part 4.2 of the ACT *Planning and Development Act 2007*, the Project is a development proposal that requires an Environmental Impact Statement (EIS), being an '*electricity transmission line construction, including additions or realignment works, outside an existing easement or exceeding 500 m in length, that are intended to carry underground or above-ground transmission lines with a voltage of 132 kV or more*'.

A preliminary environmental assessment that provided an overview of the potential environmental impacts of the project was submitted to the ACT Government in August 2019, and the EIS scoping document (EIS201900038) was issued by the ACT Government in September 2019, on which this EIS is based.

## Project description

The proposed 3.6 km transmission line includes 28 pole sites with span lengths of between 120 m and 210 m. This comprises:

- Twenty-four new 132 kV transmission pole sites from the Monaro Highway to *Harman*.
- Four existing transmission pole sites part of the existing East Lake-Gilmore transmission line.
- Transmission cabling (double circuit) along the length of the alignment.

In response to environment and heritage considerations, the pole type selected has the lowest footprint possible for the transmission line type, and siting of poles has been undertaken in consideration of known environmental values within the technical limitations of the infrastructure. In addition, environmental features, including bird deterrents are to be included to modify perching behaviour and reduce potential for fauna mortality.

Construction of the Project would involve work at discrete locations, which are between 120 m and 210 m apart. Key steps in construction would include:

- Site establishment – survey and layout, establishment of signage and environmental controls.
- Construction of foundations – excavation of footings approximately 1 m wide by 3-4 m deep using a heavy borer-lifter machine, steel and concrete foundation installation, installation of connections, and backfilling.
- Installation of poles – delivery and erection of pole sections, which would be in approximate 12 m segments, installed by the borer-lifter and by crane.
- Pole fit out – installation of hardware and stringing of conductors using brake and winch equipment.
- Site clean-up and rehabilitation – including weed management, and removal of construction materials.

Maintenance would involve annual inspections and, if required, rectification works as identified.

## Risk assessment

An environmental risk assessment, consistent with the Australian and New Zealand Standard for risk management (AS/NZS ISO 31000:2018), was conducted to identify and understand the potential impacts of the Project. The early identification of project risks allowed for design features and commitments for management during construction and operation to be identified and included. The risk assessment incorporated risks identified from the preliminary environmental assessment, the ACT Government Scoping Document, as well as other risks identified during the preparation of the EIS. Likelihood and consequence were evaluated and risks rated in consideration of the approach included in the ACT Government (2017) *Proponent's Guide to Environmental Impact Statements*.

A summary of the inherent (unmitigated) and residual (mitigated) risk rating for hazards rated medium or greater are included in Table E1.

**Table E1** Medium or higher risk summary (inherent and mitigated)

Subject	Hazard	Inherent risk	Mitigated risk
Traffic and transport	Increased traffic congestion and reduced road safety during construction.	Medium	Medium
Landscape and visual	Visual impacts on approach routes and iconic visual features in the ACT.	Medium	Medium
Socio-economic and health	Impacts upon critical service and electricity-dependent entities as a result of temporary losses in electricity supply.	Medium	Medium
	Impacts upon human health and safety as a result of electromagnetic fields (EMF) and frequencies associated with high-voltage power lines.	Medium	Low
General hazards and risk	Impacts upon construction workers and service personnel as result of exposure to high-voltage power lines.	Medium	Medium
	Risks associated with electromagnetic induction upon human health and safety.	Medium	Very low
	Risks associated with earth potential rise (EPR) upon human health and safety.	Very high	High
Ecology and natural environment	Direct impacts on ecological species or communities as a result of construction activities.	High	Medium
	Indirect impacts on ecological species or communities as a result of changes in physical characteristics of the area.	Medium	Low
	Death or injury of a listed fauna species during operation (e.g. electrocution from transmission line conductors, or maintenance vehicle strikes).	Medium	Low
	Death or injury of a listed fauna species as a result of increased predator abundance and predation intensity.	High	Medium
	Impact upon rocky areas that provide habitat for Striped Legless Lizard ( <i>Delma impar</i> ).	High	Medium
	Impact upon Natural Temperate Grassland.	Medium	Low
Heritage	Impacts on identified objects with Aboriginal Cultural Heritage value.	High	Low
Climate change	Potential impacts to project infrastructure as a result of climate change.	Low	Medium
Resources	Increase in energy consumption associated with operation of the Project.	Medium	Negligible

With mitigation measures implemented, the highest risk was rated as 'high' and associated with EPR and human health and safety. All other hazards were rated to be medium or lower when mitigation measures were implemented.

## Existing environment

The Project is to be predominantly sited within existing road reserves of Monaro Highway, Hindmarsh Drive, and Canberra Avenue. These areas historically supported treeless natural grasslands, however with the development of the transport infrastructure, include planted native and non-native species in parts of the alignment. While mostly comprised of exotic grassland with some marginal native grass cover within the road reserve, some areas of rocky habitat occur, including along the southern side of Hindmarsh Drive. The alignment is located adjacent to a broad grassland area, that contains Natural Temperate Grassland as well as native and exotic grassland. These areas are grazed and maintained periodically. The primary character of the Project alignment footprint is that of a maintained road reserve adjacent to arterial roads.

## Impact assessment

Assessment was undertaken of potential impacts to matters identified in the Scoping Document as well as other matters potentially relevant to the Project. These being:

- Planning and land status
- Traffic and transport
- Utilities
- Materials and waste
- Soils and geology
- Landscape and visual
- Water quality and hydrology
- Socio-economic and health
- General hazards and risk
- Ecology and natural environment
- Heritage
- Noise and vibration
- Air quality
- Resources
- Climate change
- Greenhouse gas

For each matter, the following were detailed:

- Environmental conditions and values
- Investigations
- Potential impacts
- Mitigation measures
- Residual risk assessment

Technical studies including biodiversity survey and assessment, a traffic and transport impact assessment, a landscape and visual assessment, and a climate change and greenhouse gas assessment were undertaken to support the EIS as described.

## Potential impacts

Potential impacts of the Project include:

- Clearing or trimming of trees and shrubs from within the road reserve to establish safe work areas.
- Mortality or injury of species as a result of construction as a result of movement of vehicles along existing road reserves or designated access tracks.
- Reduced visual amenity.
- Impact to Aboriginal heritage.
- Temporary traffic disruptions during construction.
- Localised and temporary impacts to air quality.
- Localised noise and vibration impacts.
- Erosion and sedimentation because of earthworks.

## **Committed mitigation measures**

A range of mitigation measures have been developed to avoid or reduce potential impacts of the Project. These include planning and design features, construction management commitments, and ongoing management and maintenance post construction. In summary:

- Design features include pole type, siting, and inclusion of deterrents to modify perching behaviour of birds.
- Construction mitigation measures include environmental compliance officer to oversee the Construction Environmental Management Plan for the Project, avoidance of the Aboriginal heritage site 'Hindmarsh 1', and weed management.
- Maintenance mitigation measures include ongoing post construction weed management.

## **Community and stakeholder consultation**

Consultation was undertaken with relevant stakeholders, including the ACT Government, Federal Government, relevant landowners, the local community, nearby businesses and special interest groups including the Little Eagle Research Group and Representative Aboriginal Organisations, during the preparation of the EIS. Matters raised by these stakeholders have been considered when assessing potential impacts and developing management measures.

## **Conclusion**

This EIS has considered matters raised in the Scoping Document EIS201900038 prepared by the ACT Government to identify and assess potential environmental impacts of the Project.

It has been assessed for all matters considered, provided that the committed mitigation measures are implemented, that the project would be unlikely to cause a significant adverse environmental impact.

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.3 and the assumptions and qualifications contained throughout the Report.

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# Glossary

Term/acronym	Definition
AAC	All Aluminium Conductor
ACT	Australian Capital Territory
ACT(PLM) Act	<i>Australian Capital Territory (Planning and Land Management) Act 1988</i> (Cmlth)
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
Ambient noise	The all-encompassing noise associated within a given environment. The composite of sounds from many sources, both near and far.
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
asl	above sea level
ATIPT	Active Travel Infrastructure Practitioner Tool
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the LA90 descriptor.
B-Field	When evaluating a magnetic field, a measurement of the B-Field otherwise known as the magnetic flux density is taken, see below for definition. The magnetic flux density unit is the Tesla (T) or microtesla ( $\mu$ T). Historically the gauss (G) or milligauss (mG) was used and still persists today within scientific and engineering fields and as a unit on some measurement technologies, where 1 G is equivalent to 10 <sup>-4</sup> T (or 1 mG = 0.1 $\mu$ T) (ARPANSA, 2002)
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
CHIP	Catchment Health Indicator Program
Construction work area	An indicative area in which plant and equipment will undertake most of their movements – an approximate 25 m radius from the pole location is estimated, limited by private property boundaries or roads unless indicated.
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAWE	Department of Agriculture, Water and Environment (formerly Department of the Environment and Energy)
dB	Decibel is the logarithmic unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics.
dBA	Frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at very low and very high frequencies.
dBC	Frequency weighting filter used to measure 'C-weighted' sound pressure levels, which is designed to be more response to low frequency noise
DBH	Diameter at Breast Height
DBYD	Dial Before You Dig
DCP	Development Control Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water (formerly DAWE)
Defence	Department of Defence
DLF	Distribution loss factor
EBSA	Eastern Broadacre Strategic Assessment
EEC	Endangered Ecological Community
E-Field	Electric field expressed in units of volts per metre (V/m). The electric field is voltage dependent and therefore often relatively stable over time (ENA, 2008).

Term/acronym	Definition
EIS	Environmental Impact Statement
ELF	Extremely Low Frequency (>0 Hz – 100 kHz) electric and magnetic fields.
EMF	Electromagnetic field
EMR	Electromagnetic radiation. EMR is the movement of electromagnetic energy through the propagation of a wave (moves at speed of light in a vacuum) and is composed of electric and magnetic waves, which oscillate (vibrate) in phase with, and perpendicular to, each other. This wave is not to be confused with EMF (TransGrid, 2010).
EP Act	<i>Environment Protection Act 1997 (ACT)</i>
EP Regulation	<i>Environment Protection Regulation 2005 (ACT)</i>
EPA	Environment Protection Authority
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999 (Cmlth)</i>
EPD	Environment and Planning Directorate
EPR	Earth Potential Rise
EPSDD	ACT Environment, Planning and Sustainable Development Directorate
ESA	Emergency Services Agency
ESCP	Erosion and Sediment Control Plan
ESD	Ecologically Sustainable Development
Frequency	The number of cycles or completed alternations per unit time, usually measured in Hertz (Hz) (ARPANSA, 2002).
GHD	GHD Pty Ltd
GWP	Global Warming Potential
<i>Harman</i>	HMAS <i>Harman</i>
H-Field	Magnetic field expressed in units of amperes per metre (A/m).
HGL	Hydrogeological Landscape
HMAS	Her Majesty's Australian Ship
Hz	Hertz, or cycles per second
IBRA	Interim Biogeographic Regionalisation for Australia
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEEE	Institute of Electrical and Electronics Engineers, Inc.
Impact	The effect of a project, which can be adverse or beneficial, when measured against an existing condition.
JSA	Job Safety Analysis
kV	Kilovolt
LA90(period)	The sound pressure level exceeded for 90% of the measurement period.
LAeq(1 hour)	The highest hourly LAeq noise level during the day and night periods.
LAeq(15 hour)	The LAeq noise level for the period 7 am to 10 pm.
LAeq(9 hour)	The LAeq noise level for the period 10 pm to 7 am.
LAeq(period)	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
Lamax	The maximum sound level recorded during the measurement period.
Landscape	All aspects of a tract of land, including landform, vegetation, buildings, villages, towns, cities and infrastructure.

Term/acronym	Definition
Landscape character	The combined quality of built, natural and cultural aspects which make up an area and provide its unique sense of place.
Landscape effects	Effects on the landscape as a resource in its own right.
Landscape value	The relative value that is attached to different landscapes by society. A landscape may be valued by different stakeholders for a whole variety of reasons.
LCZ	Landscape character zone, an area of landscape with similar properties or strongly defined spatial qualities, distinct from areas immediately nearby.
LGA	Local Government Area
Likely	Taken to be a real chance or possibility
LMPP	Landscape Management and Protection Plan
Locality	The area in the region of the Project, including adjoining habitats and surrounding suburbs. Generally used to describe landscape wide features.
LVIA	Landscape and Visual Impact Assessment
MAARs	Main avenues and approach routes
Magnetic field	A field of force that exists around a magnetic body or a current-carrying conductor (ARPANSA, 2002).
Magnetic field sensor	A sensor whose output changes based on fluctuations in the magnetic field (ARPANSA, 2002).
Magnetic flux density	The number of magnetic lines of force passing through, per unit area of surface. The SI unit for magnetic flux density is the Tesla (T) (ARPANSA, 2002). The magnetic flux density is dependent on the current flowing and varies continuously as the load varies on any piece of electrical apparatus (ENA, 2008).
Magnetic flux density units	1.0 mG = 0.1 $\mu$ T = 80 mA/m
Magnitude	The measurement of the scale, form and character of a development project when compared to the existing condition. In the case of visual assessment this also relates to how far the Project is from the viewer. Combines with sensitivity, magnitude provides a measurement of impact.
mBGS	metres below ground surface
mG	milligauss
Migratory species	Species listed under listed under international agreements (i.e Ramsar, JAMBA, CAMBA and ROKAMBA conventions) to which Australia is a party
mm/s	Millimetres per second
MNES	Matters of National Environmental Significance
MORCRs	Main On-Road Cycling Routes
NC Act	<i>Nature Conservation Act 2014</i> (ACT)
NCA	National Capital Authority
NCP	National Capital Plan
NEPP	Noise Environment Protection Policy (EPA, 2010)
NGER	National Greenhouse and Energy Reporting
NHMRC	National Health and Medical Research Council
NMG	Roads ACT Noise Management Guidelines (TCCS 2018)
Noise sensitive receiver	An area or place potentially affected by noise including residential dwellings, schools, child care centres, places of worship, health care institutions and active or passive recreational areas.
NVIA	Noise and Vibration Impact Assessment
OEH	NSW Office of Environment and Heritage
OPGW	Optical Ground Wire

Term/acronym	Definition
PAD	Potential archaeological deposits
PCT	Plant community type
PCU	Passenger Car Units
PD Act	<i>Planning and Development Act 2007</i> (ACT)
PD Regulation	<i>Planning and Development Regulation 2008</i> (ACT)
Pole footprint	The area subject to permanent infrastructure at each pole site. That is, the area required for the construction of pole footings.
Pole site	The design siting placement for a transmission pole or poles. Based upon the 60% design, there are 29 pole sites.
PRA	Preliminary risk assessment
Project area	The 3.6 km alignment of the electricity transmission line within the road reserve including construction work area.
Project footprint	Approximate areas in which transmission poles would be established. These are estimated to comprise pole bases with a radius of between 1 m and 1.8 m.
PSI	Contaminated Land Preliminary Site Investigation
RAO	Representative Aboriginal Organisation
Rating background level (RBL)	The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period.
Search area	The linear alignment of the Project area with a 10 km buffer search for flora and fauna records.
Sensitive receivers	A place or associated people that is sensitive to noise, air and visual impacts. Such receivers include residential dwellings, schools and drivers using the road network.
Sensitivity	The sensitivity of a landscape character zone or view and its capacity to absorb change of the nature of the Project. In the case of visual impact this also relates to the type of viewer and number of viewers. Combined with magnitude, sensitivity provides a measurement of impact.
Significance	A measure of the importance or gravity of the environmental effect, defined by significance criteria specific to the environmental topic.
Site compound	A central compound (or potentially compounds) which would support construction. Site compounds would include facilities such as demountable site offices, toilet facilities, vehicle parking and areas to store equipment, machinery and waste materials.
Study area	Encompasses the Project site (described above) and the area that may be directly or indirectly impacted by the Project. It includes the Project site and adjacent areas. Generally this is taken to be land within a 500 metre radius of the Project site.
SWMS	Safe Work Method Statements
TCCS	Transport Canberra and City Services Directorate
TCDs	Traffic Control Devices
TCP	Traffic Control Plan
TEC	Threatened Ecological Community
Territory Plan	<i>Territory Plan 2008</i> (ACT)
The Project	The Project for which this assessment was undertaken. That being the 132 kV Jerrabomberra Transmission Line.
Threatened species	A species listed under the <i>Nature Conservation Act 2014</i> (ACT) and/or the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth).
TIA	Traffic Impact Assessment
TMCP	Traffic Management and Control Plan
TP Act	<i>Tree Protection Act 2005</i> (ACT)
Transmission line alignment	The 3.6 km alignment of the electricity transmission line within the road reserve including construction work area.

<b>Term/acronym</b>	<b>Definition</b>
TTIA	Traffic and Transport Impact Assessment
TTM	Temporary Traffic Management plan
Unlikely	Taken to be a remote possibility of occurring
VCR	Volume Capacity Ratio
VENM	Virgin Excavated Natural Material
Viewshed	A portion of the landscape that can be seen from one or more observer positions. The extent of area that can be viewed is normally limited by landform, built form, vegetation and distance.
Visibility	The state or fact of being visible or seen.
Visual effects	Effects on specific views and on the general visual amenity experienced by people.
Visual impact	The impact on the views from residences, workplaces and public places.
Visual amenity	The overall pleasantness of the views people enjoy of their surroundings, which provides an attractive visual setting or backdrop for the enjoyment of activities of the people living, working, recreating, visiting or travelling through an area.
Visual receivers	Individuals and/or defined groups of people who have the potential to be affected by a project.
VP	Viewpoint
WMP	Waste Management Plan
WoNS	Weeds of National Significance
Work site	Area where construction would occur at each of the structure locations. The size and nature of these sites would vary from site to site, however they would generally include parking areas, storage of poles, spoil storage and work benches for cranes.
Workplace	Means any place, whether or not in an aircraft, ship, vehicle, building or other structure, where employees or self-employed persons work, or are likely to be in the course of their work.
WR Act	<i>Water Resources Act 2007 (ACT)</i>
ZSS	Zone substation

# 1. Introduction

## 1.1 Background to the proposal

The Department of Defence (Defence) has requested from Evoenergy, the Australian Capital Territory (ACT) electricity distribution network provider, additional power be supplied to HMAS *Harman* (*Harman*), ACT. This increase in power supply is required to support *Harman* and Defence's mission and purpose to defend Australia and its national interests. The existing 11 kV distribution line that currently extends to *Harman* along the southern side of Canberra Avenue will not provide sufficient power to address the projected Defence need. In order to address power requirements, construction of a 132 kV zone substation (ZSS) has been planned and agreed for development by Defence within *Harman*.

Evoenergy, the proponent, has identified a design solution, comprising a double circuit 132 kV transmission line. As shown in Figure 1.1, the transmission line alignment (i.e. the pathway of the transmission line) would extend approximately 3.6 km from the existing East Lake-Gilmore distribution line at the Monaro Highway and would head northeast along Hindmarsh Drive and Canberra Avenue within the southern road reserve to *Harman* (the Project).

## 1.2 Justification for the proposal

The Project would allow Evoenergy to supply Defence with electricity necessary to support future operational requirements at *Harman*. The existing electrical infrastructure is inadequate to support the anticipated load required. This large step increase in power supply is required to support *Harman* and Defence's mission and purpose to defend Australia and its national interests.

## 1.3 Purpose of this report

This EIS has been prepared by GHD Pty Ltd (GHD) on behalf of Evoenergy to address the requirements of the Scoping Document EIS201900038 prepared by the ACT Government (refer to Appendix A) to identify and assess potential environmental impacts of the Project. Details of where the requirements of the Scoping Document have been addressed in this EIS are included in Appendix B.

## 1.4 Scope and limitations

This report: has been prepared by GHD for Evoenergy and may only be used and relied on by Evoenergy for the purpose agreed between GHD and Evoenergy as set out in section 1.4 of this report.

GHD otherwise disclaims responsibility to any person other than Evoenergy arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

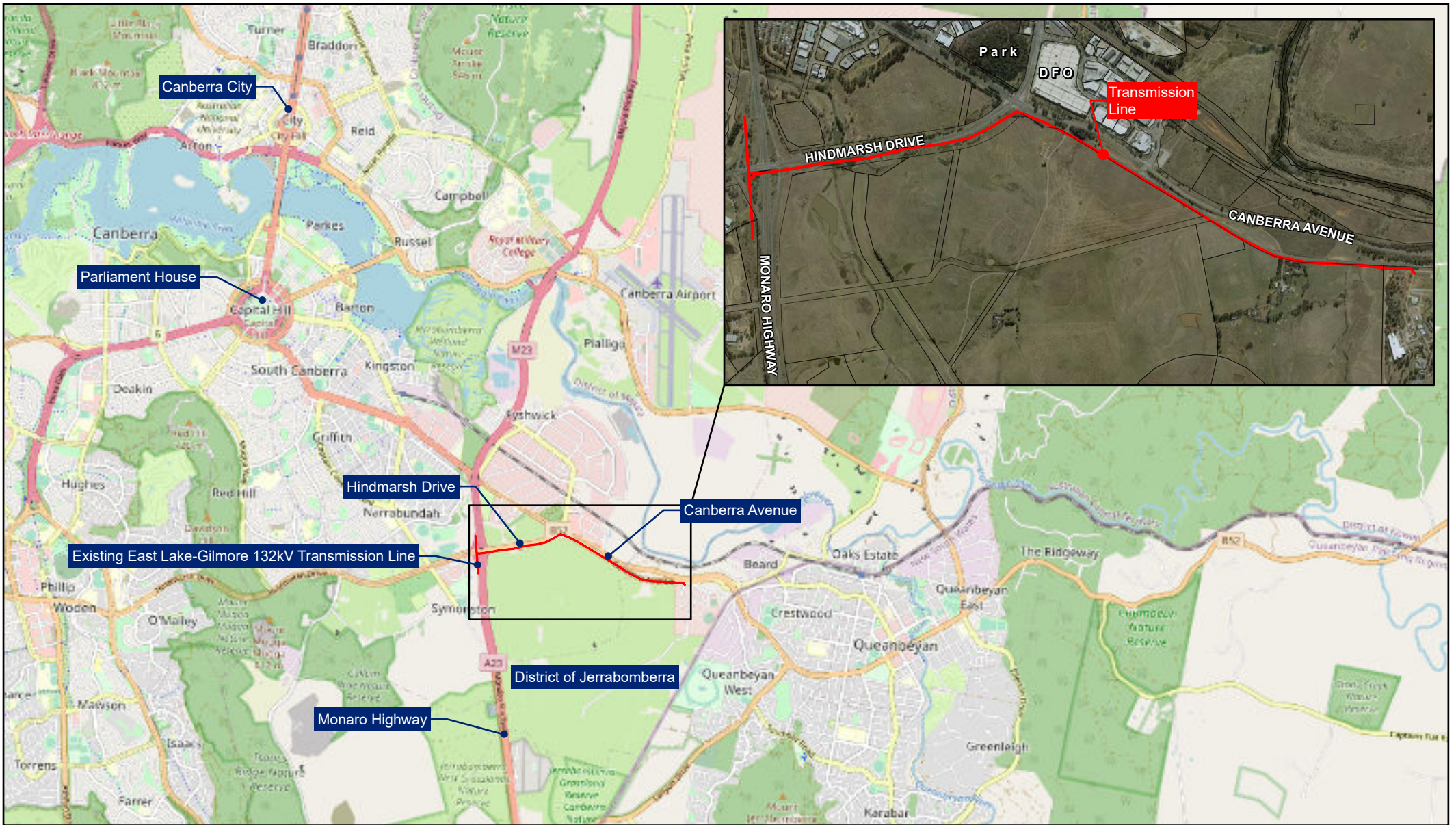
The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 1.5 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.


GHD has prepared this report on the basis of information provided by Evoenergy and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

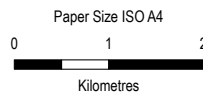
## 1.5 Assumptions

The following assumptions apply to this document:

- The Project final design, construction and maintenance would generally be in accordance with the project description (Section 2).
- Measures to avoid or reduce impact as described in this report are to be implemented by Evoenergy.
- The objective of the project is to supply power to Defence to support *Harman* and Defence's mission and purpose to defend Australia and its national interests. The Project would not supply power to other existing or future developments.



**LEGEND**  
 Proposed transmission line corridor



**Evoenergy**  
**Jerrabomberra Transmission Line Extension**

Project No. **12514817**  
 Revision No. **A**  
 Date **30 Aug 2022**

**Project location**

**FIGURE 1.1**

## 2. Project description

### 2.1 Objectives and justification

The Department of Defence (Defence) has requested that Evoenergy, the ACT electricity distribution network provider, increase the supply capacity to HMAS *Harman* (*Harman*) to meet the forecast load demand.

*Harman* is an enduring operational and support Base that functions as one of the Australian Defence Force's key communications facilities, as well as providing administrative functions to Navy personnel in the Canberra region. A significant investment in Australia's cyber security capabilities is planned for HMAS *Harman*, which will require additional power to assist Defence's mission. The increase in power supply would support *Harman* and Defence's mission and purpose to defend Australia and its national interests.

### 2.2 Land to which the proposal relates

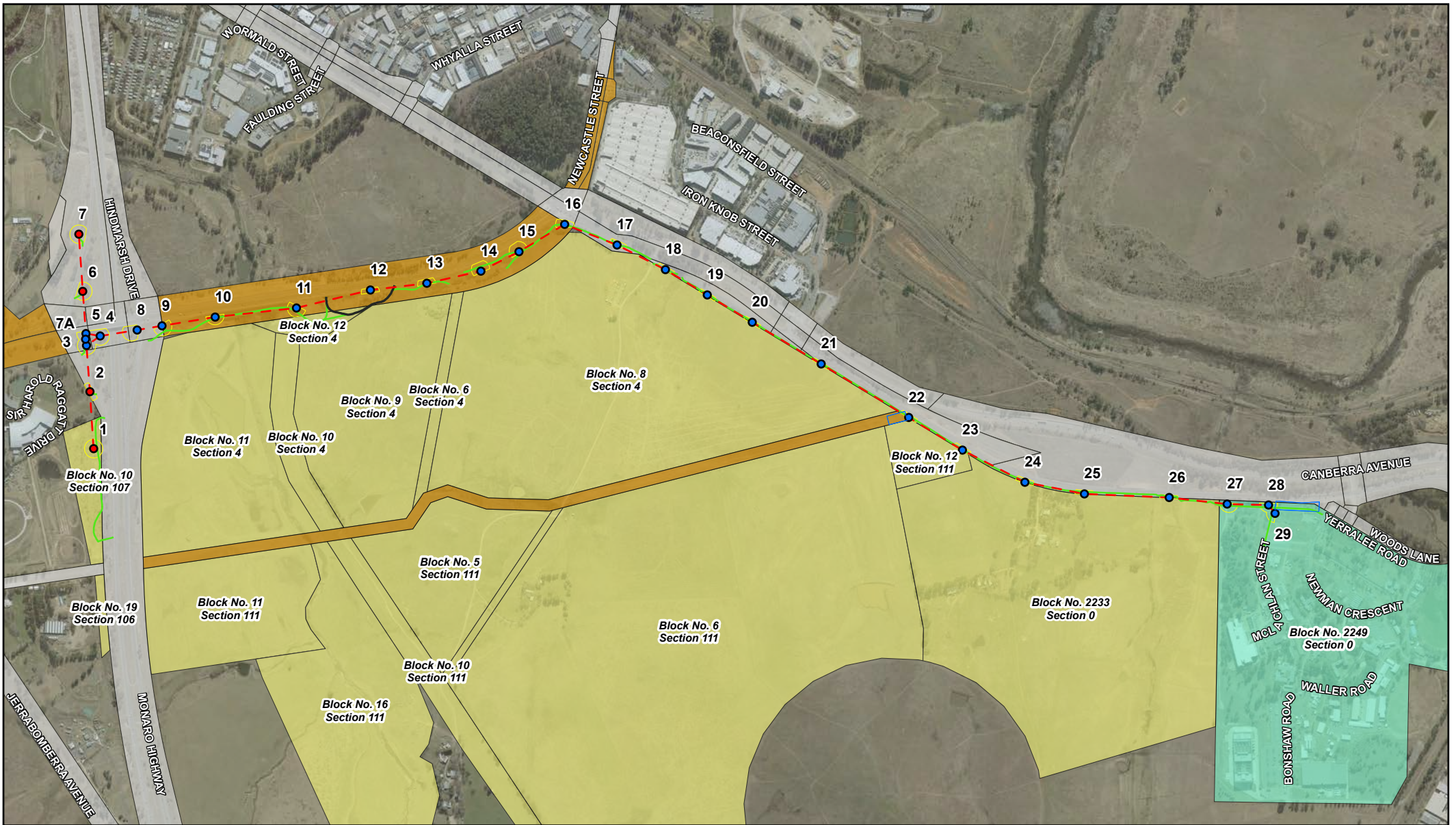
#### 2.2.1 Overview

The allotments identified in the Scoping Document and their relationship to the Project are included in Table 2.1 and the Project alignment and location of allotments is shown in Figure 2.1.

Of the thirteen allotments listed in Table 2.1, four are directly related to the Project. All other listed allotments are adjacent lands, and are included due to their listing in the Scoping Document (Appendix A) despite not being related to Project infrastructure or construction. The remainder of the transmission line poles would be sited within road reserves of Canberra Avenue (south), Hindmarsh Drive (south) and Monaro Highway (west).

**Table 2.1** Land tenure details

Block	Section	District	Lessee/Land custodian	Land zoning	Relationship to Project
<b>Land directly related to Project (infrastructure or access)</b>					
10	107	Symonston	Transport Canberra and City Services (TCCS)-City Presentation	NUZ1: Broadacre zone	Pole location and construction access
12	4	Symonston	EPSDD-Parks and Conservation	NUZ1: Broadacre zone	Construction access
2233	0	Jerrabomberra	Bonshaw ACT Ltd	NUZ1: Broadacre zone	Intersected by cable
2249	0	Jerrabomberra	HMAS <i>Harman</i> – Commonwealth Land	NUZ1: Broadacre zone (National land)	Pole location, site compound, and construction access
<b>Adjacent land</b>					
6	4	Symonston	EPSDD-Parks and Conservation	NUZ1: Broadacre zone	Adjacent property
8	4	Symonston	Private lease	NUZ1: Broadacre zone	Adjacent property
9	4	Symonston	Private lease	NUZ1: Broadacre zone	Adjacent property
10	4	Symonston	EPSDD – Parks and Conservation	NUZ1: Broadacre zone	Adjacent property
11	4	Symonston	Private lease	NUZ1: Broadacre zone	Adjacent property
13	4	Symonston	TCCS-City Presentation	NUZ1: Broadacre zone	Adjacent property
14	4	Symonston	TCCS-City Presentation	NUZ1: Broadacre zone	Adjacent property
6	111	Symonston	Private lease	NUZ1: Broadacre zone	Adjacent property
12	111	Symonston	Private lease	NUZ1: Broadacre zone	Adjacent property

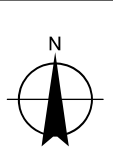


- LEGEND**
- Proposed transmission line
  - Transmission line pole - 25m buffer
  - Laydown area
  - Existing pole
  - Indicative pole siting

- Territory Plan (Blocks Private Lease)
- Territory Plan (Road Reserve)
- Territory Plan (National Land)
- National Capital Plan (Designated Area)

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 Metres

Map Projection: Transverse Mercator  
 Horizontal Datum: GDA 1994  
 Grid: GDA 1994 MGA Zone 55



**Evoenergy**  
**Jerrabomberra Transmission Line Extension**

**Project alignment and land tenure**

Project No. **12514817**  
 Revision No. **A**  
 Date **30 Aug 2022**

**FIGURE 2.1**

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 © 2022. Whilst every care has been taken to prepare this map, GHD (and Sixmaps 2022, NSW Department of Lands, ACT Government, OEH, WSP) make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.  
 Data source: Aerial imagery - Sixmaps 2022 (Metromap Tile Service); Cadastral/blocks - ACT Government 2020; Road Reserves: ACT Government, 2020. Created by: pfernandes

## 2.2.2 Infrastructure

Outside of *Harman*, permanent infrastructure would be sited within the Hindmarsh Drive and Canberra Avenue Road Reserves as well as within Block 10 Section 107 on the western side of Monaro Highway.

## 2.2.3 Construction compound

A temporary construction site compound would be sited adjacent to Canberra Avenue within the road reserve and within *Harman*.

## 2.2.4 Construction access

Construction access would be from the existing roads, along road reserves, as well as existing access tracks, including:

- Part of the access track within Block 12, Section 4, which may be used to access Pole 11. Restrictions apply to part of this track due to the presence of an Aboriginal Heritage site, as identified later in the document.
- An existing access track within Block 10 Section 107 from western side of Monaro Highway.

## 2.3 Design

### 2.3.1 Transmission line alignment

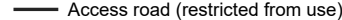

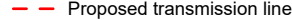


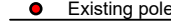

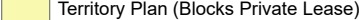



The transmission line alignment extends from the East Lake-Gilmore transmission line at the Monaro Highway to *Harman* via the southern road reserves of Hindmarsh Drive and Canberra Avenue. The design layout for the Project, is shown in Figure 2.2, and design drawings, design report and detailed pole siting figures are included in Appendix C. A summary of the alignment is provided in Table 2.2.

Table 2.2 Transmission line alignment summary

Location	Description	Approx. length	Existing electrical infrastructure
Monaro Highway west	Connection to the existing East Lake-Gilmore 132 kV transmission line on the western side of the Monaro Highway at the intersection with Hindmarsh Drive	0.2 km	Four existing poles to be restrung.
Hindmarsh Drive	New 132 kV transmission line from Monaro Highway to the corner of Canberra Avenue along the southern road reserve of Hindmarsh Drive.	1.3 km	Underground cables for road lighting columns. Road lighting down centre median.
Canberra Avenue	Corner of Hindmarsh Drive to HMAS <i>Harman</i> along the southern road reserve of Canberra Avenue.	2.1 km	A 11 kV overhead distribution line*. Road lighting. Underground reticulated road lighting columns. <small>* The 11 kV line is to be relocated to the northern side and central median strip of Canberra Avenue as part of a separate project under approval from the National Capital Authority.</small>



**LEGEND**

-  Access road (restricted from use)
-  Access road
-  Proposed transmission line
-  Transmission line pole - 25m buffer
-  Laydown area
-  Existing pole
-  Indicative pole siting
-  Territory Plan (Blocks Private Lease)
-  Territory Plan (Road Reserve)
-  Territory Plan (National Land)
-  National Capital Plan (Designated Area)

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Map Projection: Transverse Mercator  
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 Grid: GDA 1994 MGA Zone 55

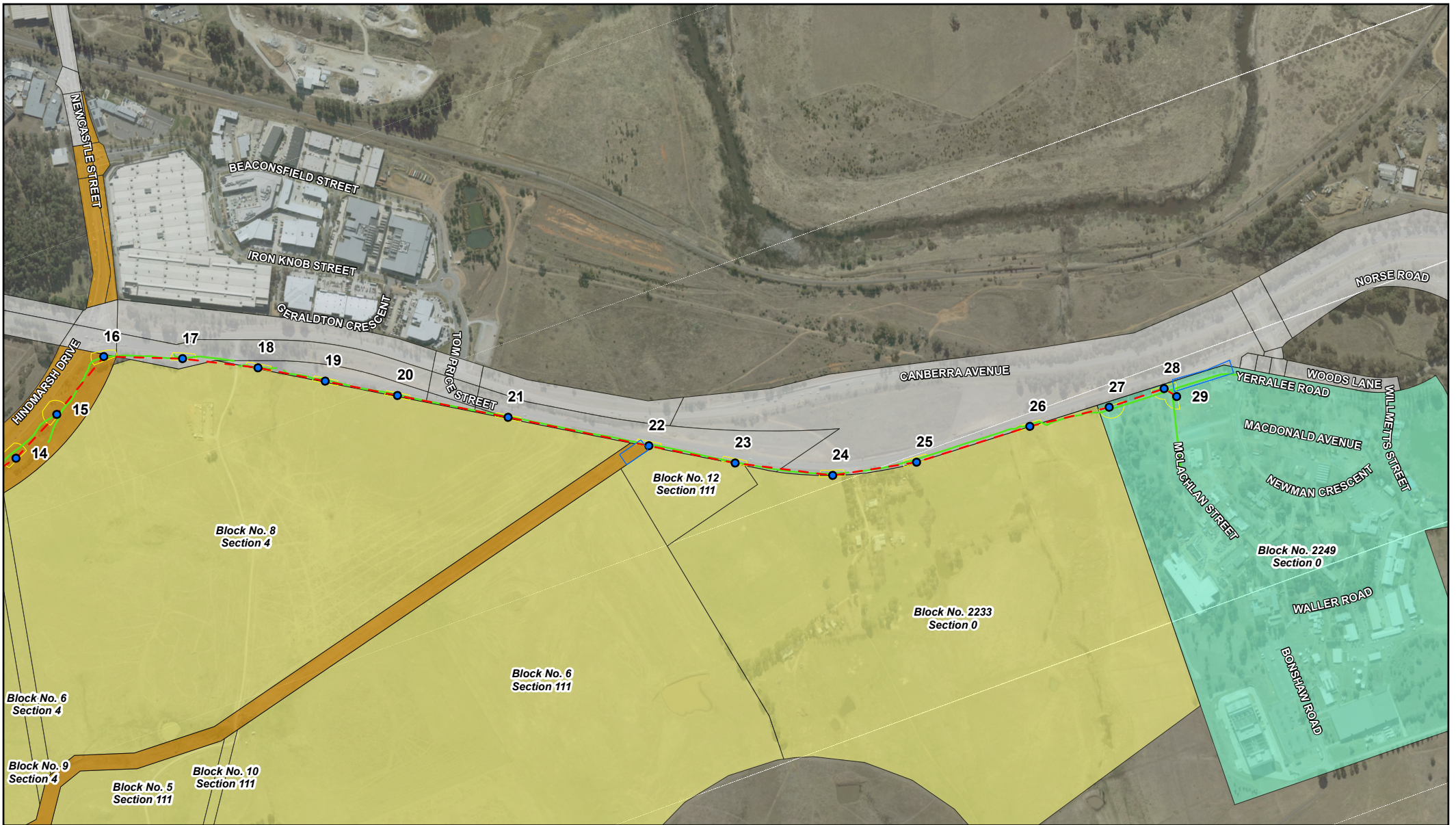


Evoenergy  
 Jerrabomberra Transmission Line Extension

**Project layout  
 Hindmarsh Drive**

Project No. 12514817  
 Revision No. A  
 Date 30 Aug 2022

**FIGURE 2.2**



**LEGEND**

- Access road
- - - Proposed transmission line
- Transmission line pole - 25m buffer
- Laydown area
- Existing pole
- Indicative pole siting
- Territory Plan (Blocks Private Lease)
- Territory Plan (Road Reserve)
- Territory Plan (National Land)
- National Capital Plan (Designated Area)

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 Metres

Map Projection: Transverse Mercator  
 Horizontal Datum: GDA 1994  
 Grid: GDA 1994 MGA Zone 55



Evoenergy  
 Jerrabomberra Transmission Line Extension

**Project layout  
 Canberra Avenue**

Project No. 12514817  
 Revision No. A  
 Date 30 Aug 2022

**FIGURE 2.3**

## 2.3.2 Pole sites and pole arrangement

The transmission line includes 28 pole sites with span lengths of between 120 m and 210 m (refer to Figure 2.2). This comprises:

- Twenty-four new 132 kV transmission pole sites from the Monaro Highway to *Harman*.
- Four existing transmission pole sites part of the existing East Lake-Gilmore transmission line.

Pole arrangement at pole sites along the transmission line alignment comprises:

- Single pole arrangements along straight-line segments (Figure 2.4)
- Two-pole arrangements where the alignment changes direction (for example at the corner of Canberra Avenue and Hindmarsh Drive) (Figure 2.5)

A detailed breakdown of the number of pole sites, pole arrangement details and their siting are included in Table 2.3. Example photos showing single and double pole arrangements are provided in Figure 2.4 and Figure 2.5, respectively.

Table 2.3 Indicative pole details

Pole arrangement	Pole material	Pole height	Pole sites	Total poles	Location	Pole site number
<b>New poles</b>						
Single	Steel	23 m	1	1	Canberra Avenue near Bonshaw	23
		24.5 m	2	2	Hindmarsh Drive, Canberra Avenue	13, 18
		27 m	2	2	Canberra Avenue near Bonshaw	24, 25
		28.5 m	1	1	Hindmarsh Drive	14
		26.5 m	1	1	Monaro Drive Hindmarsh Drive intersection	8
		21 m	2	2	HMAS <i>Harman</i>	28, 29
		26.5 m	2	2	Canberra Avenue. HMAS <i>Harman</i>	22, 27
		27 m	1	1	Monaro Highway	9
		28.5 m	4	4	Canberra Avenue, Hindmarsh Drive	22A, 21, 17, 15
		30.5 m	1	1	Canberra Avenue	19
		30 m	1	1	Hindmarsh Drive	12
		31.5 m	1	1	Canberra Avenue	26
32 m	3	3	Hindmarsh Drive, Canberra Avenue	10, 11, 20		
Double	Steel	28 m	1	2	West of Monaro Highway	7A
		24 m	1	2	Hindmarsh Drive Canberra Avenue intersection	16
<b>Total</b>			<b>24</b>	<b>26</b>	Monaro Highway to HMAS <i>Harman</i>	
<b>Existing poles</b>						
Single	Concrete	24 m	4	4	West of Monaro Highway	1, 2, 6 and 7
<b>Grand total</b>			<b>28</b>	<b>30</b>	Whole of alignment	1-29

The Project 60% design report and drawings are included in Appendix C. Figures are also provided showing the pole locations over an aerial photo at closer scale for context.



**Figure 2.4** *Example single pole arrangement*



**Figure 2.5** *Example double pole arrangement*



## 2.4 Construction

### 2.4.1 Environmental management

All construction work would be conducted in accordance with an approved Construction Environmental Management Plan (CEMP). The CEMP will establish the environmental management controls to be followed by Evoenergy, subcontractors and consultants in carrying out the scope of works for this project. The CEMP will include prescriptive mitigation measures with detailed outcome-based procedures and include monitoring requirements for identified risks to make sure that environmental management controls are consistently and effectively implemented throughout construction.

### 2.4.2 Construction process and staging

Construction of pole foundations and poles is anticipated to commence from the Monaro Highway end of the alignment and continue east to HMAS *Harman*.

The construction process will comprise the following broad stages:

- Site establishment.
- Construction of foundations.
- Installation of poles.
- Pole fit out.
- Site clean-up and rehabilitation.

Details of each of the stages and activities are included in Table 2.4.

Table 2.4 Construction stage and activities

Stage and activities	Description
<b>Site establishment</b>	
Survey for pole location and identification of existing services and utilities location	A surveyor will mark out pole locations using a theodolite or similar apparatus and survey pegs / survey spray paint. The surveyor will access the alignment via small vehicle and by foot from existing road alignments and via existing access tracks within the road reserve.  Utilities near the Project are to be protected during construction. The existing 11 kV overhead distribution cables along Canberra Avenue from Symonston are being relocated to underground cables under a separately approved project (NCA Works Approval 4 May 2020).
Establish signage and environmental controls	Signage and controls will be established by site personnel via small vehicle and foot from existing road alignments and via existing access tracks within the road reserve. This will include installation of: <ul style="list-style-type: none"> <li>– Temporary sediment controls are to be installed as per sediment and erosion control plan (to be developed). Locations will depend upon locations of ground disturbance and will target areas immediately adjacent to pole locations.</li> <li>– Temporary high visibility exclusion fencing (safety mesh webbing or similar) or visible flagging to be located adjacent to works areas to clearly define the work area and prevent access around or adjacent to:               <ul style="list-style-type: none"> <li>• Rocky areas that could provide lizard habitat adjacent to Hindmarsh Drive.</li> <li>• Vegetation on the western side of the Monaro Highway.</li> <li>• Along existing property boundary fences adjacent to areas of Natural Temperate Grassland (NTG) along Canberra Avenue and Hindmarsh Drive. Exclusion fencing to be relocated as construction progresses along the alignment.</li> </ul> </li> </ul> Temporary signage will be installed in the areas that are immediately adjacent to areas of NTG indicating environmental exclusion zones.

Stage and activities	Description
Vegetation management	<p>The alignment, while largely comprised of exotic grass and cleared areas, includes some planted eucalypts and acacia species.</p> <p>Vegetation clearing or pruning will be limited to the extent necessary to achieve the safety clearance zone of poles and conductors so that vegetation does not pose a risk to infrastructure and safe construction and operating clearances. An arborist is to conduct an assessment of trees along the alignment. Trees are to be managed in accordance with AS 4970-2009 Protection of Trees on Development Sites.</p> <p>Ground vegetation, including grasses and exotic species would not be cleared or modified (i.e. stripped) on a broad scale for the purposes of the Project. Ground layer impact would be limited to the footprint of the pole foundation.</p>
Establishment of safe construction work areas.	<p>A “safe construction working area” is an indicative 25 m radius around each pole location. This is the area within which trees and shrubs would be reviewed for vegetation management and in which the laydown of materials and construction vehicle movements would predominantly occur.</p> <p>Establishment of the safe construction work areas would involve pegging of pole locations and the establishment of temporary exclusion fencing when required. It does not involve clearing of ground layer vegetation (i.e. grass or low shrubs). Trees and shrubs would be managed as identified in ‘vegetation management’ above.</p> <p>The extent of the safe construction work area will vary depending on site access and topography at each pole location. Generally there would be a smaller safe construction work area in relatively flat areas (e.g. along Canberra Avenue), and larger safe construction work areas for sloping topographies (e.g. at the eastern end of Hindmarsh Drive).</p> <p>Safe construction work areas do not include any areas of Natural Temperate Grassland.</p>
Establishment of site access	<p>Based upon the 30% design, all pole locations would be accessible via existing roads and access tracks. Temporary signage (star picketed) would be used to clearly indicate access routes from the road.</p> <p>Existing tracks planned to be used for access would be reviewed, and if necessary maintained in consideration of Best Practice Guidelines for Fire Trail Construction and Maintenance (Bushfire Coordinating Committee 2007). Grading and addition of aggregate (gravel) or similar may be necessary for surface stabilisation and erosion prevention where existing track conditions are not sufficient for vehicle traverse.</p> <p>An Aboriginal Heritage site has been identified on the existing access track within Block 12 Section 4, south of Poles 11 and 12 (refer to Section 0). The area of the access road where this site is located is not necessary for construction and will be clearly defined to be a construction ‘no-go’ zone.</p>
Weed management	<p>Weed management during construction is to be undertaken following a weed management plan. A weed management plan (to be adapted from the ACT EPSDD <i>Jerrabomberra Valley Landscape Control Area African Lovegrass Management plan 2019-2021</i>) will be implemented during construction and for 18 months post-construction.</p>
<b>Construction of pole foundations</b>	
Excavation of pole footings	<p>A heavy borer-lifter machine would be used to excavate holes for pole foundations at each pole location. Top soil would be stripped and reused for site restoration.</p> <p>Footings are likely to be approximately 1 m wide and 3-4 m deep, however may increase to 1.8 m wide and 7 m deep where the alignment changes direction or geotechnical conditions indicate a larger footing is necessary (subject to detailed design).</p> <p>Establishment of holes for pole footings will be undertaken as close to the construction phasing for pole foundations as practicable (see below). Excavated holes will be covered with safety mesh and barricaded in the event of unforeseen delay to pole foundation construction.</p> <p>Excavated material will be used to backfill the holes above a road base layer (see ‘backfill and compaction’ below).</p> <p>Excess excavated material is to be tested, and if suitable, reused in an appropriate location elsewhere or disposed of to an appropriately licenced facility to reduce the potential for erosion and sedimentation, impacts to adjacent vegetation, spread of weeds and to reduce foraging substrate for curious birds.</p>
Installation of pole foundations (concrete foundation supports)	<p>Pole foundations, comprised of rag bolt pier assemblies and earthing rods / electrodes, will be concreted in place within the pole footing. This will involve use of a concrete truck, concrete pump and concrete vibrator to make sure that concrete permeates the entire footing matrix.</p>

<b>Stage and activities</b>	<b>Description</b>
Delivery of poles and offloading at pole locations	<p>Concrete poles would be delivered in sections of approximately 12 m in length to each pole site. The pole butt would be installed by the borer-lifter machine, with the remaining sections installed by crane after all foundations are complete.</p> <p>Delivery of poles would be synchronised with pole foundation installation so that the number of holes open at once is minimised, and the same borer-lifter machine used to excavate holes can also be used to off-load poles as they arrive. Poles will be placed directly into supporting trestles to accommodate the pole fit-off.</p>
<b>Installation of poles</b>	
Pole erection	<p>Pole erection will be undertaken as follows:</p> <ul style="list-style-type: none"> <li>– A crane or borer-lifter machine lifts the poles to the vertical position with a sling and the pole support in two locations.</li> <li>– When vertical, the lift is transferred to a single point lift from the head of the pole. The pole is lowered and bolted in place.</li> <li>– Once the pole is in the ground at the correct height, timber chocks are used as temporary braces prior to backfill (see below).</li> </ul>
Backfill and compaction	<p>Footings are backfilled with road base and compacted incrementally until the level is approximately 35 cm below ground level.</p> <p>The upper layer will be backfilled with stripped topsoil and compacted evenly to ground level with water to be directed away from the pole base.</p>
<b>Pole fit out</b>	
Dressing of poles	Insulators, hardware, earth wire support and climbing safety rails will be installed immediately prior to stringing.
Stringing of conductors (cables)	<p>Brake and winch equipment are used to string conductors (cables) along the alignment. A light vehicle and two workers travel between anchor points (specific poles, or temporary anchors comprised of large concrete blocks). The stringing rope is hauled through the pulley blocks at each pole using the scrap rope left hanging at each insulator.</p> <p>The process is repeated at every pole until the stringing rope spans the full section being strung. Braked drums of conductor are set up at one anchor point, and a capstan winch and rope receiving drum are set up at the other end. The cable is pulled through via the stringing rope with sufficient brake pressure to keep it from rubbing along the ground.</p> <p>On completion of the stringing, the cable is brought up to full tension, and left to settle for around a day. The conductor is then re-tensioned and confirmed with dynamometer and/or theodolite.</p>
Tying of conductors at each pole	Line workers will make off the earthwire termination to the earthing ferrule provided at the pole top from an elevated work platform. Each of the three phase conductors will be released from the stringing rollers and secured on the post insulators using any specified armouring or antivibration fittings.
<b>Clean up and rehabilitation</b>	
Clean-up crew	Following completion of construction, a clean-up crew will remove environmental controls and signage when no longer needed along with any other construction debris not collected during regular maintenance. Clean up activities will be undertaken with minimal mechanical assistance to minimise ground disturbance. Clean-up activities would be subject to relevant measures of the CEMP.
Rehabilitation	Rehabilitation of areas disturbed during construction will be in accordance with a rehabilitation plan to be developed and included in the CEMP. Rehabilitation will be conducted in consideration of adjacent NTG and native grassland communities.
Weed management	Weed management will be detailed in an approved project specific Weed Management Plan. Weed management is to be undertaken immediately prior to, and for 18 months following construction. Advice has been obtained from the ACT Government on their current program for weed management in the region.

## 2.4.3 Plant and equipment

An indicative list of plant and equipment required for construction is provided in Table 2.5.

Table 2.5 *Indicative plant and equipment list*

Plant and equipment	
Backhoe	Flatbed Hi-ab truck
Bobcat	Generators
Brake and winch equipment	Heavy borer-lifter
Concrete agitator	Hydraulic pole tamper
Concrete pump	Light vehicles
Cranes - various	Piling rig
Dumper trucks	Rigid tippers
Elevated worker platforms	Tilt tray trucks
Excavators / loader backhoe	Water carts

## 2.4.4 Site compound and material laydown

The Contractor's site compound and material laydown areas will be established at:

- HMAS *Harman* (approved by Defence as an established works area).
- Halfway along Canberra Avenue within the distribution line easement adjacent to Block 12 Section 111.

These sites are largely cleared and do not contain native vegetation communities. The site compound and material laydown area will be used during construction. Following completion of construction these areas would be rehabilitated and subject to weed management in accordance with the post-construction weed management plan.

## 2.4.5 Site access

Site access for construction will predominantly be via sealed roads and existing access tracks within or adjacent to the road reserve (See Figure 2.2). Where possible, movements between construction work areas will be via sealed roads (i.e. Canberra Avenue and Hindmarsh Drive). Existing access tracks are shown, although as noted, there would be restrictions on the use of the access track on Block 12 Section 4.

## 2.4.6 Construction workforce

The construction workforce would vary depending on the stage of construction and associated activities. During peak construction activities, the Project would employ around 115 to 125 workers, with an average workforce anticipated to be around 25 to 35 workers (depending on the stage of construction works).

## 2.4.7 Timing of works

Construction is expected to commence in early 2023, and is estimated to take seven to 12 months.

## 2.4.8 Construction hours

Construction hours would be confirmed following appointment of the construction contractor and full understanding of construction staging. Works would typically be limited to the standard hours for construction work, being:

- Monday to Saturday 7:00 am to 6:00 pm.
- Sundays and Public Holidays 8:00 am to 6:00 pm.

Works outside the standard hours may be necessary for the following:

- Transmission line cutover and commissioning.
- The delivery of materials outside standard hours requested by police or other authorities for safety reasons especially around Monaro Highway and Canberra Avenue.
- Stringing of conductors at the intersection of Hindmarsh Drive and along the Monaro Highway.
- Where works require lane closures for safety purposes in order to minimise traffic congestion.
- Emergency work to avoid the loss of lives and/or property.

## 2.5 Operation and maintenance

### 2.5.1 Post construction maintenance

Evoenergy will conduct post construction maintenance for an 18-month period following construction. This would include:

- Management of weed species (including African lovegrass and Chilean needle grass) along the alignment in accordance with a weed management plan. Weeds would be carefully managed to avoid damage to NTG and native grassland.
- Observations of, and if required, rectification of backfilled areas at pole bases to make sure that they are stabilised and drain appropriately away from infrastructure.
- Inspections of work areas to make sure they have been appropriately restored, and to implement rectification works if required.

### 2.5.2 Ongoing maintenance

#### General

Operational and maintenance activities would be incorporated into Evoenergy's operational maintenance program. The transmission line will likely be inspected on, at most, a yearly basis.

The main activities associated with operating the transmission line includes maintenance such as:

- Visual and thermo-vision line inspections.
- Inspection along the alignment by foot or light vehicle for inspections, patrols, switching, placement of earths
- Vegetation management if needed (see below).
- Replacement/repair of aging or damaged components (typically insulators, broken conductor, or other broken hardware).

#### Vegetation management

The Project is to be located within the Hindmarsh Drive and Canberra Avenue road reserves. These are areas in which the ACT Government has responsibility for ongoing maintenance.

Evoenergy has a statutory responsibility to maintain adequate clearance between transmission line assets and vegetation. Vegetation management (trimming, pruning, clearing) of trees and shrubs would be undertaken where vegetation poses a risk to infrastructure and safe operating clearances.

Vegetation management would be conducted in consultation with an arborist as required. As vegetation clearances would be established prior to installation of the transmission line, it is not anticipated that vegetation management would be necessary for several years.

## 2.6 Project benefits

The Project would provide power supply to support *Harman* and Defence's mission and purpose, and as a result of this would benefit Australia and its national interests.

## 2.7 Alternatives considered

### 2.7.1 The consequences of not proceeding

The Project infrastructure and timing of delivery are critical to support Defence infrastructure and capability projects. The consequences of not proceeding may impact upon national security and Defence capability.

### 2.7.2 Options assessment

#### Overview

An Options Assessment prepared by Evoenergy is included at Appendix D. The Options Assessment reviewed power options, feasible connection points and reviewed potential alignment options against a number of differentiating criteria.

#### Options assessment summary

A minimum 132 kV power solution was assessed to be required to meet the Project's objectives. Two feasible connection points were identified:

- East Lake - Gilmore 132 kV transmission line which connects Gilmore Zone Substation to Causeway Switching Station
- Gilmore Zone Substation

Six potential alignment options were identified for the feasible connection points (Table 2.6). Constraints and values associated with eight differentiating criteria including ecology/biodiversity, cultural heritage, technical feasibility and high level cost were attributed to each option.

Table 2.6 Options considered

Option	Alignment description
Option 1	Canberra Avenue from Narrabundah Lane Corridor intersecting Cookanalla via the existing electrical right of way.
Option 2	Hindmarsh Drive and Canberra Avenue southern road reserves from Monaro Highway.
Option 3a	Hindmarsh Drive and Canberra Avenue northern road reserves from Monaro Highway.
Option 3b	Hindmarsh drive northern road reserve and Canberra Avenue southern road reserve from Monaro Highway.
Option 4	Canberra Avenue from the Monaro Hwy.
Option 5	Woods Lane from Gilmore substation via the Monaro Hwy.

An undergrounding review was conducted in consideration of the values and constraints for each alignment option. It was assessed that the option of undergrounding, which is trenched along an alignment that is 8-10 m wide (Figure 2.7) would be unfeasible in relation to constructability and cost, as well as having a substantially larger impact footprint compared with overhead transmission lines.

Based upon the Options Assessment, the highest rated option was Option 2, which is assessed in this EIS.

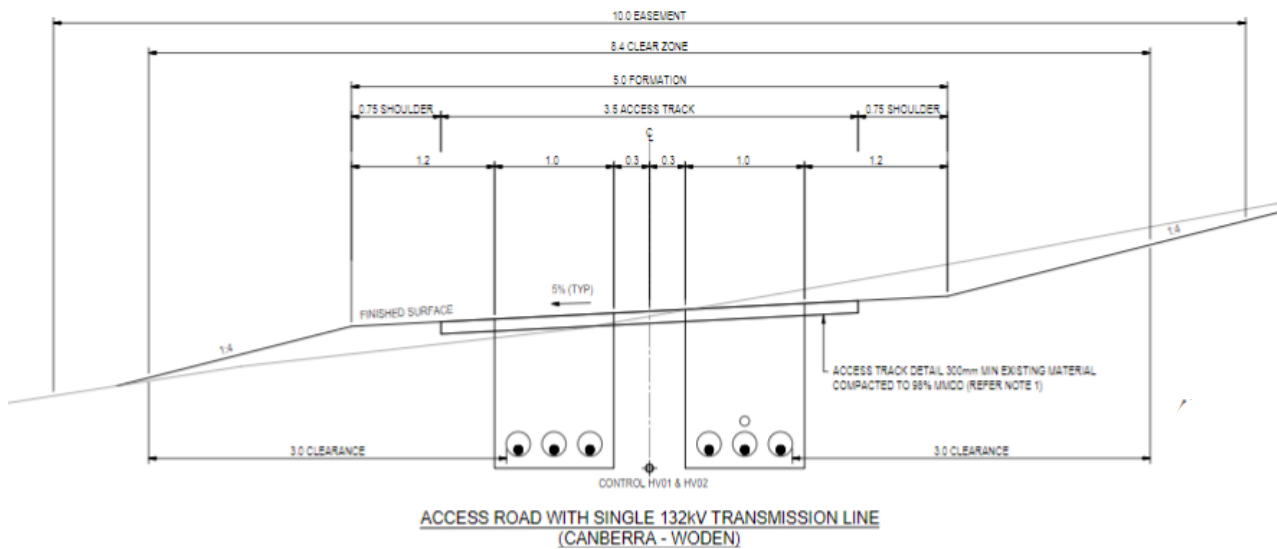


Figure 2.7 Example cross section for 132 kV underground transmission line

## 2.8 Other developments in the region

### 2.8.1 Evoenergy – 11 kV undergrounding project – Canberra Avenue

#### Summary

The existing 11 kV overhead distribution line along Canberra Avenue from Symonston will be removed and replaced by underground cables. These works follow Canberra Avenue approximately 3 km from north of its intersection with Hindmarsh Drive to its intersection with Woods Lane inside HMAS *Harman*. This is being undertaken as a separate project subject to development approval (NCA Works Approval, 4 May 2020).

#### Relationship to the Project

The 11 kV undergrounding project is currently in progress independently of the Project. This project while creating space for the proposed 132 kV transmission line, is necessary to service existing and future customers in the area. It is understood that decommissioning of the existing 11 kV transmission line would be undertaken in consideration of environmental values identified in this EIS and staged in a way that reduces potential for cumulative impact, by reducing the length of time spent on construction or demolition and working in a manner consistent with measures to be implemented for this Project.

### 2.8.2 Essential Energy – South Jerrabomberra high voltage supply project

#### Summary

The South Jerrabomberra Regional Job Precinct will include 1500 residential lots, a business park, industrial estate, community precincts. Essential Energy are to develop a 132 kV powerline from TransGrid's Queanbeyan Bulk Supply Point located in Oaks Estate in Queanbeyan, along the rail corridor on a section of the non-operational Queanbeyan to Bombala rail line, to connect with a new zone substation in the South Poplar's Innovation Precinct (Essential Energy 2022).

#### Relationship to the Project

The Essential Energy project is not related to the Project. It extends down the eastern side of *HMAS Harman* in New South Wales and is not connected at any point.

### 2.8.3 Defence – *HMAS Harman* zone substation and capability projects

#### **Summary**

Defence has developed and agreed the development of a zone substation at *HMAS Harman* to support other confidential projects to be developed. A site selection process and environmental assessment in accordance with the Defence Environment and Quality Management System was undertaken.

#### **Relationship to the Project**

Future projects to be developed in *HMAS Harman* would be dependent upon the electricity to be supplied by the Project.

## 3. Legislative and strategic context

### 3.1 ACT legislation

#### 3.1.1 Planning and Development Act 2007

##### Overview

The *Planning and Development Act 2007* (PD Act) aims to provide a planning and land system that contributes to the orderly and sustainable development of the ACT.

Section 113(1) of the PD Act states that a person preparing a development proposal may apply to the planning and land authority for approval to undertake the proposed development. Approval of a development proposal is subject to one of three possible assessment tracks as defined in section 112 which include code track, merit track and impact track. Impact track assessment applies if *'the relevant development table states that the impact track applies; or if the proposal is of a kind mentioned in schedule 4'* (s123(a)).

##### Relevance the project

The Project fits in to the impact track as it is of the kind mentioned in schedule 4 part 4.2 which identifies an *'electricity transmission line construction, including additions or realignment works, outside an existing easement or exceeding 500 m in length, that are intended to carry underground or above-ground transmission lines with a voltage of 132 kV or more'*. As the Project requires assessment in the impact track, the development application must include a final or draft EIS (s127(2)). The planning and land authority or Environment Minister may only decide the application if a draft EIS is lodged with the development application (s162(2)).

Prior to preparation of an EIS, the proponent must apply to the planning and land authority for an EIS scoping document (s212(1)). A Scoping Document (Application Number: EIS 201900038) was issued by the ACT Government EPSDD on 25 September 2019 under Division 8.2.2 of the PD Act. Preparation of this EIS has been undertaken in accordance with the requirements set out in the Scoping Document, which is provided at Appendix A.

#### 3.1.2 Planning and Development Regulation 2008

##### Overview

Section 97(2) of the PD Act notes that a regulation may prescribe the contents of a planning report, that being any report prepared that is prepared to inform a decision under the PD Act. Section 50 of the Planning and Development Regulation 2008 (PD Regulation) prescribes the requirements for preparation of an EIS according to s 208(1) of the PD Act.

##### Relevance to the project

The requirements for preparation of an EIS as prescribed by the PD Regulation have been followed in this EIS.

#### 3.1.3 Environment Protection Act 1997

##### Overview

The *Environment Protection Act 1997* (EP Act) provides a regulatory framework to protect and enhance the environment, to prevent environmental degradation and reduce and eliminate the discharge of pollutants to the air, land and water. The EP Act also provides for the identification and remediation of contaminated land and the management of waste and pesticides.

The EP Act establishes the Environment Protection Authority (EPA) as the body responsible for administering and undertaking the functions of the EP Act.

## **Relevance to the project**

The EPA administers legislative policies pertaining to the protection of specific components of the environment. Policies legislated under the EP Act relevant to the Project include general, air, contaminated sites, hazardous materials, noise and water quality. These policies have been addressed, where appropriate in the assessment of impacts in Section 5.

### **3.1.4 Environment Protection Regulation 2005**

#### **Overview**

The *Environment Protection Regulation 2005* (EP Regulation) supports the EP Act. Part 4 of the EP Regulation defines environmental values and standards pertaining to components of the environment and establishes regulations and offences to protect them.

#### **Relevance to the project**

Regulations relevant to the Project include emissions into the air, noise, protection of waterways, controlled waste, sampling and analysis of pollutants and erosion and sediment control measures for development sites. The Project will ensure compliance with all relevant regulations and will undertake construction in accordance with an approved Construction Environmental Management Plan (CEMP).

### **3.1.5 Nature Conservation Act 2014**

#### **Overview**

The *Nature Conservation Act 2014* (NC Act) establishes the formal process for the identification and protection of threatened species and ecological communities in the ACT region. Under the Act, the Conservator of Flora and Fauna must prepare an action plan in response to each declaration of a threatened species, ecological community or threatening process.

#### **Relevance to the project**

Proponents must assess the likely impact of a proposed development on threatened species and ecological communities listed under the NC Act. Threatened species and ecological communities potentially relevant to the Project have been assessed in consideration of the NC Act in Section 5.11.

### **3.1.6 Tree Protection Act 2005**

#### **Overview**

The *Tree Protection Act 2005* (TP Act) aims to protect trees and urban forest values within urban areas of the ACT. Trees of exceptional value are protected and identified under the TP Act. Trees protected by the TP Act are listed in the ACT Tree Register.

#### **Relevance to the project**

There are no registered trees located within the Project area, and therefore the provisions of the TP Act do not apply to the Project.

### **3.1.7 Water Resources Act 2007**

#### **Overview**

The *Water Resources Act 2007* (WR Act) aims to ensure the use and management of water resources by the Territory is sustainable and supports the protection of ecosystems that depend on waterways. It is also designed to protect waterways and aquifers from modification and damage.

The WR Act requires that works undertaken within a waterway, or construction of a water structure with a capacity of more than two megalitres, is to be licensed. If the work is approved by an Environmental Authorisation or Environment Protection Agreement under EP Act, an additional waterway work licence is not required.

### **Relevance to the project**

A Waterways Works Licence may be required by the construction contractor for the works adjacent to Jerrabomberra Creek (ID 2793). If the work is approved by an Environmental Authorisation or Environment Protection Agreement under the *Environment Protection Act 1997*, an additional waterway work licence is not required.

## **3.2 Commonwealth legislation**

### **3.2.1 Environment Protection and Biodiversity Conservation Act 1999**

#### **Overview**

The Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect the environment, particularly in relation to matters of national environmental significance (MNES) which include:

- world heritage properties.
- national heritage places.
- wetlands of international importance (Ramsar' wetlands).
- nationally threatened species and ecological communities.
- migratory species.
- Commonwealth marine areas.
- the Great Barrier Reef Marine Park.
- nuclear actions (including uranium mining).
- a water resource, in relation to coal seam gas development and large coal mining development.

The environment as defined in Section 528 of the Act includes

- a. Ecosystems and their constituent parts, including people and communities
- b. Natural and physical resources
- c. The qualities and characteristics of locations, places and areas
- d. Heritage values of places
- e. The social, economic and cultural aspects of a thing mentioned in paragraph (a), (b), (c) or (d).

The EPBC Act Policy Statement 1.1, Significant Impact Guidelines – Matters of National Environmental Significance and EPBC Act Policy Statement 1.2, Significant Impact Guidelines – Actions on, or imposing upon, Commonwealth land and Actions by Commonwealth Agencies provide a definition and criteria to assist with an assessment of significant impact.

An action that will have, or is likely to have an impact on a matter of national environmental significance requires referral to the Commonwealth Environment Minister to assess whether a formal approval of the Action under the EPBC Act is required.

#### **Relevance to the Project**

An EPBC Act assessment report has been prepared to consider the project in relation to matters of national environmental significance and whole of the environment matters. This is included as Appendix E.

The EPBC Act assessment concluded that the Project is unlikely to have a significant impact on any MNES and therefore does not require referral to the Commonwealth.

## 3.2.2 ACT Climate Change Strategy 2019-2025

### Overview

The ACT government has established a legislated target under the Climate Change and Greenhouse Gas Reduction Act 2010 of zero net emissions by 30 June 2045.

The ACT Climate Change Strategy 2019-2025 outlines the next stage of the ACT Government's climate change response and identifies actions to meet legislated targets and prepare for the impacts of climate change. The strategies target to provide the ACT electricity network with 100% renewable electricity has already been achieved. The proposed transmission line will be integrated into the existing ACT electricity network and will deliver 100% renewable electricity consistent with the ACT Climate Change Strategy.

### Relevance to the Project

Beyond renewable electricity supply, the strategy places a strong focus on reducing emissions associated with transport and fuel combustion. The EIS includes an assessment of the Project's impact on Climate Change in consideration of construction phase greenhouse gas emissions and the steps identified in the ACT Climate Change Strategy to reduce emissions. This assessment is located in Section 5.17 and Appendix F.

## 3.2.3 Canberra's Living Infrastructure Plan: Cooling the City (2019)

### Overview

*Canberra's Living Infrastructure Plan: Cooling the City (2019)* (the living infrastructure plan) sets out the ACT Government's commitment to maintain and improve living infrastructure in Canberra. The living infrastructure plan recognises the role that 'living infrastructure' plays with cooling the city as the climate warms and becomes more variable and extreme.

### Relevance to the Project

The Project is not inconsistent with actions outlined in the living infrastructure plan.

## 3.3 Other requirements

### 3.3.1 National Capital Plan

#### Overview

The National Capital Plan (NCP) is the Commonwealth Government's strategic Plan for Canberra and the Australian Capital Territory, and is administered by the National Capital Authority (NCA). The NCP maintains broad oversight of planning in the Territory and importantly an interest in the planning, design and development of those areas having the special characteristics of the National Capital.

The NCP prescribes land use controls across the whole of the Territory and includes more detailed planning provisions for areas where the Commonwealth has a specific interest, including designated areas and national land. Under the Commonwealth *Australian Capital Territory (Planning and Land Management) Act 1988* (ACT(PLM) Act), land that is not designated land (section 25) or national land (section 28) is territory land and subject to approval under the Territory Plan.

#### Designated areas

Designated areas, as defined in section 9 of the ACT(PLM) Act, includes land that has the special characteristics of the National Capital. Designated Areas include main avenues and approach routes (MAARs) because they create the first impressions entering Canberra and build anticipation and recognition of Canberra as the National Capital. The Project area is located within the road reserves of the Monaro Highway and Canberra Avenue which are designated areas subject to provisions of the MAARs precinct code and special requirements for main avenues as per section 4.23 of the NCP.

## National land

The Project will involve construction on HMAS *Harman* (Jerrabomberra Part Blocks 2062 (retired, now 2249) and 2004) which is national land subject to Development Control Plan (DCP) 11/04. Works occurring at *Harman* are on National Land and subsequently require a Letter of Consistency to be obtained from the NCA.

## Broadacre areas

The Project area is located in land zoned as Broadacre and is subject to policies for broadacre areas as per section 3.6 of the NCP. All proposals for development occurring in Broadacre areas within two kilometres of HMAS *Harman* must be referred to Defence for examination and comment which is to be considered in making a decision on whether to approve the proposal.

## Special requirements

Under clause 4.24 of the NCP, development on land that is within 200 m from the middle lines of an approach route, but not within a designated area, is subject to 'special requirements'. A DCP exists for Part Block 12 Section 111 Symonston and Part Block 2233 Section 0 Jerrabomberra (DCP 19/01). As transmission line cables will intersect Block 2233, the Project is subject to special requirements under the abovementioned DCP but does not require works approval by the NCA. Block 12 Section 111 Symonston and Block 2233 Jerrabomberra is under EPSDD planning jurisdiction, and any works on these sites are not required to be submitted for NCA Works Approval.

## 3.3.2 Territory Plan 2008

### Overview

The *Territory Plan 2008* (Territory Plan) is a statutory planning instrument administered by the ACT Planning and Land Authority and enacted under the *Planning and Development Act 2007*. The purpose of the Territory Plan is to control planning and development in the ACT in a manner which promotes '*an attractive, safe and efficient environment in which to live, work and have their recreation*'. The Territory Plan manages development and land use by establishing strategic directions and plans, land uses as well as codes and criteria associated with different land uses.

### Strategic directions

The Territory Plan Strategic Directions establish the general principles for sustainable development as necessary to achieve the objectives of the Territory Plan. The Strategic Directions outline broad principles for achieving environmental, economic, and social sustainability as well as spatial planning and urban design principles that reflect specific policies of the Territory Plan.

The Project is consistent with the broad objectives outlined in Statement of Strategic Directions as it will allow for the supply of electricity to industrial land in the future (1.14), promote new investment through energy provision (1.12) and has been assessed against the ecological footprint (1.17). The Project is not inconsistent with any principles of the Statement of Strategic Directions.

## 3.3.3 ACT Planning Strategy 2018

### Overview

The ACT Planning Strategy 2018 recognises the social, economic and environmental changes occurring in Canberra. The Strategy reflects and integrates the vision and directions of the community and other ACT Government strategies, particularly housing, transport and climate change. The vision of this strategy is for Canberra to be a sustainable, competitive and equitable city that respects Canberra as a city in the landscape and the National Capital, while being responsive to the future and resilient to change.

## Relevance to the project

Action 2.5.3 of the strategy continues to support employment with the 'defence and security' cluster within the Project area. The Project involves the provision of electrical infrastructure to meet projected demands for existing and proposed employment in this area, which is consistent with the general aims and objectives of the ACT Planning Strategy 2018.

## 3.3.4 Eastern Broadacre Strategic Assessment

### Overview

The Eastern Broadacre area of the ACT encompasses part of the eastern edge of the ACT including the Majura Valley in the north and the Jerrabomberra Valley in South. Development is anticipated to occur in this area over the course of 20 years and will comprise greenfield and infill development, including associated infrastructure, such as roads and services.

In 2014, the Australian Government entered into an agreement with the ACT Government to undertake a strategic assessment in accordance with Section 146 of the EPBC Act. The Eastern Broadacre strategic assessment is currently underway and has not yet been endorsed by the Commonwealth.

### Relevance to the project

The Project will provide an increased electricity supply to *Harman* which is not included in the Eastern Broadacre strategic assessment area. The Project would have no bearing on any future developments in the Eastern Broadacre area as the transmission line will only service *Harman*.

The Project has been assessed to be unlikely to have a significant impact upon any matters of national environmental significance (Appendix E), and therefore would not affect the environmental considerations or outcomes of the strategic assessment.

## 3.3.5 Ecologically sustainable development

Section 9 of the PD Act outlines the key consideration for Ecologically Sustainable Development (ESD) principles applicable to development in the ACT. The Project has been assessed against these below.

### The precautionary principle

A thorough review of the proposed design, construction and maintenance has been undertaken to identify areas where the project would be able to avoid or mitigate potential for impact. Evoenergy is committed to implementing practical measures that have been demonstrated to be effective to minimise impacts on the environmental values of the Project area.

With implementation of the proposed measures, it would be unlikely that the project would cause serious or irreversible damage.

### Inter-generational equity

Given the location and nature of the Project within existing road reserves, the Project would not result in any impacts that are likely to adversely impact on the health, diversity or productivity of the environment for future generations.

### Conservation of biological diversity and ecological integrity

A Biodiversity assessment was undertaken to understand the existing values of the Project area and identify appropriate measures to avoid or manage potential impacts of the Project on biodiversity. A range of Project and location specific design and mitigation measures are committed to be implemented to minimise impacts upon biodiversity and maintain ecological integrity. An assessment of the Project on biodiversity values is provided in Section 5.11.

## **Appropriate valuation and pricing of environmental resources**

The EIS has examined the environmental consequences of the Project and has identified management measures to minimise the potential for adverse impacts. The implementation of these measures would result in an economic cost to the proponent including increased capital expenditure and operation costs. The Project has been developed to minimise the potential for impacts to environmental values rather than providing a least cost solution.

# 4. Risk assessment

## 4.1 Overview

A risk-based approach to potential environmental impacts from the project was employed. This approach rates hazards with respect to the likelihood (i.e. chance of occurring), and the consequence (i.e. the outcome), of each potential impact occurring.

Early identification of hazards that have a higher risk rating (i.e. higher risk of an adverse impact), assists both the proponent and the determining authority to clearly identify the highest rated risks. Early implementation of the risk based approach allows a proponent to commit to measures that would avoid or reduce impact. Such measures may include design features, commitments for management during construction and operation. This approach has been implemented by Evoenergy through:

- Review and commitment to modification of design to reduce potential for impact (see Section 2.3.5).
- Commitment to a range of construction and operational management measures targeted to avoid or reduce potential for impact, based upon identified hazards.

An environmental risk assessment, consistent with the Australian and New Zealand Standard for risk management AS/NZS ISO 31000:2018, was conducted to identify and understand the potential impacts of the Project. This approach aligns with the ACT Government (2017), *Proponent's Guide to Environmental Impact Statements* and the 'General Requirements for the EIS' outlined in the Scoping Document (201900038).

## 4.2 Methodology

### 4.2.1 Risk identification

An initial preliminary risk assessment was completed for the project (WSP, 2019) to identify the 'inherent risk' to relevant environmental and social matters. The objective of the initial preliminary risk assessment was to identify the significance level of potential impacts from the Project to assist the creation of the Scoping Document.

The preliminary risk assessment in this EIS is a combination of the initial preliminary risk assessment (WSP, 2019), risks identified in the scoping document, and other risks identified during the preparation of this EIS.

### 4.2.2 Likelihood evaluation

Likelihood of a hazard occurring is the chance, or probability of a potential impact being realised. The likelihood criteria and descriptions used in the risk assessment are provided in Table 4.1.

Table 4.1 Likelihood criteria and definitions (ACT Government 2017)

Likelihood	Description	Probability (%)	Community attitude
Remote	May occur in exceptional circumstances	<1	Few people interested
Unlikely	Not expected to occur in most circumstances	1-20	Some people affected
Possible	May occur	21-49	Many people affected
Likely	Probably will occur	50-85	Most people affected
Almost certain	Expected to occur	>85	Almost everyone affected

### 4.2.3 Consequence evaluation

The evaluation of consequence was conducted through applying a consequence definition in consideration of the criteria included in Table 4.2, including:

- The kind, size, frequency, intensity, scope and length of time of the impact.
- The sensitivity, resilience and rarity of the environmental function, system, value or entity likely to be affected.

Table 4.2 Consequence descriptions and criteria examples (ACT Government 2017)

Consequence	Description	Minimal	Minor	Moderate	Major	Catastrophic
<b>Magnitude</b>						
Spatial	The area over which the impact will occur, from square metres to square kilometres. Evaluating magnitude must consider the potential for indirect and off-site impacts.	A single pool	A reach of river or part of a catchment	Multiple reaches or whole catchment	Multiple catchments	Whole of basin
Intensity	The level of impact within the spatial area, from minor disruption to total destruction. A low intensity impact over a large area could be worse than a high intensity impact in a small area, depending on other elements.	Low level behavioural, lifespan or condition effect	Acute impacts on some species	Moderate impacts on growth, recruitment or survival rates	Lethal impacts on some species	Lethal for individuals or communities
<b>Temporal</b>						
Duration	The length of time of the impact, from a single event to a permanent change.	Single incident or transient event	Short term impact, single generation	Medium term	Long term, multiple generations	Permanent
Timing	Short term events may create significant impacts if they occur often. They may also coincide with particularly sensitive times in the receiving environment such as breeding cycles.	Occurs outside breeding times	Occasional interruption of feeding or breeding	Interrupts one life cycle	Regularly interrupts life cycle	Permanent interruption of life cycle
<b>Ecological</b>						
Values	The quality of the receiving environment, generally identified through the declaration of conservation areas, identification of protected species and other features of natural conservation value.	Previously disturbed areas	Previously disturbed areas/Parkland	Nature conservation area	Conservation area, listed species or other conservation feature of ACT significance	Wilderness, nationally threatened species or other conservation feature of national significance
Sensitivity	The capacity of the receiving environment to regenerate or adapt to the impact (resilience). The sensitivity of an environment to a potential impact will require informed judgement and consideration of cumulative impacts.	Will recover completely	Will recover with some changes	Moderate change to ecosystem functioning	Significant change to ecosystem functioning	Will not recover
<b>Social</b>						
Number of people	The number of people directly or indirectly affected through lost opportunities for enjoyment or other values such as equity or existence values.	Some people indirectly impacted	Some people directly impacted or several indirectly	Several people directly impacted or many indirectly	Large number of people directly impacted	Loss of life

<b>Consequence</b>	<b>Description</b>	<b>Minimal</b>	<b>Minor</b>	<b>Moderate</b>	<b>Major</b>	<b>Catastrophic</b>
Heritage	The impact on known or possible items of heritage or cultural value.	Impact on item of minimal significance	Impact on multiple items of low significance	Impact on significant item	Impact on multiple significant items	Major impact on protected item
Political	The measure of the likely political implications or level of community interest.	Single negative press article	Multiple negative press articles	Significant public interest	Leads to an inquiry	Change of government
<b>Economic</b>						
Economic	The financial cost of the impact through lost productivity or the cost of remediation.	Minimal losses	Several thousand dollars lost revenue or remediation costs	Half million dollars in lost revenue or remediation costs	One million dollars in lost revenue or remediation costs	Several million dollars in lost revenue or remediation costs

## 4.2.4 Risk rating

Each risk identified in the preliminary risk assessment is assessed as a combination of its likelihood and consequence. Risk rating, and significance level is based upon the risk assessment matrix in Table 4.3.

Table 4.3 Risk assessment matrix (ACT Government 2017)

		Consequence				
		Minimal	Minor	Moderate	Major	Catastrophic
Likelihood	Remote	Negligible	Negligible	Very low	Low	Medium
	Unlikely	Negligible	Very low	Low	Medium	High
	Possible	Very low	Low	Medium	High	Very high
	Likely	Low	Medium	High	Very high	Significant
	Almost Certain	Medium	High	Very high	Significant	Significant

## 4.2.5 Assessment of residual impact

After establishment of the inherent (unmitigated) risk rating in the preliminary risk assessment, mitigation measures were developed, typically where a risk rating was medium or greater. These measures included modifications to the design, and measures to be implemented during and following construction.

The hazards identified in the preliminary risk assessment, were reassessed in consideration of the mitigation measures implemented. This residual impact assessment for each identified aspect is included in Section 5, with a summary provided in Section 5.18.

## 4.3 Preliminary risk assessment

The preliminary risk assessment includes risks identified from the Scoping Document 'Table 1 – Identified impacts and requirements to be addressed in the EIS', risks identified in the Preliminary Environmental Assessment (WSP 2019) as well as risks that have been subsequently identified and assessed during the preparation of this EIS. The preliminary risk assessment, which considers unmitigated risks is included in Table 4.4. The residual impact assessment is included in Section 5 following the assessment of impacts.

Table 4.4 Preliminary risk assessment (unmitigated)

Environmental Subject	Hazard identified	Inherent risk assessment		
		Likelihood	Consequence	Risk Rating
Planning and Land Status	Impact of power lines upon adjacent land uses identified as “approach routes” within NCA Designated Areas.	Possible	Minor	Low
	Potential impact to property values.	Possible	Minor	Low
Traffic and Transport	Increased traffic congestion and reduced road safety during construction.	Possible	Moderate	Medium
	Changes to existing access.	Unlikely	Minor	Very low
Utilities	Impacts to existing infrastructure during construction.	Unlikely	Moderate	Low
	Impact to existing bores and water infrastructure within the Project footprint.	Possible	Minor	Low
Materials and Waste	Increased waste to landfill during construction and demolition.	Possible	Minor	Low
	Hazards created by stockpiling of materials within the construction site.	Possible	Minor	Low
Soils and geology	Impact on adjoining land as a result of sediment and erosion.	Possible	Minor	Low
	Site contamination (such as liquid contaminant spills (hydrocarbons, chemicals etc)) from construction machinery.	Possible	Minor	Low
	Encountering contaminated land.	Possible	Minor	Low
Landscape and visual	Visual impacts on approach routes and iconic visual features in the ACT.	Likely	Minor	Medium
	Visual disturbance caused by the temporary storage of machinery and materials along approach routes.	Likely	Minimal	Low
Water quality and hydrology	Impact on water quality due to potential erosion and sedimentation during and post-construction.	Possible	Minor	Low
Socio-economic and health	Impacts upon critical service and electricity-dependent entities as a result of temporary losses in electricity supply.	Unlikely	Major	Medium
	Impacts upon human health and safety as a result of electro-magnetic fields (EMF) and frequencies associated with high-voltage power lines.	Unlikely	Major	Medium
General hazards and risk	Impacts upon construction workers and service personnel as result of exposure to high-voltage power lines.	Remote	Catastrophic	Medium
	Risks associated with electromagnetic induction upon human health and safety.	Remote	Catastrophic	Medium
	Risks associated with Earth potential rise (EPR) upon human health and safety	Possible	Catastrophic	Very high
	Potential risk of bushfire during construction.	Unlikely	Minor	Very low
	Potential for transmission lines to cause bushfires.	Unlikely	Minor	Very low

Environmental Subject	Hazard identified	Inherent risk assessment		
		Likelihood	Consequence	Risk Rating
Ecology and natural environment	Direct impacts on ecological species or communities as a result of construction activities.	Possible	Major	High
	Indirect impacts on ecological species or communities as a result of changes in physical characteristics of the area.	Unlikely	Major	Medium
	General impacts to fauna during construction.	Unlikely	Minor	Very low
	Death or injury of a listed fauna species during operation (e.g. electrocution from transmission line conductors, or maintenance vehicle strikes).	Unlikely	Major	Medium
	Death or injury of a listed fauna species as a result of increased predator abundance and predation intensity.	Possible	Major	High
	Impact upon rocky areas that provide habitat for Striped Legless Lizard ( <i>Delma impar</i> ).	Possible	Major	High
	Impact upon Natural Temperate Grassland.	Unlikely	Major	Medium
Heritage	Impacts on identified objects with Aboriginal Cultural Heritage value.	Likely	Moderate	High
	Direct impacts on existing nominated heritage places and/or object (such as physical, visual and potential vibration impacts).	Unlikely	Minimal	Negligible
Noise and vibration	Potential noise and vibration impacts from construction activities on sensitive receivers.	Possible	Minor	Low
Air quality	Decrease in air quality during construction (e.g., dust, hydrocarbon fumes).	Possible	Minor	Low
Greenhouse gas	Generation of greenhouse gas emissions during construction from vehicles and machinery.	Possible	Minor	Low
Climate change	Potential impacts to project infrastructure as a result of climate change.	Possible	Minor	Low
Resources	Increased demand on resources (e.g. electricity, fuel, concrete, water) resulting in reduced availability of resources for the local community.	Possible	Minor	Low
	Increase in energy consumption associated with operation of the Project.	Likely	Minor	Medium

# 5. Assessment of impacts

## 5.1 Overview

This section provides an assessment of the relevant environmental aspects with potential to be impacted by the Project as identified in the preliminary risk assessment.

The approach for assessing impacts upon each environmental aspect and how it aligns with the risk assessment methodology is indicated in Table 5.1.

**Table 5.1** Assessment of impacts methodology

Aspect sub-heading	Scoping document requirement summary	Relevant risk assessment methodology step
Overview	General description of the section.	1. Risk identification.
Environmental conditions and values	Baseline conditions.	
Investigations	Findings and results of any environmental investigations.	
Potential impacts	Description of the environmental impacts of construction and operation.	2. Evaluating likelihood. 3. Evaluating consequence. 4. Risk rating.
Mitigation measures	Safeguards and mitigation measure that are to be implemented to reduce the identified potential impacts.	4. Mitigation and residual impact.
Residual risk assessment	Risk assessment, in consideration of implementation of mitigation measures, for risks identified to be medium or greater in the preliminary risk assessment.	

## 5.2 Planning and land status

### 5.2.1 Overview

This section outlines the potential planning and land status risks, impacts and mitigation measures associated with the Project. Using a desktop assessment, this section specifically addresses the following requirements of the Scoping Document:

- Include a description of planning context of the area where the project will be located.
- Describe planning and development status of any land or project relevant to the proposal.
- Describe land use of the proposed land and any land to be affected.
- Include reference to the pending *Eastern Broadacre Strategic Assessment*.

### 5.2.2 Environmental conditions and values

#### Land use

##### Existing land use

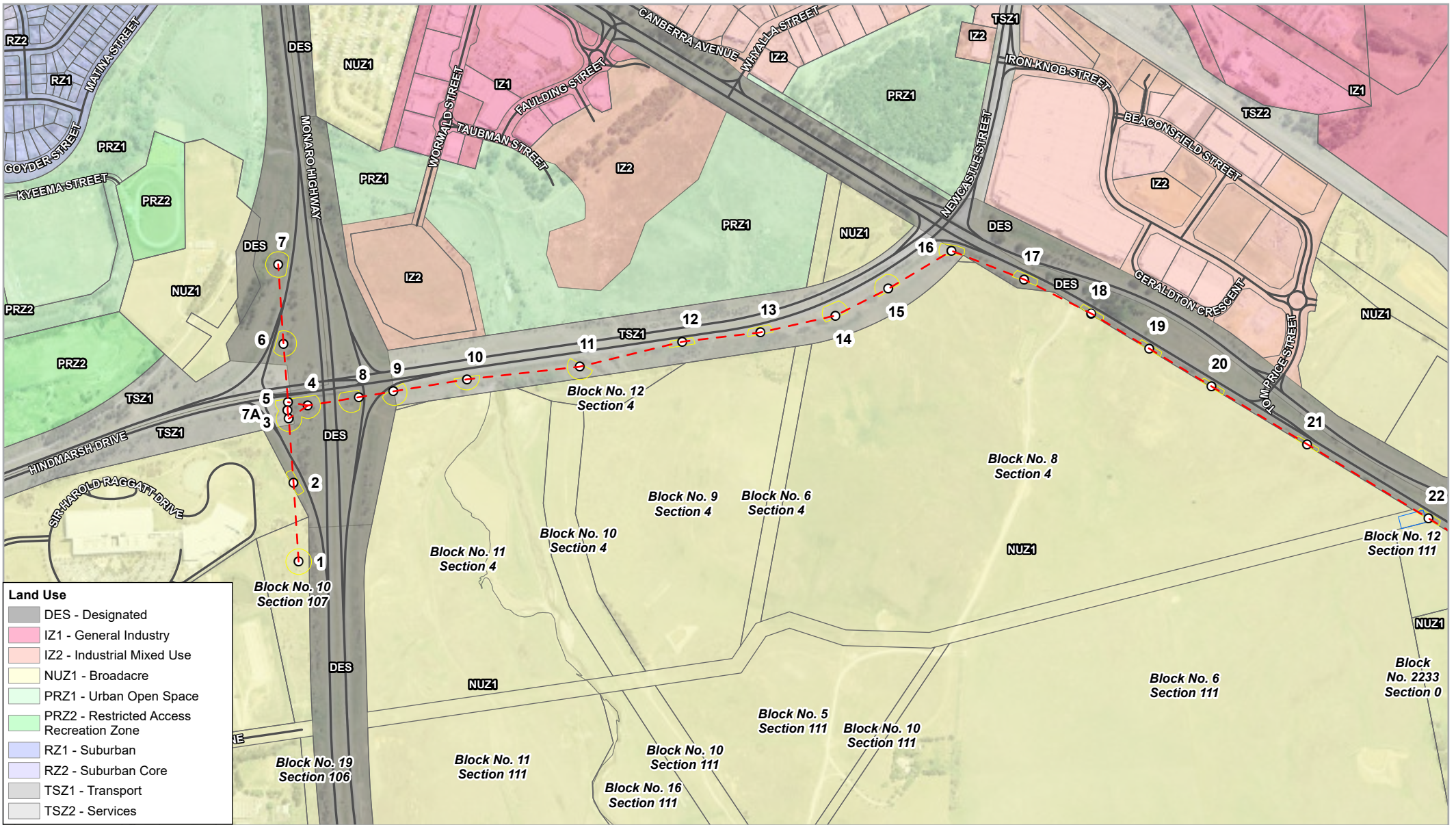
The existing uses of the land identified to which the project relates (Section 2.2) are:

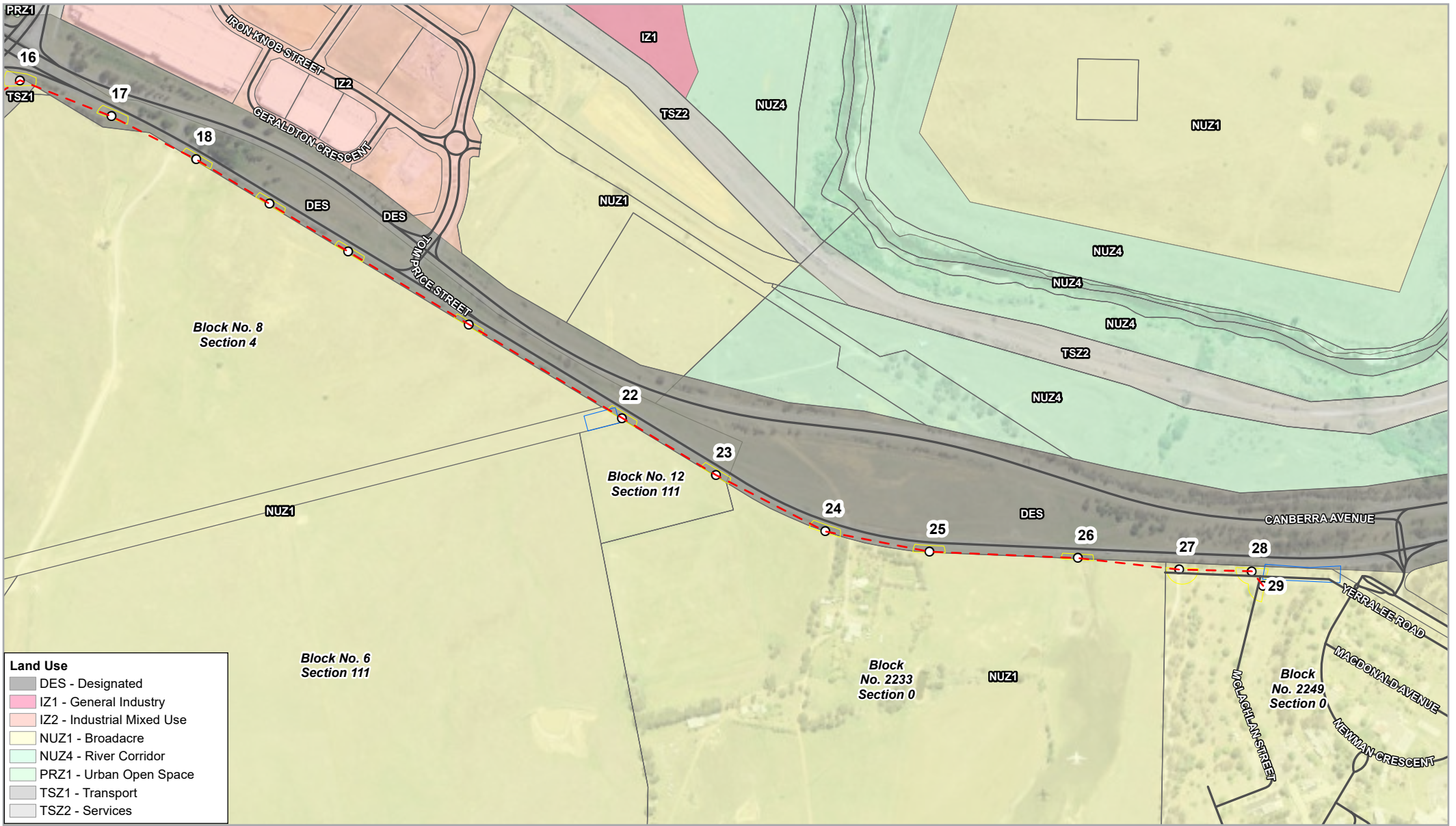
- Road reserve – cleared and maintained road shoulder and adjacent areas, with some areas comprised of native and non-native trees and shrubs.
- Pasture with access tracks – used for grazing of stock.

Current land use zoning as per the Territory Plan 2008 is shown in Figure 5.1 and Figure 5.2. Surrounding land uses are identified in Table 5.2.

**Table 5.2** Surrounding land uses

Description	Uses	Dominant Zoning
North – Hindmarsh Drive	<ul style="list-style-type: none"> <li>– Road/transport</li> <li>– Grazing / vacant land (AMTECH Estate)</li> <li>– Suburb of North Symonston, including:               <ul style="list-style-type: none"> <li>• Light industrial / medical</li> <li>• Residential</li> </ul> </li> </ul>	PRZI: URBAN OPEN SPACE
South – Hindmarsh Drive	<ul style="list-style-type: none"> <li>– Grazing, farmland/rural</li> <li>– Rural residence</li> </ul>	NUZI: BROADACRE
North – Canberra Avenue	<ul style="list-style-type: none"> <li>– Road/transport</li> <li>– Commercial:               <ul style="list-style-type: none"> <li>• Direct Factory Outlet (DFO)</li> <li>• Other bulky goods developments</li> </ul> </li> <li>– Farmland</li> <li>– Molonglo River</li> </ul>	IZ2: INDUSTRIAL MIXED USE
South – Canberra Avenue	<ul style="list-style-type: none"> <li>– Grazing, farmland/rural</li> <li>– Rural residences approximately 800 m and 50 m from Project area)</li> <li>– Defence (HMAS <i>Harman</i>)</li> </ul>	NUZ1: BROADACRE
West – Monaro Highway	<ul style="list-style-type: none"> <li>– Industrial:               <ul style="list-style-type: none"> <li>• Geoscience Australia</li> <li>• Jerrabomberra Fire Station</li> </ul> </li> <li>– Education:               <ul style="list-style-type: none"> <li>• St Benedict's Primary School</li> </ul> </li> </ul>	NUZ1: BROADACRE





## National Capital Authority

The proposed transmission line alignment would be constructed within and adjacent to the road corridors of Monaro Highway and Canberra Avenue. These roads are designated areas (refer to Figure 5.1 and Figure 5.2) under the National Capital Plan (NCP) and are managed as part of the 'main avenue and approach routes precinct code'. The roads are subject to multiple land use categories under the NCP, including 'national and arterial roads' and 'inter-town public transport system'. As both roads are part of the 'main avenue and approach routes precinct code', they are subject to design policies and works approval by the NCA. If development were to occur outside of these road reserves, it may also be subject to special requirements under a Development Control Plan.

HMAS *Harman* is not designated land, but is National Land managed by Defence on behalf of the Commonwealth. Development on *Harman* is subject to special requirements and planning approval as administered by the NCA.

## Eastern Broadacre Strategic Assessment

As discussed in Section 3.3.2 the Project is within the area subject to the Eastern Broadacre Strategic Assessment (EBSA). The Project will deliver an increased electricity supply to *Harman* which is not included in the strategic assessment area. As electricity supply will only service *Harman*, the Project will not have any bearing on future developments in the area, including those considered in the EBSA.

## Permissibility within the Zone

Under the Territory Plan 2008, a 'major utility installation – major service conduit' (the Project) is permissible in the Impact Track in all of the relevant zones. Whilst listed in the Merit Track for NUZI: BROADACRE and TSZ1: TRANSPORT zones, the Project is triggered in the impact track under Schedule 4 of the *Planning and Development Act 2007*.

## Future land use

The proposed transmission line alignment is almost wholly contained in road reserves of major roads so is unlikely to be subject to changes in land zoning. None of the Project area or surrounding allotments are identified as 'Future Urban Area' under the Territory Plan 2008.

It is understood that there is likely to be development occur within the HMAS *Harman* based in the future. The area, identified as the *Harman Precinct* in the EBSA, broadly covers any future development and future land uses in the region.

## 5.2.3 Investigations

A review of existing and future land uses was undertaken by desktop assessment and site visit to identify the potential land use impacts associated with the construction of the Project. This involved:

- Assessment and review of the surrounding land uses via ACTmapi and Google Earth Pro
- Review of the broad strategic planning documents including the EBSA
- Site visit to 'ground-truth' the study area

The risk of potential impact to property values, identified in the initial preliminary risk assessment (WSP, 2019) was assigned a low risk rating and is covered in landscape and visual assessment.

## 5.2.4 Potential impacts

### Identified risks

Risks to planning and land status are identified in the preliminary risk assessment (Section 4.3) to be

- Impact of power lines upon adjacent land uses identified as "approach routes" within NCA Designated Areas
- Potential impact to property values.

Potential impacts to planning and land status as a result of construction and operation of the project are discussed in the following sections.

## Construction

Development of the Project would not result in a change the land use zoning or the status of land within the Project area.

The locations of each pole with respect to land-use zonings is provided below in Table 5.3.

**Table 5.3** Pole locations within land use zones

Pole identification	Land administrator	Land use zoning
Pole 2(E), Pole 3(N), Pole 4(N), Pole 5(N), Pole 6(E), Pole 7 (E), Pole 8(N), Pole 17(N), Pole 18(N), Pole 19(N), Pole 20(N), Pole 21(N), Pole 22(N), Pole 23(N), Pole 24(N), Pole 25(N), Pole 26(N)	National Capital Authority (Road Reserve)	DES - Designated
Pole 1 (E)	ACT Government (Blocks Private Lessee)	NUZ1 - Broadacre
Pole 9(N), Pole 10(N), Pole 11(N), Pole 12(N), Pole 13(N), Pole 14(N), Pole 15(N), Pole 16(N)	ACT Government (Road Reserve)	DES - Designated
Pole 27(N), Pole 28(N), Pole 29(N)	National Capital Authority (National Land)	NUZ1 – Broadacre

*Poles (N) = New pole construction, (E) = Existing pole*

All new poles are located within road reserves. The 132 kV poles along Canberra Avenue will follow the existing alignment of a 11 kV transmission line, and the alignment in this area is consistent with the existing land use.

The Project has the potential to cause temporary reduction in visual amenity during the construction phase as a result of erection of fencing, barricades, lighting, site compounds, vehicle movements and other construction activities. This could affect:

- Drivers using the road network.
- Clients and workers in the commercial spaces at DFO or other retail or commercial properties located northeast of the Newcastle Street and Canberra Avenue intersection.
- Limited pedestrian traffic.

The landscape and visual assessment in Section 5.7 assesses the visual impacts during construction, and construction traffic impacts are discussed in Section 5.3.

Other potential amenity impacts include noise and air quality. These are assessed in Section 5.13 and Section 5.14, respectively.

## Operation

During operation there would be no change to the land status or planning status of the road reserve.

Following construction, the primary visual impact caused by the Project would on sensitive receivers. As above these could include:

- Drivers using the road network.
- Clients and workers in the commercial spaces at DFO or other retail or commercial properties located northeast of the Newcastle Street and Canberra Avenue intersection.
- Limited pedestrian traffic.

Refer to Section 5.7 for an assessment of the visual impacts of the Project during operation.

## 5.2.5 Mitigation measures

To reduce potential impact of the Project on planning and land use, the following measures have been included in design or are to be implemented:

- Pole type – The pole type selected for the Project has the lowest construction footprint possible for the required supply (i.e. does not comprise towers that require larger footings and clearances, and may have greater visual impact). Such structures minimise the overall visual impact compared to other options available, such as lattice towers.
- Alignment route – Because the project infrastructure is to be located predominantly within road reserves, some of which already contain transmission line infrastructure, no planning or land use changes are necessary.
- Existing infrastructure – The alignment extends along the route of an existing transmission line alignment along Canberra Avenue. Amenity change is of less impact than that of an alignment without existing infrastructure.

Other landscape and visual mitigation measures have been included in Section 5.7.5.

## 5.2.6 Residual risk assessment

Based on the mitigation measures identified, an assessment of the residual planning and land status risks associated with the Project have been considered. These residual risks are identified in Table 5.4.

*Table 5.4 Planning and land status – residual risk assessment*

Identified Risk	Preliminary risk rating	Residual risk assessment		
		Residual likelihood	Residual consequence	Residual risk rating
Impact of powerlines upon adjacent land uses identified as “approach routes” within NCA Designates areas.	Low	Possible	Minor	Low
Potential impact to property values	Low	Possible	Minor	Low

## 5.3 Traffic and Transport

### 5.3.1 Overview

This section outlines the potential traffic and transport risks, impacts and mitigation measures associated with the Project. Using a Traffic and Transport Impact Assessment (TTIA) (Appendix G), this section address the following traffic and transport requirements of the Scoping Document:

- Provide a Traffic Management and Control Plan (TMCP) detailing all safety measures to be implemented during construction
- Describe arrangements for the transport of construction materials, equipment, products and personnel during the construction phase of the development Project
- Include a description of the volume of traffic generated during construction
- Investigate the impacts the Project will have on traffic congestion and road safety and describe mitigation measures to reduce impacts
- Investigate the impacts on the vehicular route chosen to transport oversized equipment and accessories by heavy vehicles and describe mitigation measures to reduce the impacts
- Identify and investigate each of the entrance/exit points to be utilised during construction to ensure the minimum stopping site distances are achieved in accordance with any applicable standards.

## 5.3.2 Environmental conditions and values

According to Trunk Road Infrastructure Standard No.01 (*Road Planning Act 2012*), the classification of roads in the ACT is based on a formal road hierarchy. The classification relates to the predominant function of a road and to the extent it serves the two basic purposes of the road network – the movement of traffic and access to property.

There are two primary types of roads within the ACT road network – trunk roads (arterial roads) and local roads (major collector roads, minor collector roads, and access streets).

The classification of roads within the existing road network can be used as an indication of the functional role each road plays with respect to the volume of traffic they should appropriately carry. The ACT Government Environment and Sustainable Development Estate Development Code (ACT Government 2020) includes a set of road hierarchy classifications detailed in Table 5.5 which includes typical daily traffic volume for various classes of roads.

**Table 5.5** Functional classification of roads (ACT Government 2020)

Location	Traffic Volume (vehicles per day)
Arterial Roads	>6,000
Major Collector Roads	3,001 – 6,000
Minor Collector Roads	1,001 – 3,000
Access Street	0 – 1,000

The classification and key features of the roads along the Project alignment are provided in Table 5.6.

**Table 5.6** Key features of roads along the Project area

Feature	Canberra Avenue	Hindmarsh Drive	Monaro Highway
Classification	Arterial	Arterial	Arterial
Carriageway	Generally, two traffic lanes are provided in each direction separated by a wide central median.	Generally, two lanes in each direction separated with a raised median.	Two lanes separated in each direction.
Parking	No Stopping restriction.	No Stopping restriction.	No Stopping and No Parking restrictions.
Speed limit	80 km/h	60 km/h signposted in the eastbound direction and 80 km/h in westbound.	100 km/h, 80 km/h on the entry ramps to Hindmarsh Drive.
Pedestrian facilities	Footpaths are provided on the northern side of Canberra Avenue.	No dedicated facilities.	No dedicated facilities.
Bicycle facilities.	Dedicated cycle lanes are provided approaching Tom Price Street and Hindmarsh Drive.	Dedicated cycle lanes on both sides of the road.	No dedicated facilities.
Public transport	Canberra Train Station is located on the eastern side of Canberra Avenue, west of the site (in Kingston). Bus stops are located on the northern and southern sides of Canberra Avenue. Canberra Avenue at Woods Lane bus stop is located on the eastern side of where the proposed transmission line terminates.	No dedicated bus stops on Hindmarsh Drive. The nearest bus stops are located on Canberra Avenue, around 300 m to the north of the site.	No dedicated facilities.

### 5.3.3 Investigations

The TTIA identifies the potential construction and operational traffic impacts and management as a result of constructing the 3.6 km transmission line along Monaro Highway, Hindmarsh Drive and Canberra Avenue.

The TTIA included a desktop assessment of the following:

- Traffic signal data were provided by ACT Transport service using signal detector counts. The counts were collected for 24 hours from Monday 10 February 2020 until Sunday 16 February 2020.
- Traffic counts were provided for the following intersections, as shown in Figure 5.3.
  - Canberra Avenue / Woods Lane.
  - Canberra Avenue / Tom Price Street.
  - Canberra Avenue / Hindmarsh Drive.
  - Monaro Highway / Hindmarsh Drive.
- Midblock traffic counts were extracted using intersection counts.

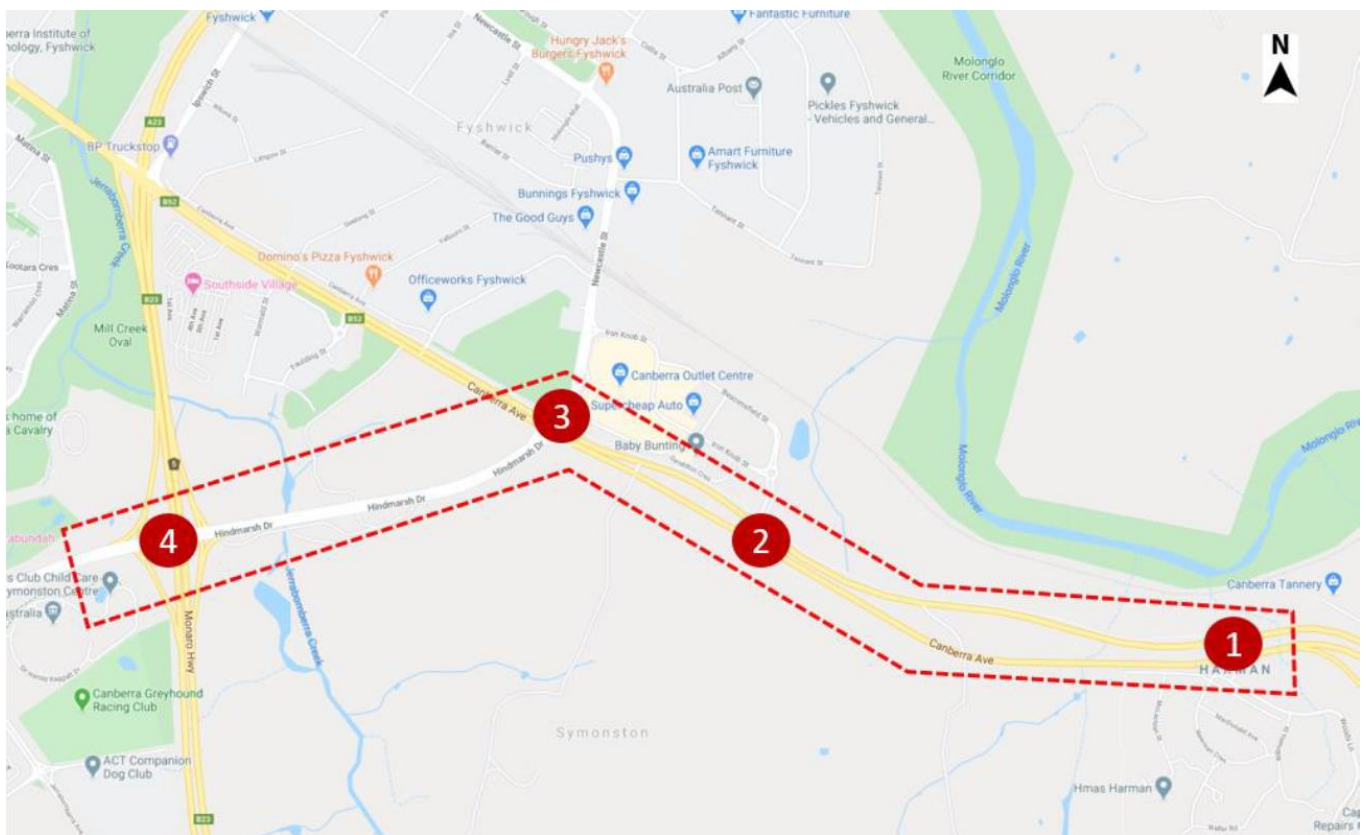


Figure 5.3 Locations of signalised intersection traffic count data collection

A summary of the surveyed AM and PM peak hour traffic volumes, for the above network peak hours, is provided in Table 5.7.

Table 5.7 Survey data summary

Time	Canberra Avenue	Hindmarsh Drive
AM Peak	Between 8:00 am and 9:00 am. The peak volume in both directions is approximately 4,264 vehicles, with 1,164 in the eastbound and 3,100 in the westbound directions.	Between 8:00 am to 9:00 am. The peak volume in both directions during this period is approximately 2,302 vehicles, consisting of 1,215 and 1,117 in the eastbound and westbound directions respectively.
PM Peak	The weekday evening peak was observed to be between 5:00 pm and 6:00 pm. The peak traffic volume in both directions during this period is approximately 4,206 with around 2,854 vehicles in the eastbound direction and 1,352 in the westbound direction.	The weekday evening peak hour was observed between 4:00 pm and 5:00 pm. The peak volume in both directions during this period is approximately 2,133 vehicles consisting of 1,147 in the eastbound and 1,221 in the westbound direction.
Weekend	The weekend peak hour was observed to be between 12:00 pm and 1:00 pm, with approximately 2,946 vehicles in both directions on Saturday.	The weekend peak hour was observed on a Saturday between 12:00 pm and 1:00 pm, with approximately 1,879 vehicles on Saturday on eastbound and westbound directions. Traffic volumes were observed to be generally much lower on a Sunday with a total of 1,405 vehicles between 12:00 pm and 1:00 pm.

### Mid-block capacity analysis

The saturation flow rate represents the maximum rate of flow for a traffic land as measured at the stop line during the green indication. It is measured in units of passenger cars per hour per land (pc/h/ln). The TTIA adopted a one-way mid-block capacity of 1,200 pc/h/ln for the arterial roads, including Canberra Avenue and Hindmarsh Drive, which is in keeping with the Austroads special conditions which are reflective of the existing conditions.

The Volume Capacity Ratio (VCR) was identified and found that Hindmarsh Drive in the vicinity of the Project is within the acceptable capacity during AM and PM peak periods. However, Canberra Avenue east of Tom Price Street westbound was found to be over capacity with a VCR of 1.45 and Passenger Car units (PCU) of 3,472 vehicles per hours during AM peak. Similarly, the VCR during PM peak at Canberra Avenue east of Tom Price Street was identified to be 1.33 with 3,196 vehicles in the eastbound direction.

### Crash data analysis

The TTIA included a review of crash data provided by Transport Canberra and City Services (TCCS). The five-year period (2014 – 2018) crash data summary is based on the reports of the Police and the public for the following intersections:

- Canberra Avenue / Woods Land.
- Canberra Avenue / Tom Price Street.
- Canberra Avenue / Hindmarsh Drive.
- Hindmarsh Drive / Monaro Highway.

The data indicates that the highest number of crashes occur at the Canberra Avenue and Hindmarsh Drive intersection with a total of 161 crashes, which involved six injuries. The majority of these crash types were vehicles from one direction with a total of 144 crashes. The crash types also included manoeuvring (seven crashes) and intersection (five crashes) crashes. The crash hot spots of reported crashes since 2012 at key intersections within the study area are shown in Figure 5.4, with the highest locations of crashes shown in red and orange.

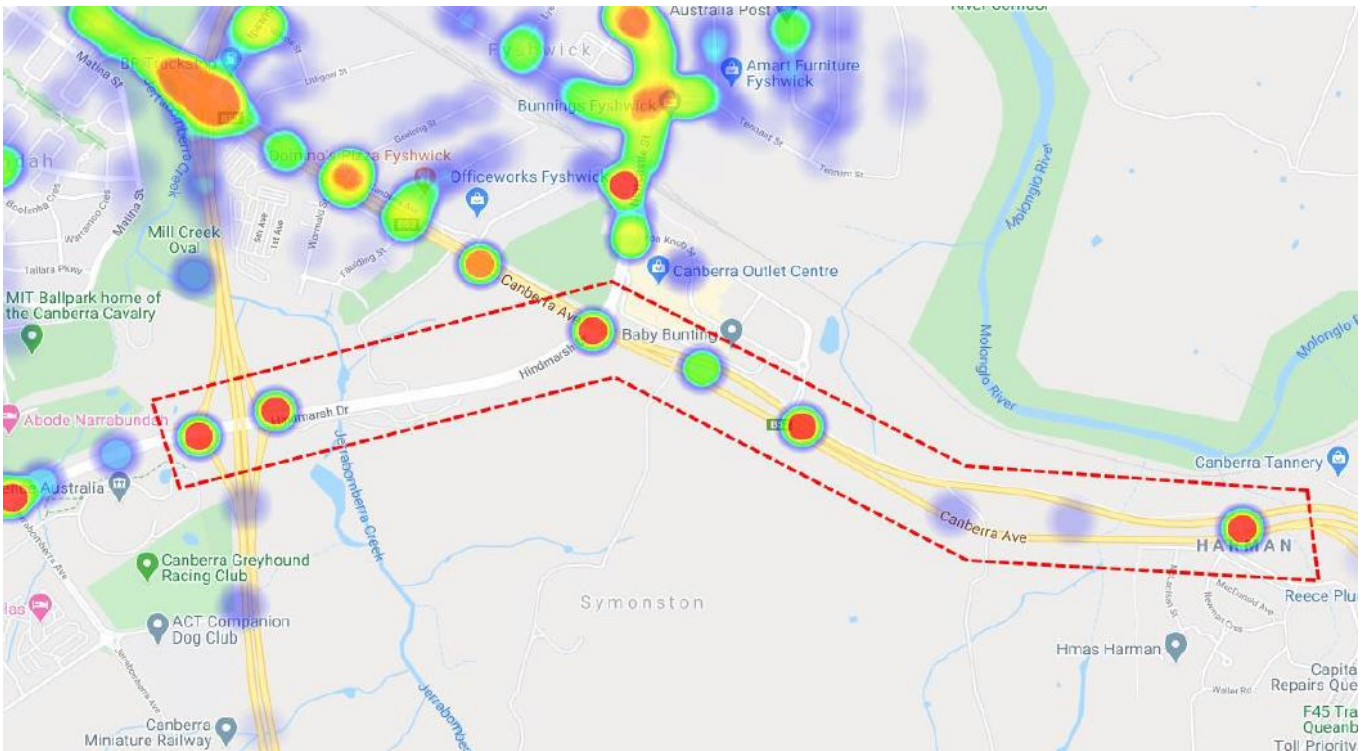


Figure 5.4 Crash hot spots (Source: ACT Government Open Data Portal, modified by GHD)

### Public transport

There are a number of bus routes along Canberra Avenue which includes route 2, 56, 830, 831 and 834. Bus route 182 travels along the Monaro Highway and operates during morning and afternoon peak hour. The bus service route map within the study area is shown in Figure 5.5.

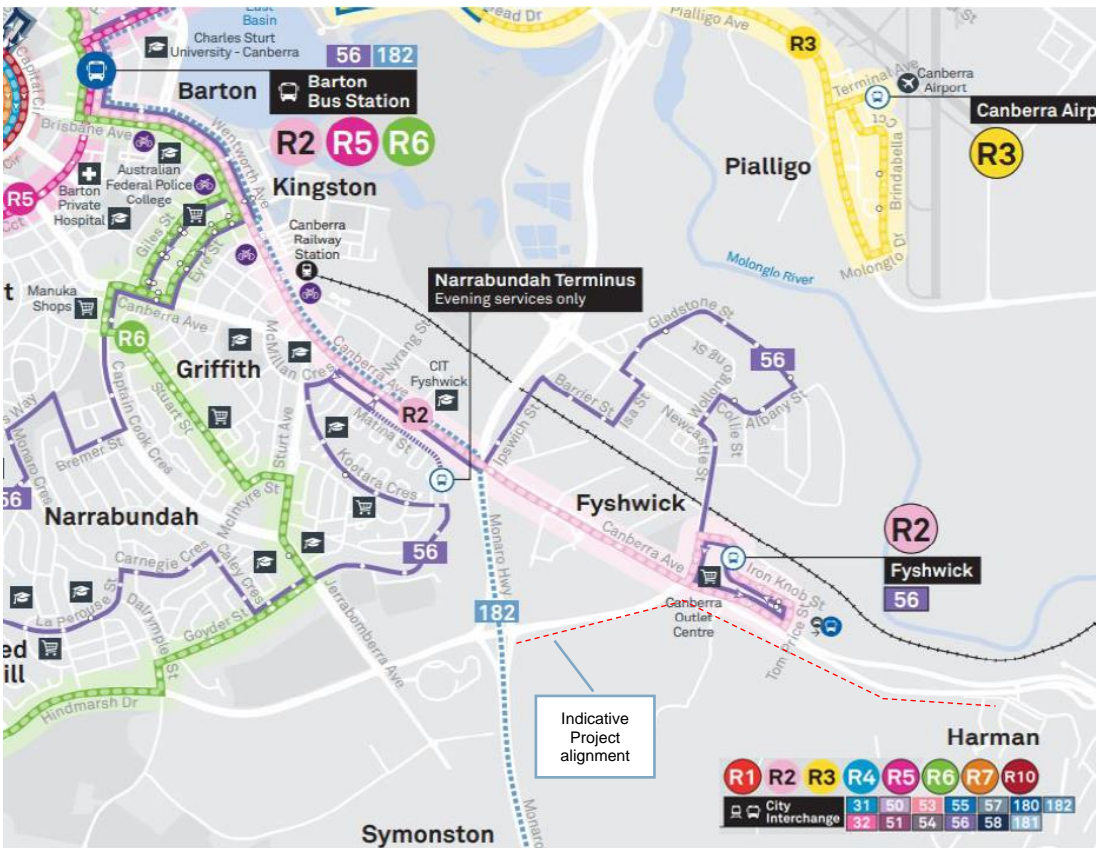


Figure 5.5 Bus services in the vicinity of the Project (Transport Canberra modified by GHD)

Bus stop facilities are located near Woods Lane on the eastern and western side of the road. The Canberra Avenue and Woods Lane bus stop is located within the study area. The bus routes at this stop include 830, 831, and 834 providing between one to two service(s) per hour. These bus stops are illustrated in Figure 5.6.



Figure 5.6 Bus stop locations (Source: Transport ACT 2020, modified by GHD)

### Active transport

The existing active travel infrastructure within and in proximity to the study area is displayed in Figure 5.7.

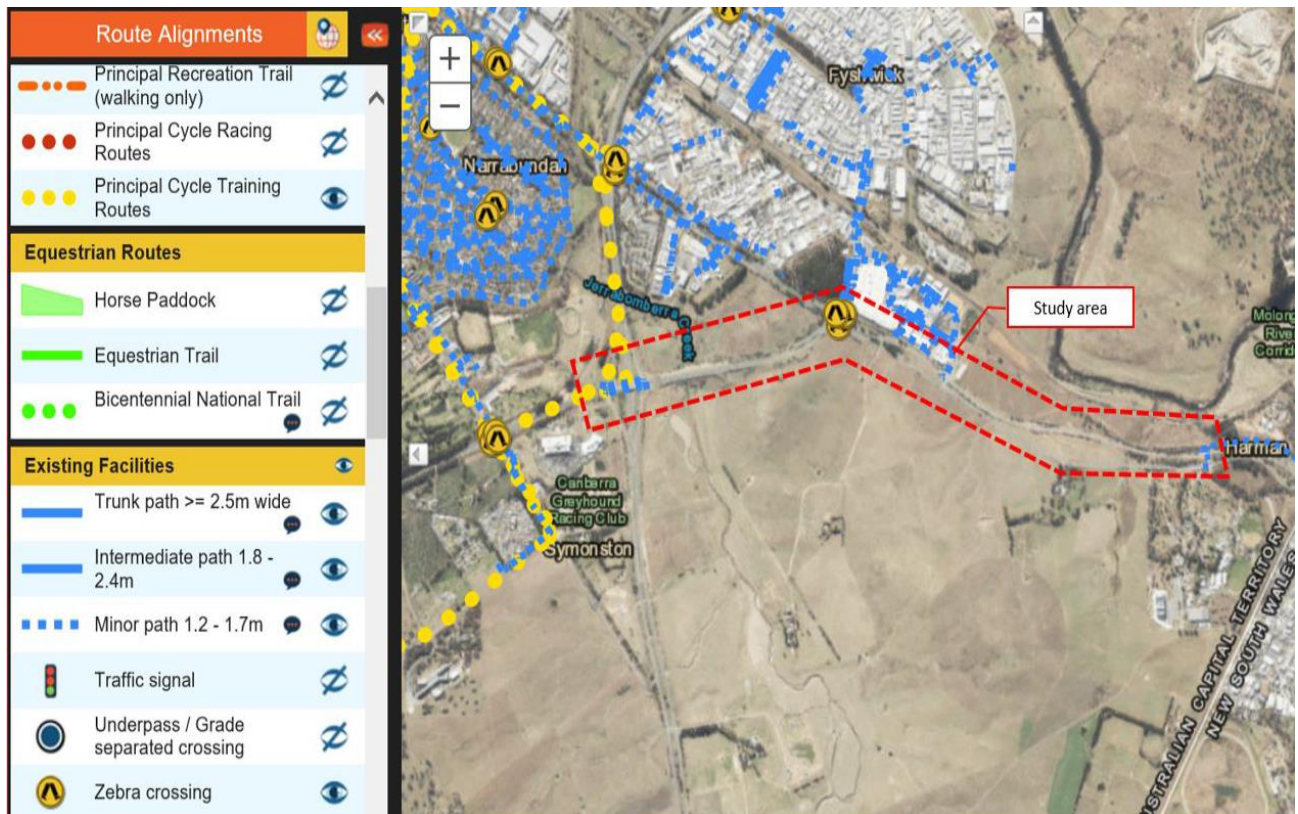


Figure 5.7 Active transport locations (Source: Active Travel Infrastructure Practitioner Tool, modified by GHD).

As shown in Figure 5.8, the Active Travel Infrastructure Practitioner Tool (ATIPT) shows one type of On-Road Cycle Route in the vicinity of the study area, namely the main On-Road Cycling Routes (MORCRs) which are located along Canberra Avenue, Hindmarsh Drive and Monaro Highway.

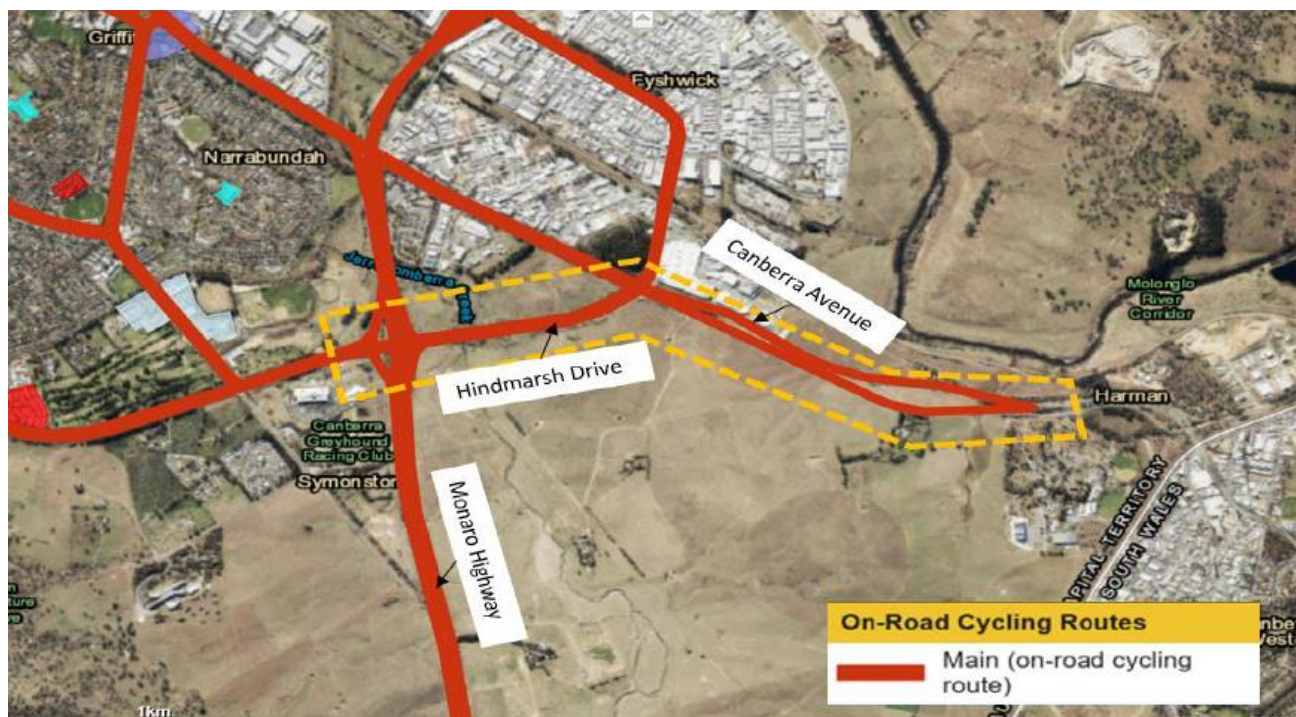


Figure 5.8 On road cycling routes in the Project area (Source: Active Travel Infrastructure Practitioner Tool, modified by GHD)

### 5.3.4 Potential impacts

Risks of the Project as they relate to traffic and transport were identified in the preliminary risk assessment (Section 4.3) to be:

- Increased traffic congestion and reduced road safety during construction.
- Changes to existing access.

Potential impacts to traffic and transport as a result of construction and operation of the Project are discussed below.

#### Construction

##### Access

Since the proposed works are to be carried out within the road verge, there is already an access to existing overhead lines. Where necessary, existing access tracks would be used to access transmission line easements.

Additional access points to each of the transmission line pole structures could be required if the existing access roads are not sufficient. Review of aerial photography indicates that existing accesses are likely to be sufficient for Project access. Any work on existing tracks would be undertaken in accordance with the Best Practice Guidelines for Fire Trail Construction and Maintenance (Bushfire Coordinating Committee 2007). Based upon the 60% design it is unlikely that new tracks would need to be constructed.

Based upon data reviewed, the TTIA assessment assumed that 80 percent of construction traffic would approach from north of Canberra Avenue and turn right into Hindmarsh Drive, as shown in Figure 5.9. Ten percent of construction vehicles would access the site from Newcastle Street travelling to Hindmarsh Drive. The remaining 10 percent of construction vehicles would access the site from south of Canberra Avenue. It is anticipated that vehicles from the north-west would utilise the existing signalised intersection arrangement at Canberra Avenue / Woods Lane to access the southern verge of Canberra Avenue.

Partial land closures might be required during conductor stringing across Monaro Highway. In addition, partial lane closure of Canberra Avenue (towards City) and Hindmarsh Drive might be required during delivery of poles and other heavy equipment.

The potential site access/egress locations were reviewed and the TTIA indicates that the minimum safe intersection sight distance derived from the *Guide to Road Design, Part 4A: Unsignalised and Signalised Intersections* (Austroads 2021). The assumed site locations may vary during the development of the detailed construction Traffic Management and Control Plan (TMCP) (to be undertaken by the engaged contractor prior to commencement of works).

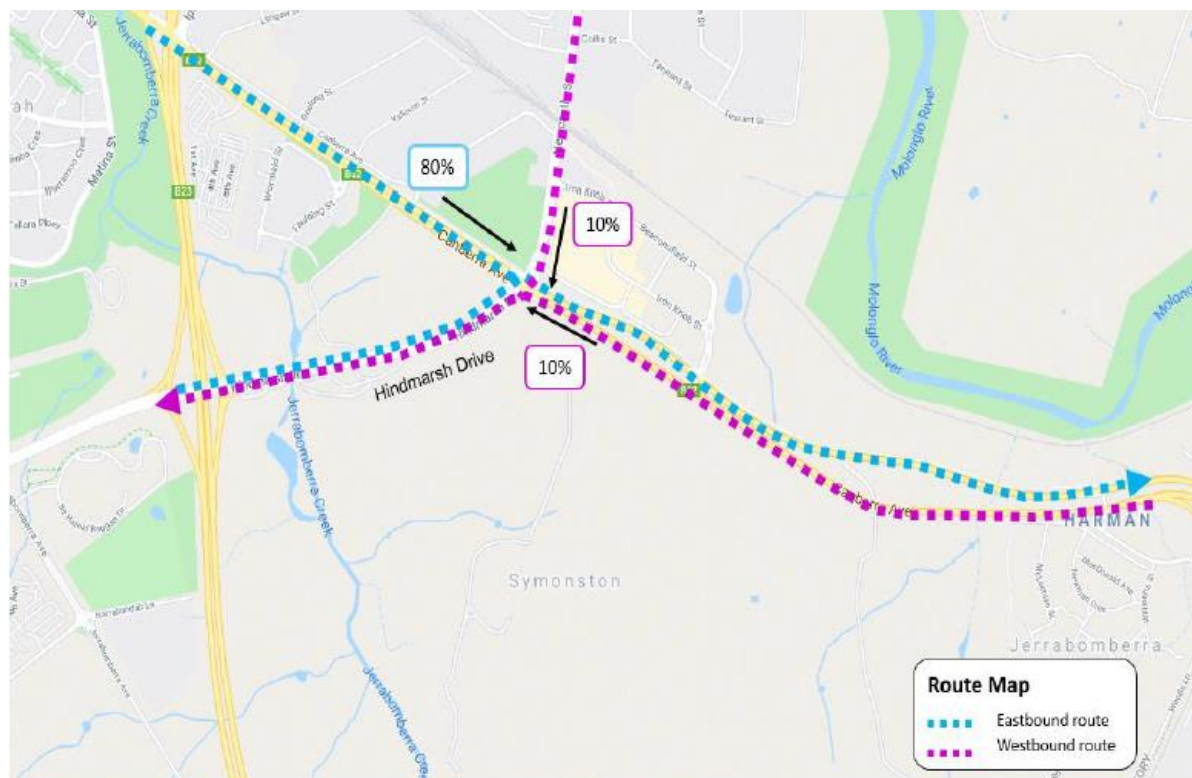


Figure 5.9 Construction traffic routes (Source: Google Maps (2020), modified by GHD)

## Traffic

The expected increase in daily traffic with the peak construction activity for the Project are as following:

- AM peak hour (8:00 am – 9:00 am).
  - 15 light vehicles arriving at the construction site.
  - Three heavy vehicles arriving at the construction site.
- PM peak hour (5:00 pm – 6:00 pm).
  - 15 light vehicles departing the construction site.
  - Three heavy vehicles departing the construction site.

The peak hour traffic generation is associated with light vehicle movements during shift changeover periods. Light vehicle movements during other times of the day are expected to be minimal. A smaller volume of traffic movement will occur during the day, both of which consist of low traffic volumes which will not adversely impact the existing operation of the road network.

The VCR and PCU at Canberra Avenue and Hindmarsh Drive during AM and PM peak are shown in Figure 5.10 and Figure 5.11 respectively.

The following are the key findings of the midblock assessment:

- The traffic generation associated with the peak construction activity for the Project has been assessed and is estimated to result in an increase of 15 light vehicles and three heavy vehicles during AM and PM peak hours.
- The traffic data indicates that under the existing conditions, Canberra Avenue east of Tom Price Street is over theoretical capacity with a VCR of 1.45 during AM peak in the westbound direction.
- During PM peak, under the existing conditions, Canberra Avenue has a VCR of 1.33 east of Tom Price Street in the eastbound direction.
- Canberra Avenue was found to have a VCR of 1.21 in the westbound direction west of Tom Price Street during peak.
- The VCR at Hindmarsh Drive is found to be within capacity. Therefore, it is expected to operate well during the construction period.

In summary, the data indicates that Canberra Avenue is over capacity under the existing condition. The additional traffic during the construction period is equivalent to less than one vehicle per minute during the peak hour arrival and departure period. Therefore, the additional traffic during the construction period would not adversely impact the existing road network operation and would be within the typical daily fluctuation in traffic at these locations.

### **Workers' car parking**

Site personnel are expected to park at car parking areas provided at the construction sites, which would be managed by the contractor. Vehicle parking spaces for construction personnel would generally be within 25 m of each pole location site. As such, there would be minimal impact to on-street carparking in the study area.

### **Public transport**

A bus stop is located at the southern side of Canberra Avenue, north of Wood Lane. Currently, bus services operate at hourly intervals from this location. There could be possible delays to bus services during construction if there are temporary road closures, which would be managed through the development of a TMCP. The bus stop would not be impacted by construction activities and would continue to be available for use by commuters. Bus service operators would be notified prior to works commencing.

### **Pedestrians and bicycle riders**

The proposed construction arrangements are not expected to impact pedestrians, as there are no pedestrian paths in the Project area.

There are on-road cycle routes along Canberra Avenue and Hindmarsh Drive. It is recommended that the TMCP, to be developed by the contractor, considers the management of cyclists along the adjoining road network to the Project area to avoid delays and manage safety concerns.

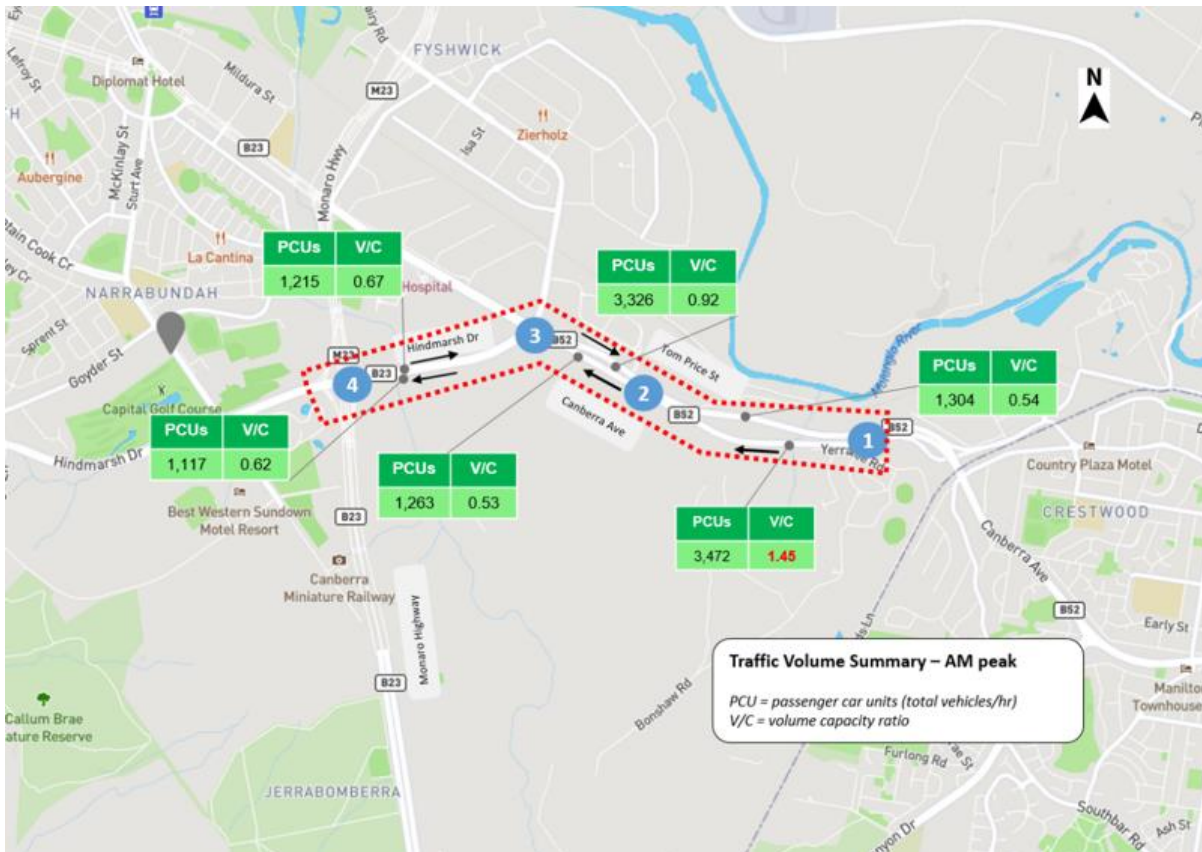


Figure 5.10 Traffic volume AM Peak (Source: Transport Canberra Map modified by GHD)

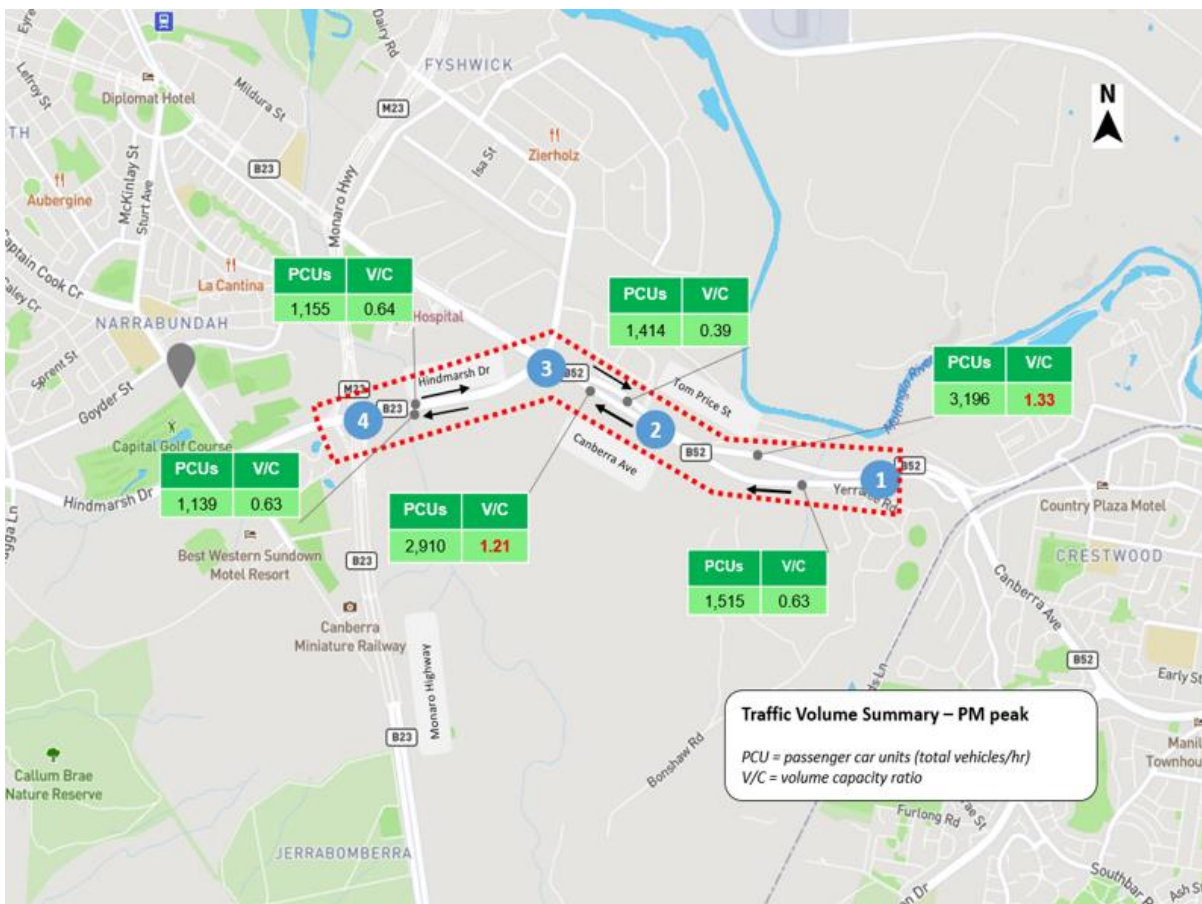


Figure 5.11 Traffic volume PM Peak (Source: Transport Canberra Map modified by GHD)

## Operation

### Traffic

During operation, traffic generated by the Project would be limited to Evoenergy staff and associated contractors. These visits would be once a year for the transmission line inspection.

It is likely that inspection activities would be mainly carried out using light vehicles (approximately one to three vehicles). Larger vehicles and equipment such as trucks, elevated work platforms and cranes (approximately ten personnel) would be used for maintenance activities such as replacing/ refurbishing fittings on the transmission line. Existing access track and distribution line easement will be utilised for this activity.

Operational traffic is assumed to result in the following peak hour traffic generation:

- AM peak hour (8:00 am – 9:00 am):
  - Three light vehicles arriving and departing the site
  - Five heavy vehicles arriving and departing the site
- PM peak hour (4:00 pm – 5:00 pm):
  - Three light vehicles arriving and departing the site
  - Five heavy vehicles arriving and departing the site.

The operational peak hour traffic is expected to be lower than the peak hour traffic associated with the construction activities. During operation, traffic is expected to be low and would not adversely alter the existing road network operating conditions.

### Parking

Personnel are expected to park at a designated off-street location, close to the site. As such, there would be minimal impacts to on-street carparking in the study area.

### Public transport

The operation of the Project would not impact train or bus services operating in the vicinity of the Project area. The additional traffic generated by the operation of the Project would have minimal impacts on public transport services.

### Pedestrians and bicycle riders

Operation of the Project would not impact pedestrian or bicycle facilities. The minor increase in traffic movements associated with the Project would have minimal impacts to pedestrians and bicycle riders.

## 5.3.5 Mitigation measures

Mitigation and management measures to minimise impacts to traffic and transport are outlined in Table 5.8.

**Table 5.8** Traffic and transport mitigation measures

Potential impact	Mitigation	Timing
Traffic management	<p>A Traffic Management and Control Plan (TMCP) (incorporating a Temporary Traffic Management plan (TTM)) is to be prepared prior to the commencement of works with site induction for construction personnel being undertaken to outline the requirements of the TMCP/TTM.</p> <p>Access to the surrounding public road network will be maintained throughout the construction period. Vehicles will be permitted to travel past the worksite with traffic signage in accordance with the TMCP/TTM incorporating Traffic Control Plan (TCP) to be developed in accordance with AS1742.3 – <i>Traffic Control for Works on Roads and the relevant authority guidelines by accredited personnel</i>.</p> <p>The aim of the TMCP/TTM is to maintain the safety of all workers and road users within the vicinity site and the following are the primary objectives:</p> <ul style="list-style-type: none"> <li>– To minimise the impact of the construction vehicle traffic on the overall operation of the road network.</li> <li>– To provide continuous, safe and efficient movement of traffic for both the general public and construction workers.</li> <li>– Installation of appropriate advance warning signs to inform users of the changed traffic condition.</li> <li>– To provide a description of the construction vehicles and the volume of these construction vehicles accessing the construction site.</li> <li>– To provide information regarding the changed access arrangement and also a description of the proposed external routes for vehicles, including the construction vehicles accessing the site.</li> <li>– Establishment of a safe pedestrian environment in the vicinity of the site.</li> </ul>	Pre-construction and Construction.
	<p>The construction contractor intending to use any part of a road or road related area such as a footpath will need to apply to TCCS for the authorisation of a TTM plan with construction to be coordinated with TCCS in compliance with the plan.</p> <p>The TTM plan is to document the authorisation to install, display or interfere with, change or remove traffic control devices (TCDs), temporary TCDs and other features. The TTM plan must be prepared by a qualified person and must include details on:</p> <ul style="list-style-type: none"> <li>– The start date and end date of works.</li> <li>– The extent of the proposed work area.</li> <li>– TCDs, including temporary devices, that are to be installed, removed or altered.</li> <li>– The licence number of the person who prepared the plan.</li> </ul>	Pre-construction and Construction
	<p>In addition to a TTM plan, the construction contractor will need to apply for:</p> <ul style="list-style-type: none"> <li>– Work approval – for any occasion when work will occur on public unleased land including the implementation of measures included within the TTM plan</li> <li>– Approval to temporarily close a public road or use a closed public road.</li> </ul>	Pre-construction and Construction
Traffic management	<p>The TMCP/TTM is to include management measures for:</p> <ul style="list-style-type: none"> <li>– wet weather</li> <li>– pedestrians and bicycle riders</li> <li>– general traffic</li> <li>– bus transport.</li> </ul>	Pre-construction and Construction

Potential impact	Mitigation	Timing
Access	Key site access would be identified with “Truck turning” signs to advise motorists of changes on the road network or vehicle movements to/from the site. Additionally “Road workers” symbolic and associated signage would be provided to inform motorists of the impending works within and adjacent to the roads and associated workers.	Pre-construction and Construction
	Site access is to be restricted to authorised personnel only and existing employees on site. Pedestrian access to and around the site is to be maintained at all times. Within the site pedestrian travel paths are to be maintained to key areas such as construction entrances and be free from trip hazards. The TMCP, to be developed by the contractor, is to include measures to manage risks to cyclists along the adjoining road network to the Project area.	Pre-construction and Construction
Lane closures	Lane closures should be undertaken outside the road network peak periods with the appropriate signage and traffic control.	Pre-construction and Construction
Safety	Consideration would be given to the proximity of workers to the through traffic movement, with roadwork speed reduction in place if workers are proximate to high speed areas.	Pre-construction and Construction
Construction traffic routes	Vehicles would access the site via the construction traffic routes identified in Section 5.6.4. Peak heavy vehicle traffic movements would be minimised, where possible, during the AM and PM peak hour and during the middle of the day on the weekend, when higher traffic volumes occur within the road network.	Pre-construction and Construction
Parking	Encouraging carpooling between workers will decrease traffic activity and parking demand. Parking for construction workers is provided within the site. Parking on the public road network is not to occur, with the exception of off-road parking when working in road reserve areas.	Pre-construction and Construction
Maintenance	During inspections and associated maintenance, appropriate temporary traffic management is to be applied with application and approval of the TTM to the road authority. The TTM is to consider the safety to workers and public, accessibility for all road users around the works site and the associated amenity to minimise delays to traffic (including pedestrians and cyclists).	Operation

### 5.3.6 Residual risk assessment

Based on the mitigation measures identified, an assessment of the residual traffic and transport risks associated with the Project have been considered and are identified in Table 5.9.

Table 5.9 Traffic and Transport – residual risk assessment

Identified risk (Section 4)	Preliminary risk rating	Residual risk assessment		
		Residual likelihood	Residual consequence	Residual risk rating
Increased traffic congestion and reduced road safety during construction	Medium	Possible	Moderate	Medium
Changes to existing access	Very Low	Unlikely	Minor	Very Low

## 5.4 Utilities

### 5.4.1 Overview

This section outlines the potential utility risks, impacts and mitigation measures associated with the Project. Using a desktop assessment, this section specifically addresses the following utilities requirements of the Scoping Document:

- Description of the existing utilities located on the land subject to the Project
- Description of any new utilities, removal or realignments required as part of the Project
- Investigation of potential impacts to existing infrastructure and provision of mitigation measures to reduce the impacts.

### 5.4.2 Environmental conditions and values

#### Existing Electrical Network

An extensive power network exists within the wider region, which services all existing developments adjacent to the proposed transmission line alignment. An existing 11 kV distribution line runs along Canberra Avenue as part of the broader ACT network. This is to be relocated as part of a separate project, in progress in 2022. This Project would involve extension of an existing 132 kV transmission line. The location of the existing 11 kV distribution line and its proposed relocation alignment in the context of the Project is shown in Figure 5.13.

#### Future Utilities

A new electricity zone sub-station is to be constructed at HMAS *Harman* which is subject to separate assessment and approval (refer Figure 5.13). No other future projects in the vicinity of the Project are known that need to be considered as part of the Project design.

### 5.4.3 Investigations

A Dial-Before-You-Dig (DBYD) search was undertaken as part of the geotechnical investigations conducted to inform the concept design for the Project (Appendix H).

The DBYD search identified a variety of existing utilities located within the study area. These services include electrical (both network and street light cables), water supply mains, sewer, high pressure gas mains, stormwater and telecommunications.

An Electrical Hazard Interference assessment was conducted by GHD in July 2021 to ensure that induced and transferred voltages to existing assets were within the allowable limits as stipulated in the Australian Standards

### 5.4.4 Potential impacts

Risks of the Project as they relate to utilities were identified in the preliminary risk assessment (Section 4.3) to be:

- Impacts to existing infrastructure during construction.
- Impact to existing bores and water infrastructure within the Project footprint.

The geotechnical investigations included intrusive bore hole drilling at each proposed pole location (refer to Section 5.6.3). No utilities were encountered during the borehole investigations, and it is not anticipated that existing utilities will require relocation prior to, or during, construction.

The locations of existing utilities and services will be investigated further during detailed design. A DBYD will be conducted prior to construction commencing. Should relocation and protection of services and utilities be required as a result of further investigations and / or the DBYD, potential impacts would include:

- Potential damage to existing infrastructure during construction (and associated safety risks)
- Disruption to services and utilities.

There is ongoing communication between Evoenergy and the Defence to ensure critical government network assets are avoided. There is also a standing agreement and guideline with Jemena, the ACT gas network provider, to be implemented during construction.

The repeat DBYD is required to make sure information is up to date before construction commences and to organise an authorised services locator to be on site when construction is undertaken near certain utilities located in the Project area.

### Canberra Primary Main

The DBYD results for the Canberra Primary Main are provided in Appendix H and in Figure 5.12. A preliminary assessment of the Earth Potential Rise (EPR) and low frequency induction hazard to the gas main was undertaken.

The new earthing systems would be located further from the gas main than the existing 132 kV systems, and the proposed assets do not share a common parallel alignment with the gas main. It is therefore considered unlikely that a low frequency induction risk would be caused by the proposed works. As the proposed works do not result in a material change to the fault levels or protection clearance times, the EPR risk is considered equivalent to or lower than the existing risk.

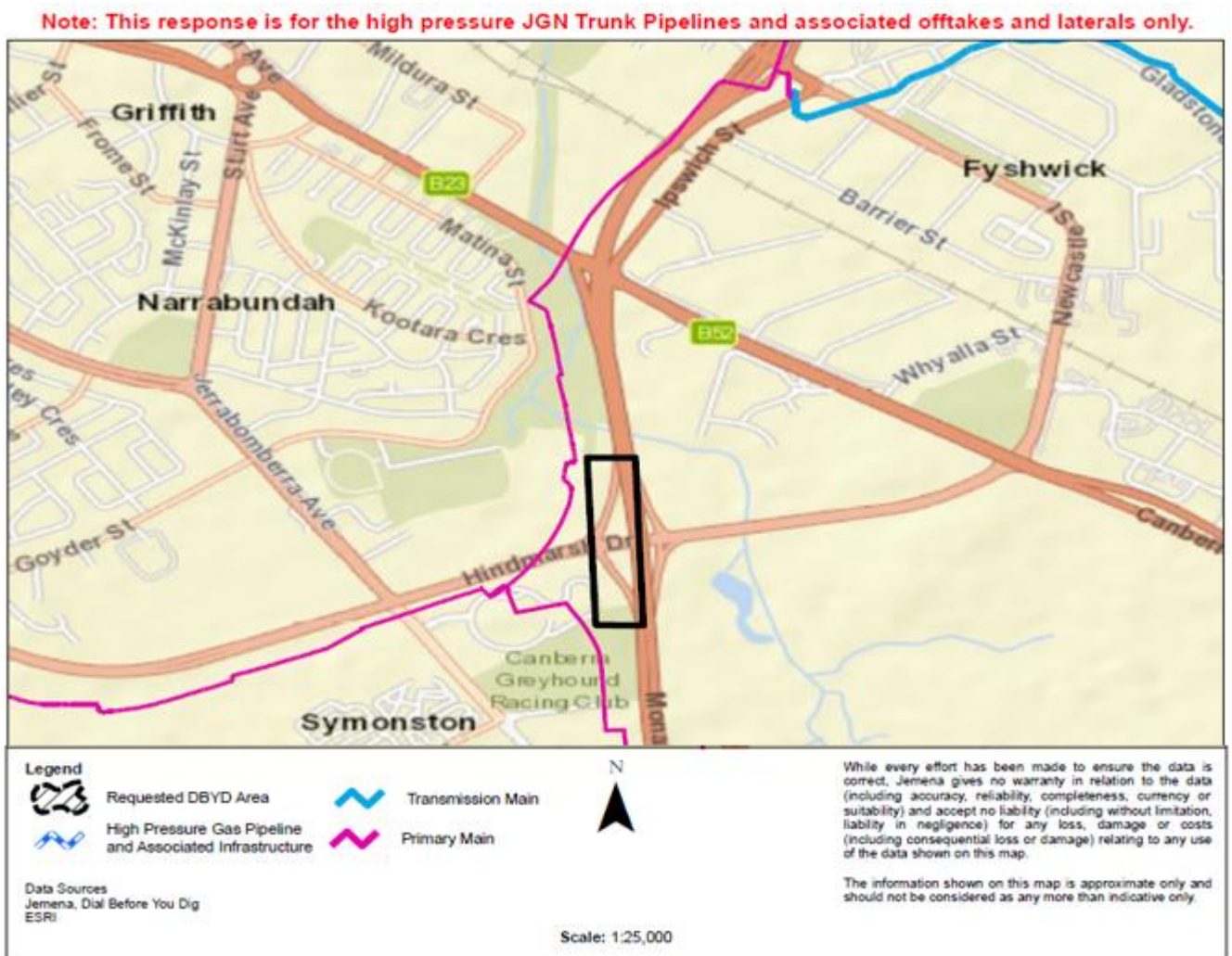


Figure 5.12 DBYD for Canberra Primary Main (CPM in red and proposed transmission line in blue)

## 5.4.5 Mitigation measures

Mitigation and management measures to minimise impacts to utilities and services are outlined in Table 5.10.

Table 5.10 Utilities mitigation measures

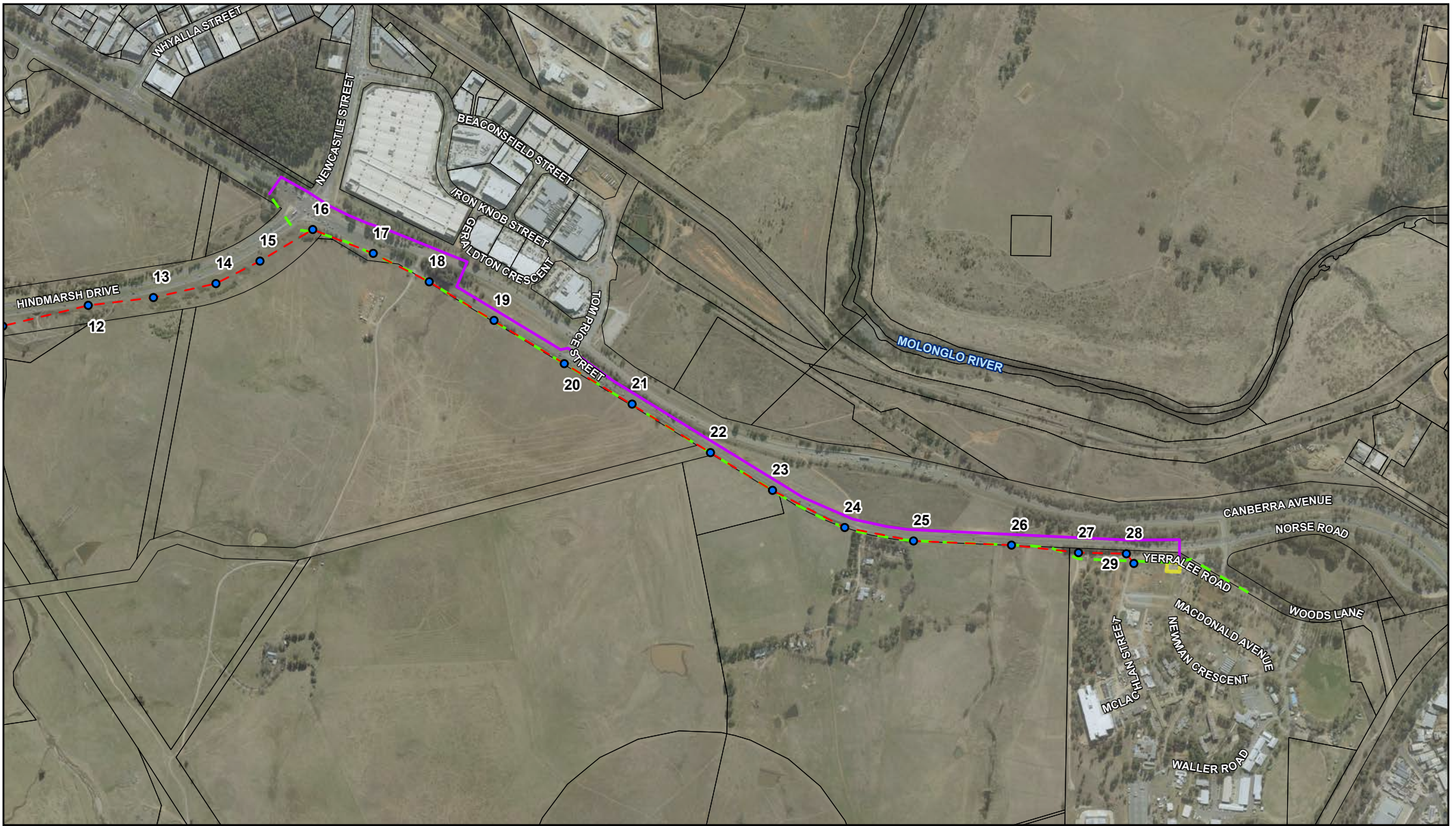
Potential impact	Mitigation	Timing
Locations of utilities and services	The location of existing utility service and any changes required would be confirmed by the construction contractor during the detailed design of the Project in consultation with the relevant utility provider.	Detailed design and pre-construction
Impacts to critical services and utilities	Prior to commencing detailed design, the DBYD will be conducted again to verify the locations of the utilities and services. During the detailed design process necessary clearance distances as per AS standard and Evoenergy standards shall be determined and provided to utility and service providers as necessary. Site supervision by the utility and service providers would be included as required during construction.'	Pre-construction and construction
Services locations	The proponent must consult with Canberra Airport for approval of any crane/s to operate on the site.	Construction
Protection of utilities and services	Repeat the DBYD prior to construction commencing which may result in specific operating procedures around particular utilities such as: For all works in the vicinity of High-Pressure Gas Mains arrange for a Jemena Representative to attend and supervise all excavations All construction works in vicinity to the Canberra Primary Main, High Pressure Gas Main and fibre optic services (where applicable) will be in consultation with the relevant stakeholders. Adherence to minimum clearances for assets dictated by relevant utility providers Guideline to designing, constructing and operating around existing AS2885 Natural Gas Pipelines On site attendance by owners of certain assets to identify locations.	Preconstruction
	Utilise the 'Work Near Underground Assets Guideline'.	Pre-construction and construction

## 5.4.6 Residual risk assessment

Based on the mitigation measures identified, an assessment of the residual utilities risks associated with the Project have been considered. These residual risks are identified in Table 5.11.

Table 5.11 Utilities – residual risk assessment

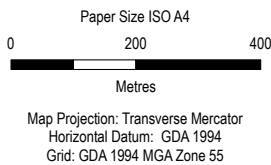
Identified risk	Preliminary risk rating	Residual risk assessment		
		Residual likelihood	Residual consequence	Residual risk rating
Impacts to existing infrastructure during construction	Low	Unlikely	Minor	Very low
Impact to existing bores and water infrastructure within the Project footprint	Low	Unlikely	Minor	Very low



**LEGEND**

- - - Proposed transmission line
- Indicative pole siting
- - - Existing 11 kV distribution Line

- Approved undergrounding of 11kV distribution line
- Approved substation
- Blocks / cadastre



**Evoenergy**  
Jerrabomberra Transmission Line Extension

**Existing and future utilities  
in the vicinity of the project**

Project No. **12514817**  
Revision No. **A**  
Date **30 Aug 2022**

**FIGURE 5.13**

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© 2022. Whilst every care has been taken to prepare this map, GHD (and Sixmaps 2022, NSW Department of Lands, ACT Government, OEH, WSP) make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.  
Data source: Aerial imagery - Sixmaps 2022 (Metromap Tile Service: ); General topo - ACT Government 2020 & NSW LPI DTDB 2015; Cadastre/blocks - ACT Government 2020; Preliminary environmental assessment data - WSP. Created by: pfernandes

## 5.5 Materials and waste

### 5.5.1 Overview

This section describes the handling of materials and waste due to the Project. Using a desktop assessment, this section specifically addresses the following materials and waste requirements of the Scoping Document:

- Describe all materials to be stockpiled on site
- Provide details on the quantity, storage and disposal of any waste products (including any waste soil) generated during installation and commissioning works
- Investigate potential impacts of stockpiling materials (including any hazard to persons who may use the area) and provide mitigation measures to reduce any impacts.

Spoil waste and contaminated waste are discussed in Section 5.6.

### 5.5.2 Environmental conditions and values

The ACT Waste Management Strategy 2011-2025 (ESD 2021) outlines the strategic direction of the ACT Government on waste issues and sets targets for improving waste management. These include achieving more than 90 per cent resource recovery by 2025 and a carbon neutral waste sector by 2020.

A desktop assessment of materials and waste management identified options for avoiding, mitigating, and managing major waste streams in accordance with the waste hierarchy as shown in Figure 5.14.

### 5.5.3 Investigations

Resource use and waste impacts due to the Project have been assessed qualitatively by reviewing the likely waste and resource streams during construction and operation and applying the waste hierarchy shown in Figure 5.14.

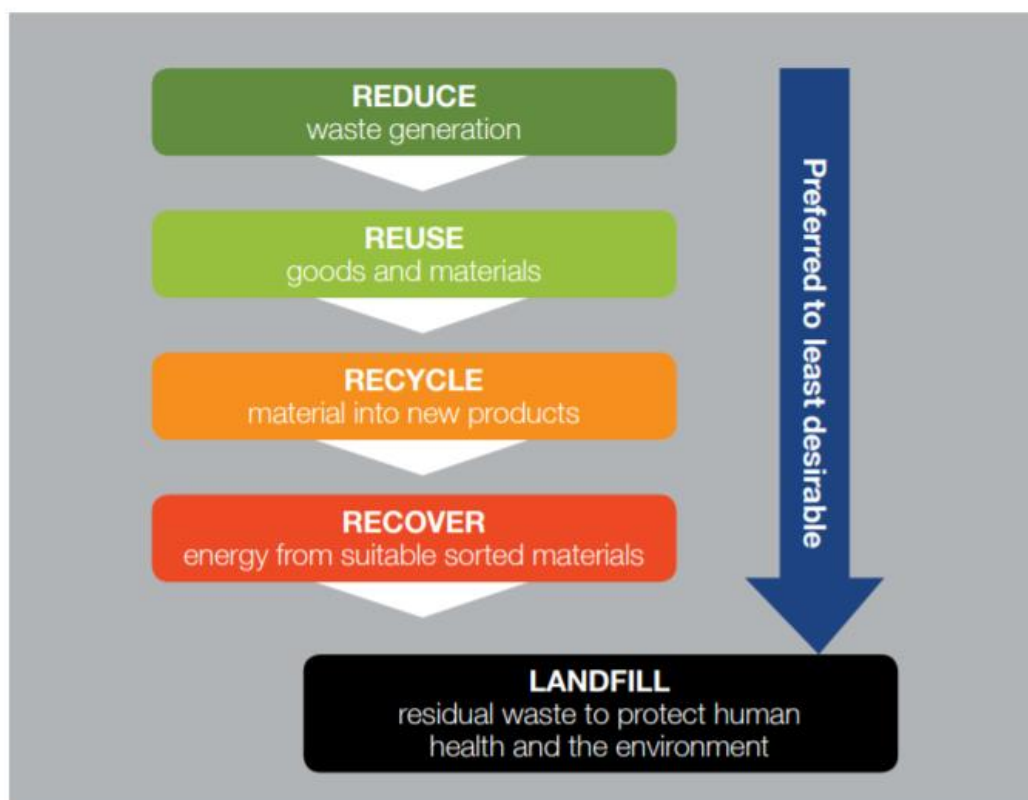


Figure 5.14 ACT Waste management hierarchy (ESD 2011)

## 5.5.4 Potential impacts

Risks of the Project as they relate to materials and waste were identified in the preliminary risk assessment (Section 4.3) to be:

- Increased waste to landfill during construction and demolition.
- Hazards created by stockpiling of materials within the construction site.

Potential impacts from materials and waste as a result of construction and operation of the Project are discussed below.

### Construction

Construction activities have the potential to generate waste, some of which would be able to be reused or recycled. The expected waste streams and activities likely to generate waste include:

- Excess spoil (refer to Section 5.6)
- Green waste from vegetation clearing (where green waste cannot be mulched and used on site for the landscaping works)
- Packaging materials associated with items delivered to the site, such as pallets, crates, cartons, plastics and other packaging materials
- Wastes produced from the maintenance of construction plant and equipment, including liquid wastes from cleaning, repairing and maintenance
- Wastes from installation of the insulators, hardware, earth wire support, conductors, climbing safety rail, stringing rollers and scrap rope
- Conduits and cables from protection and/or relocation of utilities (if required)
- Waste material resulting from any on-site spillage and subsequent clean-up of fuels/oils
- Sewage wastes generated through the use of worker's facilities at the site compound
- Redundant erosion and sediment controls would also become waste during construction and site reinstatement
- General wastes, such as paper, cardboard, beverage containers and food wastes, generated by workers at construction facilities.

It is anticipated that waste would be removed from construction areas at the end of each day or temporarily stored at the site compound sites. All wastes would be disposed of at an appropriately licensed waste facility.

Any excess materials following construction would be removed from site for either re-use / recycling or disposal at an approved disposal site. Through the implementation of mitigation measures and procedures to achieve the principles of the waste management hierarchy, it is expected that the Project would have a minor adverse impact on resource use and waste during construction.

Construction is expected to generate minimal quantities of waste. The estimated waste volumes are provided in Table 5.12. Further information on spoil management is provided in Section 5.6.

**Table 5.12** Estimated waste volumes

Waste type	Estimated quantity
Material packaging and off-cuts	Minor – one skip bin per fortnight
Excavated spoil	Minor – generally to be reused on site, however spoil may need to be redirected for disposal or reuse by a licensed third party
Vegetation	Vegetation trimmed or cleared from safe construction work areas, comprising of trees and shrubs. Groundcover within the immediate footprint of the pole footings.
Concrete	Minor
Conduits and cables from protection of utilities (if required)	Minor – one skip bin per month

Waste type	Estimated quantity
Oily rags, waste oil	Minor
General office waste	Minor – one skip bin per month
Sewage from construction site	Minor
Paper, cardboard, plastics, glass and other recyclable materials	Minor – one bin each per month
Redundant sediment and erosion control materials	Minor

## Operation

The main activity associated with operation of the Project includes visual inspections and maintenance activities and waste generation during these activities is likely to include:

- Clearing of existing or new vegetation if it encroaches on clearances that are required to be maintained around the new conductors
- Replacement/repair of aging or damaged components (typically insulators, broken conductor, or other broken hardware).

Operational aspects of the Project would be similar to those Evoenergy currently has in place to manage resource use and waste. There would be limited volumes of waste generated and minimal resources used, and the primary source of waste would include vegetation from tree trimming, damaged components that cannot be repaired and packaging associated with replacement components. The Project would therefore have a negligible impact on resource use and waste management during operation and waste would be managed according to the waste hierarchy in Figure 5.14.

## 5.5.5 Mitigation measures

Mitigation and management measures to minimise impacts due to materials and waste are outlined in Table 5.13.

Table 5.13 *Materials and waste mitigation measures*

Potential impact	Mitigation	Timing
Waste management	<p>A Waste Management Plan (WMP) is to be prepared and implemented as part of the CEMP. The WMP should provide specific guidance on measures and controls to be implemented to support minimising the amount of waste produced and appropriately handle and dispose of unavoidable waste. It would also address the importation of waste to the site for use in undertaking the Project. The WMP would include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>– Measures to avoid and minimise waste associated with the Project</li> <li>– Classification of wastes generated by the Project and management options (re-use, recycle, stockpile, disposal)</li> <li>– Classification of wastes received from off-site for use in the Project and management options</li> <li>– Procedures for storage, transport and disposal</li> <li>– Monitoring, record keeping and reporting, including any documentation management obligations arising from resource recovery exemptions.</li> </ul>	Pre-construction and Construction
Waste production	<ul style="list-style-type: none"> <li>– Additional clean fill material would be sourced if required from appropriate local sources.</li> <li>– Cleared weed-free vegetation would be chipped/ cut up and reused on site.</li> <li>– Weeds would be managed to control them from further spread including, immediate removal (without stockpiling) and disposal at appropriate weed disposal facilities.</li> <li>– Waste material would be removed from site regularly and before receptacles are full as well as prior to completion of works.</li> <li>– Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.</li> </ul>	Pre-construction and Construction

Potential impact	Mitigation	Timing
	<ul style="list-style-type: none"> <li>Garbage receptacles would be provided at the site compound and recycling of materials encouraged. There would be no disposal or re-use of construction waste on to other land.</li> <li>Waste would not be burnt on-site.</li> <li>Materials and products with a recycled content would be used where that material or product is cost and performance effective.</li> <li>Portable toilets would be provided for construction workers and would be managed by the service provider to ensure the appropriate disposal of sewage.</li> </ul>	
Soil requiring disposal	<p>All soils requiring off-site disposal will be assessed in accordance with EPA Information Sheet 4: Requirements for reuse and disposal of contaminated soil in the ACT.</p> <p>Soils should be classified (where possible) <i>in-situ</i> prior to excavation or when stockpiled during excavation, depending on available time and room for stockpile areas. Any unexpected contamination finds would follow the same classification procedures. Material that is classified as Virgin Excavated Natural Material (VENM) may be used in accordance with EPA's Environment Protection Contaminated Sites Information Sheet 10.</p>	Pre-construction and Construction
Stockpile hazard	<p>Potential hazards associated with construction workers or general persons in areas used for stockpiling materials will be managed by the contractor.</p> <p>This includes, but is not limited to:</p> <ul style="list-style-type: none"> <li>Stockpile signage including warning signs</li> <li>Fencing and bunting</li> <li>Regular communication during toolbox talks</li> </ul> <p>Prevention of access for non-authorised persons</p>	Pre-construction and Construction
Contaminated waste	Any excess contaminated excavated material that is not able to be reused on site would be transported to a site legally able to accept that material, following appropriate classification and approvals in accordance with EPA requirements, including EPA Information Sheet 4: Requirements for reuse and disposal of contaminated soil in the ACT.	Construction
Reuse of spoil	Where possible excavated spoil will be reused on site as backfill.	Construction

## 5.5.6 Residual risk assessment

Based on the mitigation measures identified, an assessment of the residual materials and waste risks associated with the Project have been considered. These residual risks are identified in Table 5.14.

Table 5.14 Materials and Waste – residual risk assessment

Identified risk (Section 4)	Preliminary risk rating	Residual risk assessment		
		Residual likelihood	Residual consequence	Residual risk rating
Increase waste to landfill during construction and demolition.	Low	Possible	Minor	Low
Hazards created by stockpiling of materials within the construction site.	Low	Unlikely	Minor	Very low

## 5.6 Soils and geology

### 5.6.1 Overview

This section outlines the potential risks to soils and geology, impacts and mitigation measures associated with the Project. Using a Geotechnical Investigation (Appendix I) and a Contaminated Land Preliminary Site Investigation (PSI), this section specifically addresses the following soils and geology requirements of the Scoping Document:

- Describe the soil and geology features of the area.

- A contaminated land search for the site needs to be performed and reflected in the EIS. Discuss any contamination impacts that are present at the site, and how the site will be remediated, if required.
- Provide a Erosion and Sediment Control Plan and describe erosion impacts from construction and operation activities, especially during extreme weather.
- Detail measures to reduce the impacts of sediment and erosion in the Plan, including dust suppression.
- An unexpected finds protocol that is prepared by a suitably qualified environmental consultant should be included in the EIS.

## 5.6.2 Environmental conditions and values

### Regional geology

The Canberra 1:100 000 Geological Sheet Series 8727 (BMRGGA and Abell 1992) indicates that the site spans across the following geological formations (refer Appendix I):

- The central and south-eastern portions of the on Canberra Avenue and Hindmarsh Drive) are underlain by the Palaeozoic Mount Ainslie Volcanics formation, comprising dacitic ignimbrite, minor ashstone, agglomerate and shale.
- Areas of the central-northern and central-western portions of the Project area are underlain by the Palaeozoic Canberra Formation, comprising mudstone, siltstone, minor sandstone, limestone, hornfels, dacitic ignimbrite and volcanoclastic sediments.
- The western portion of the Project area is located near a boundary between the Canberra Formation and the Palaeozoic Narrabundah Ashstone Member, comprising tuffaceous sandstone, tuff and ashstone.

### Soil landscape

The Soil Landscapes of the Canberra 1:100,000 Sheet map (Jenkins 2000) indicates that the Project area is primarily located on the boundary between the Williamsdale transferral soil landscape, comprising moderately well-drained red-brown chromosols and brown kandosols. The south eastern portion is located near a boundary with the Pialligo alluvial soil landscape, comprising varied alluvial layers of sand and silt with relict tertiary gravel deposits. A small area along the western portion of the Project area is also located within the Ginninderra Creek alluvial soil landscape, comprising deep (>100cm) alluvial soils on floodplains, with deep imperfectly drained sodic chromosols on margins.

### Topography and drainage

The Project area varies in elevation from approximately 577 m Australian Height Datum (AHD) to approximately 600 m AHD on the corner of Hindmarsh Drive and Commonwealth Avenue (pole locations 14–16).

According to the Australian Capital Territory Hydrogeological Landscapes map (DPE 2017), the proposed alignment lies along a boundary between the Symonston Hydrogeological Landscape (HGL) to the south, and the South Canberra HGL to the north, generally comprising a moderately steep catchment-based landscape with deeply incised channels (Appendix I).

The main watercourse within the study area is Jerrabomberra Creek, which crosses the proposed transmission line alignment on Hindmarsh Drive. There is an unnamed watercourse and depression along the western boundary of HMAS Harman. It crosses the proposed transmission line alignment at Canberra Avenue and drains north to the Molonglo River which flows to Lake Burley Griffin. The Molonglo River flows approximately 370 m to the north of the proposed alignment.

## 5.6.3 Investigations

### Geotechnical

The geotechnical investigations included a desktop assessment and site investigations.

The site investigations included a site walkover and intrusive investigation fieldwork, between 19 February and 1 April 2020, comprising the excavation of 32 cored boreholes at the proposed pole locations to conduct the following assessment of the ground conditions:

- Soil conditions, including soil types, strength and consistency.
- Assess rock conditions, including strength, weathering and significant defects.
- Groundwater levels, if encountered.
- Comment on excavatability for piling excavation methods.

A search of the CSIRO Australian Soil Resource Information System (ASRIS 2013) documented an “extremely low probability” of acid sulfate soil occurrence at the site.

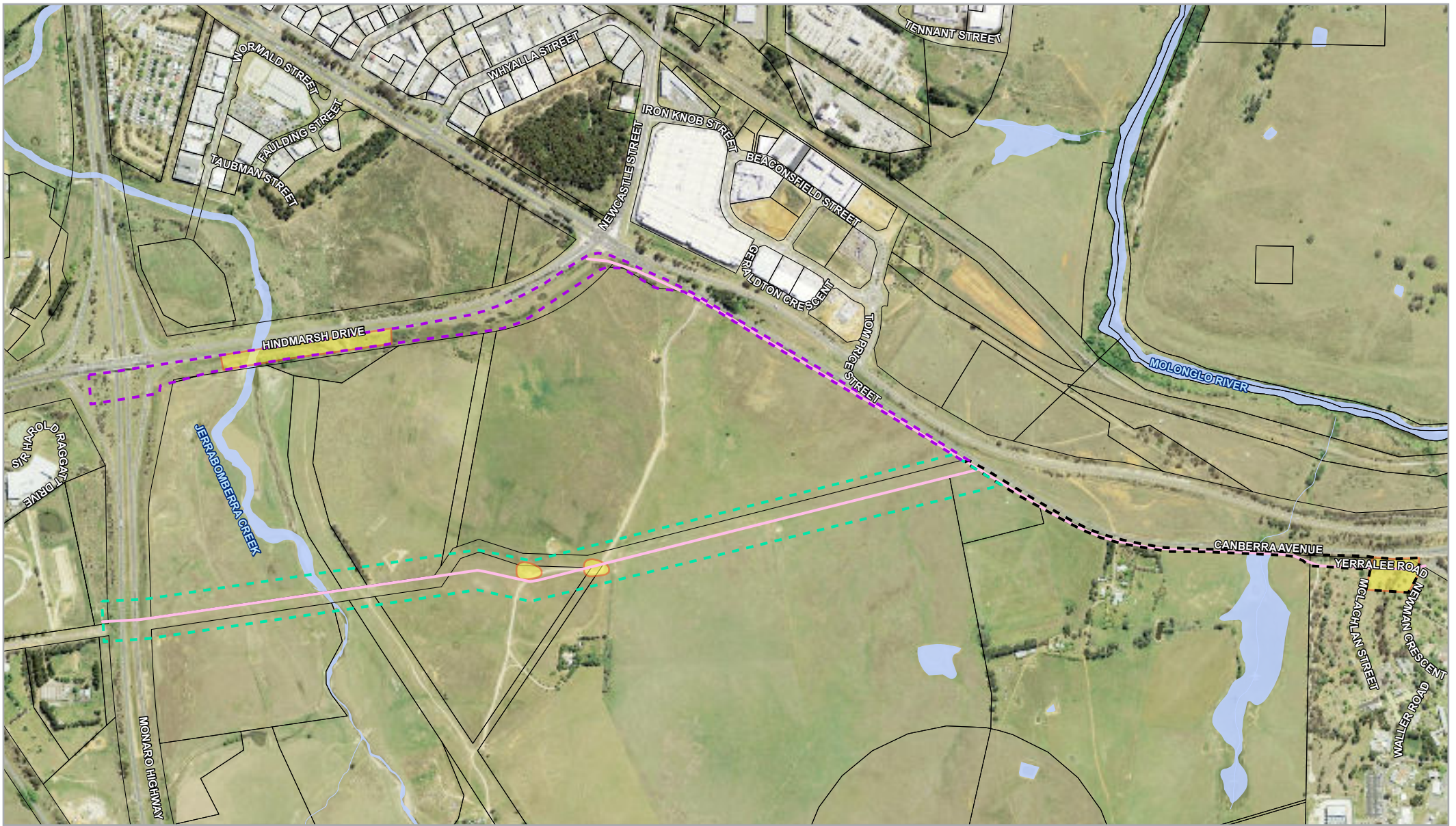
### Contamination

The PSI (Appendix A) included the following:

- A desktop review of information, including:
  - Site details and location.
  - Groundwater bore search of records in ACTmapi.
  - Review of historical aerial photographs.
  - Search of contaminated land records held by the EPA.
  - Information on the physical site setting, including topography, hydrogeology and geology.
- A site inspection involving a site walkover to identify any obvious signs of contamination.

The PSI identified the following Areas of Environmental Concern (AEC) in the study area, as shown in Figure 5.15.

- Potentially uncontrolled fill used along road verges.
- Waste metal/oils in the road verge off Hindmarsh Drive.
- Residual building materials following building demolition in the Harman substation site / other Defence activities close to the Harman substation site.



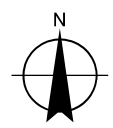
- LEGEND**
- Blocks / cadastre
  - Waterbody
  - Waterway
  - 11kV transmission line

- Areas of Environmental Concern
- Corridor Sections**
- Common Section
- Option 1
- Option 2

Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 55



**Evoenergy**  
Jerrabomberra Transmission Line Extension

**Areas of environmental concern**

Project No. 12514817  
Revision No. A  
Date 30 Aug 2022

**FIGURE 5.15**

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© 2022. Whilst every care has been taken to prepare this map, GHD (and Sixmaps 2022, NSW Department of Lands, ACT Government, OEH, WSP) make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

## 5.6.4 Potential impacts

Risks of the Project as they relate to soils and geology were identified in the preliminary risk assessment (Section 4.3) to be:

- Impact on adjoining land as a result of sediment and erosion.
- Site contamination (such as liquid contaminant spills (hydrocarbons, chemicals, etc)) from construction machinery.
- Encountering contaminated land.

Potential impacts to soils and geology as a result of construction and operation of the Project are discussed below.

### Construction

#### Spoil

Spoil from the excavation is planned to be reused on site for filling and compaction. Excavation works will be carried out using excavators and borer machines.

Laboratory testing for soil classification purposes was not conducted as part of the Geotechnical Investigations however, the preliminary assessment suggested that the material would be suitable as general backfill (Appendix I). To assess the reuse or disposal options for excavated materials for use as backfill, a risk-based approach will be applied. If the excavated material is of suitable properties for use as backfill then in most cases, it will be reused for that purpose on site. Where there is surplus excavated material that cannot be reused on site then it would be necessary to undertake soil classification tests to identify reuse or disposal options.

In the event that excavated material is assessed not to be appropriate for reuse on site, it could be necessary to import additional material to make up any identified deficit (for backfilling of pole footings). If required, material would be sourced from a local quarry as certified Virgin Excavated Natural Material (VENM).

Stockpiled materials can also cause impacts when materials are mixed. For example, mixing of suitable and unsuitable material or mixing contaminated material can lead to materials that would have ordinarily been reused being rendered as waste. Improper management and handling of stockpiled materials may lead to the need to dispose of materials rather than being able to reuse the materials during construction.

Stockpiled materials would be kept separate where possible to maximise potential for re-use and measures to achieve this would be detailed in a WMP that would be incorporated into the CEMP.

#### Erosion and sedimentation impacts

During construction, there would be potential for sediment and nutrient laden runoff from areas disturbed by construction to impact water quality in downstream waterways. Areas which would present a high risk of soil erosion include locations where both surface gradients and slope lengths combined would increase the erosive potential of stormwater runoff.

Activities which have the highest risk of sedimentation and erosion impacts include:

- Works near creeks and stormwater drainage lines.
- Vegetation removal.
- General earthworks, including stripping of topsoil, excavation of material or filling of material.
- Stockpiling of topsoil and vegetation.
- Transportation of materials.
- Movement of heavy vehicles across exposed earth.
- Mobilisation of unconsolidated materials if disturbed surfaces are not stabilised or successfully revegetated following construction.

An Erosion and Sediment Control Plan (ESCP) will be prepared as part of the CEMP to identify and mitigate erosion impacts from construction activities, particularly during extreme weather.

## Contamination

Potential impacts in relation to contamination associated with the construction of the Project include:

- Increasing waste amounts from improper practices such as poor fill management.
- Contaminated or hazardous waste not being correctly disposed of.
- Release of contaminants from construction plant and equipment into underlying soils and groundwater.
- Movement of contaminated sediments from chemical spills into waterways.

The contamination risk from uncontrolled fill would be appropriately managed with the use of an Unexpected Finds Protocol during project construction. This should be included in the CEMP.

Construction activities would require on-site use and storage of diesel fuel, and lubricating oils. Incorrect storage or use of these materials could result in accidental spills. All hazardous materials would be stored and banded within designated areas within the site compounds in accordance with AS 1940-2004 the storage and handling of flammable and combustible liquids. Refuelling of vehicles, plant and machinery would be undertaken in accordance with the Contractors CEMP.

There is not proposed to be any bulk storage of any hazardous materials other than diesel fuel and lubricating oils used in plant and equipment. Safeguards for the transport, storage, use and disposal of these substances would be developed and implemented during construction, to minimise the risk of impacts from these substances on soil and water.

## Operation

There is potential for the access tracks to be impacted by wind and water erosion during operation. Access tracks would be maintained in accordance with the Best Practice Guidelines for Fire Trail Construction and Maintenance (Bushfire Coordinating Committee 2007).

There is potential for accidental spillage of hazardous materials during the operational stage, mainly associated with maintenance activities. This would be addressed through the Evoenergy standard operating procedures.

## 5.6.5 Mitigation measures

Mitigation and management measures to minimise impacts to soils and geology are outlined in Table 5.15.

*Table 5.15 Soils and geology mitigation measures*

Potential impact	Mitigation	Timing
Sediment and erosion	An ESCP would be prepared as part of the CEMP. All erosion and sediment control measures are to be designed, implemented and maintained in accordance with the "Environment Protection Guidelines for Construction and Land Development in the ACT" (EPA 2011). Erosion and sediment mitigation measures would be installed and maintained for the duration of the construction period.	Pre-construction and Construction
Unexpected contamination find	An Unexpected Finds Protocol would be prepared as part of the CEMP that includes: – Procedures for the identification, assessment, management, validation, and disposal of potential contamination. – Contractor induction procedure.	Pre-construction and Construction
Storage of materials and stockpiles	Storage of construction materials and stockpiles, fuels and chemicals is to be located away from drainage lines and include controls such as bunding to prevent leakage.	Pre-construction and Construction
Contaminated waste	Disposal and management of potentially occurring contaminated waste will be managed as per the Unexpected Finds Protocol, and EPA advice. No soil is to be disposed from the site without EPA approval.	Construction

Potential impact	Mitigation	Timing
Spills or leaks	Vehicles and machinery will be properly maintained to minimise the risk of fuel/oil leaks. Routine inspections of all construction vehicles and equipment should be undertaken for evidence of fuel/oil leaks. All fuels, chemicals and hazardous liquids will be stored within an impervious bunded area in accordance with Australian standards and EPA guidelines. Any on-site refuelling will occur in a designated area within the site compound with impervious surfaces.	Pre-construction and Construction
Construction dewatering	Any dewatering activities will be undertaken in a manner that prevents pollution of waters.	Construction
Access tracks	Access tracks would be constructed and maintained in accordance with the Best Practice Guidelines for Fire Trail Construction and Maintenance (Bushfire Coordinating Committee 2007).	Construction and Operation

## 5.6.6 Residual risk assessment

Based on the mitigation measures identified, an assessment of the residual soils and geology risks associated with the Project have been considered. These residual risks are identified in Table 5.16.

Table 5.16 Soils and geology – residual risk assessment

Identified risk (Section 4)	Preliminary risk rating	Residual risk assessment		
		Residual likelihood	Residual consequence	Residual risk rating
Impact on adjoining land as a result of sediment and erosion	Low	Unlikely	Minor	Very low
Site contamination, such as liquid contaminant spills from construction machinery	Low	Unlikely	Minor	Very low
Encountering contaminated land	Low	Possible	Minor	Low

## 5.7 Landscape and visual

### 5.7.1 Overview

This section outlines the potential risks to landscape and visual, impacts and mitigation measures associated with the Project. Using a Landscape and Visual Assessment (LVIA) (Appendix J), this section specifically addresses the following landscape and visual requirements of the Scoping Document:

This section provides an assessment of potential landscape and visual impacts as identified in the Scoping Document:

- Undertake a visual assessment and impact analysis of the site and surrounds to describe the current landscape value of the area.
- Visual assessment and impact analysis must address impacts from the subject sites on approach routes as identified in the NCP.
- Visual assessment and impact analysis must provide perspectives of the site from both carriageways and present a comparative assessment of existing and proposed views upon immediate surrounds, views along approach routes and any significant views/vistas.
- Identify impacts on important view sheds and significant views and vistas to and from the site.
- Describe measures to be adopted to reduce the visual impact from the infrastructure bulk and scale, any stockpiling that may be required and lighting of the facility.

## 5.7.2 Environmental conditions and values

The LVIA included a landscape baseline assessment to identify the existing natural and cultural features within the study area. This included determination of key landscape and spatial elements, features and values. Aspects considered included land use, built form, landform, topography, hydrology, vegetation and historical features. These have been discussed in the following sections.

The LVIA also included a visual baseline assessment to identify the existing visual baseline environment within the study area. This includes determination of key visual elements, features and values. Key aspects considered include built form and vegetation, landform and topography, key views and viewsheds, visually prominent features and visual features of interest and value. These have been discussed in the following sections.

### National Capital Plan

The NCP has specific relevance to the landscape and visual impact assessment due to:

- The Inner Hills.
- Main avenues and approach routes.

The Inner Hills provide the scenic backdrop and natural setting for Canberra's urban areas, and within Canberra Central they are integral to the original plan.

The Approach Routes include the land within the boundaries of the reservations of the following roads:

- Barton Highway
- Canberra Avenue from Hume Circle to the ACT border
- Fairbairn Avenue
- Federal Highway
- Monaro Highway through to Morshead Drive
- Morshead Drive/Pialligo Avenue to the ACT border.

Development within Canberra's main avenues and approach routes is required to maintain the traveller's first perception of enhancing views to recognisable and popular images of the National Capital so as to further build expectation and define the approach. The Monaro Highway and Canberra Avenue approach routes in relation to the proposed transmission line are shown in Figure 5.16.

### Land use

The Project is primarily located within road reserves. The adjacent land use for the most part consists of broadacre properties used for agricultural grazing. Other land uses include industrial areas on the northern side of Canberra Avenue and parks and recreation on the northern side of Hindmarsh Drive. Figure 5.1 and Figure 5.2 show land use zones within the study area.

### Built form

The main built form within the study area consist of the large industrial buildings located within the industrial area on the northern side of Canberra Avenue. These buildings also occur on the south side of Canberra Avenue, closer to the intersection with Monaro Highway. There are also some large buildings associated with Geoscience Australia on the western side of Monaro Highway. The only other key built form elements within the study area are light poles, overpasses signage and other road infrastructure elements.

### Landform and topography

The transmission line alignment follows the road reserves of Hindmarsh Drive, Monaro Highway and Canberra Avenue, all of which are arterial roads. The terrain surrounding the Project area is gently undulating with steeper slopes near the intersection of Hindmarsh Drive and Canberra Avenue. The highest elevation is 612 m AHD near the intersection of Hindmarsh Drive and Canberra Avenue. The lowest point within the study area is 562 m AHD at the junction between Jerrabomberra Creek and Hindmarsh Drive. Figure 5.17, Figure 5.18 and Figure 5.19 show views of the landscape baseline in the study area. Vegetation is described in Section 5.11.

## Hydrology

The main watercourse within the study area is Jerrabomberra Creek with its associated floodplain, which crosses the Project alignment on Hindmarsh Drive. There is an additional watercourse and depression crossing the alignment on Canberra Avenue which drains north to Molonglo River. Hydrology within the study area is shown in Figure 5.30.

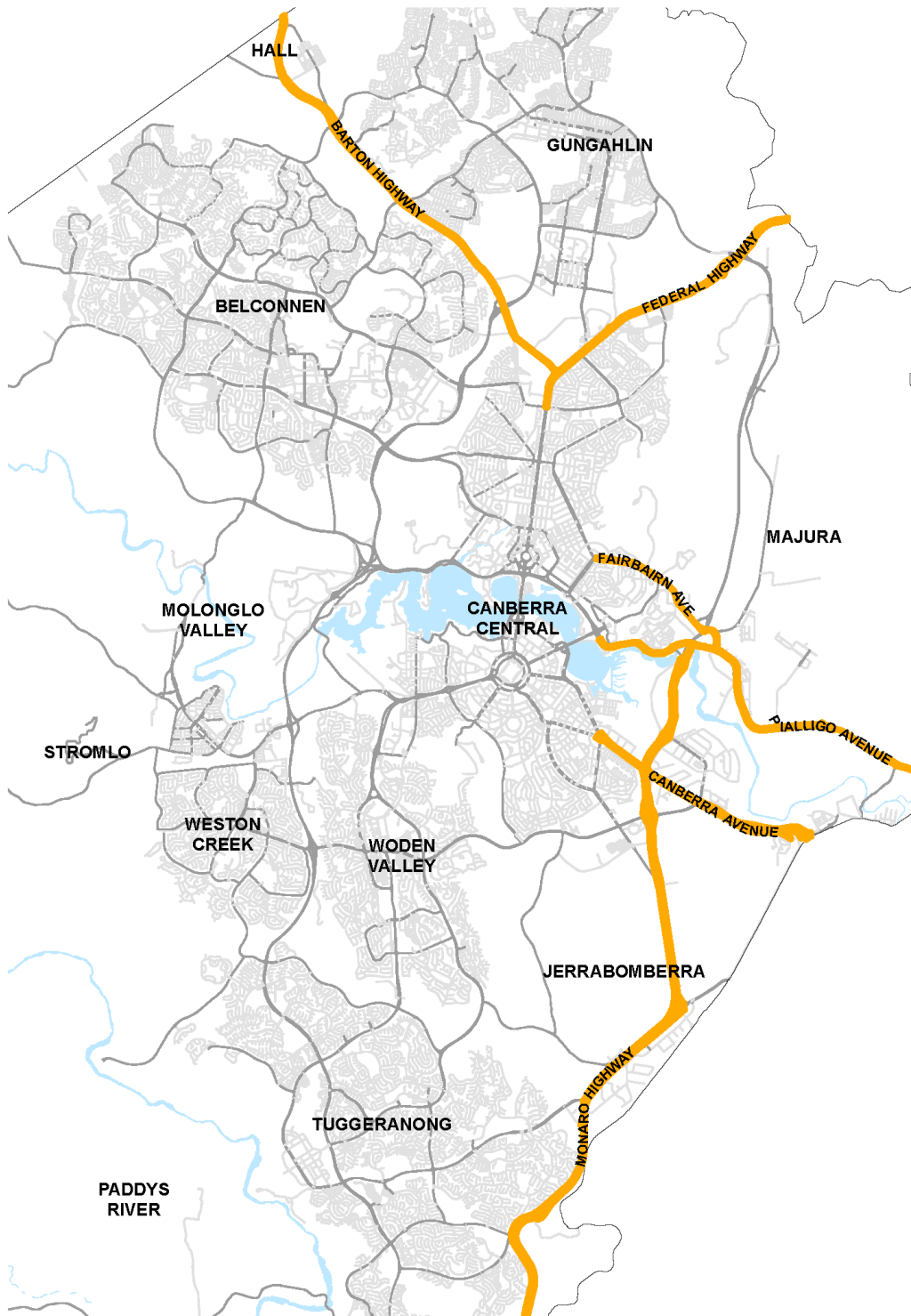


Figure 5.16 Monaro Highway and Canberra Avenue approach routes



**Figure 5.17** View west along Hindmarsh Drive



**Figure 5.18** View south-east along Canberra Avenue



**Figure 5.19** View south towards Jerrabomberra Creek from Hindmarsh Drive

### **Key views and viewsheds**

Key views and viewsheds within the study area mainly take in the vegetated hills and mountain ranges to the south, south-west and south-east.

Along Canberra Avenue heading south-east on the approach to the intersection of Newcastle Street, the road rises over a crest where there are views towards the hills of Cuumbeun Nature Reserve and Mount Jerrabomberra. The views of these hills are eventually concealed by vegetation as the road descends down the hill further toward HMAS Harman. Adjacent to HMAS Harman, a central planted median impedes views across the landscape and also into the facility.

Views toward the hills and mountain ranges to the south of the study area are particularly evident from Hindmarsh Drive, between the intersection of Canberra Avenue and Monaro Highway. The elevated road level, combined with limited vegetation along the southern side of the road result in generally unimpeded views across the landscape. The only exception is a hill on the south side of the intersection between Canberra Avenue and Hindmarsh Drive which impedes views to the south.

Figure 5.20 shows a view of mountain ranges south-east from Hindmarsh Drive.

### **Visually prominent features**

The layout and design of Canberra has utilised the natural topography, incorporating the hills surrounding the city as a scenic backdrop. These have been incorporated into the plan as much as the lake, foreshore, buildings and roads. For this reason, the planning and management of the inner hills as open space areas are central to maintaining and enhancing the character of the National Capital.

Some of the inner hills include Black Mountain, Mount Ainslie, Mount Majura, Mount Pleasant, Red Hill, Mount Mugga, Isaacs Ridge, Wanniasa Hill, and Narrabundah Hill. Many of these hills can be seen from the study area. For example, from Hindmarsh Drive views of Black Mountain, Isaacs Ridge, Wanniasa Hill and Red Hill can be obtained. From Monaro Highway, Mount Ainslie, Mount Pleasant and Mount Majura can be seen to the north.

Figure 5.21 shows a view north from Hindmarsh Drive overpass of Mount Pleasant, Mount Ainslie and Mount Majura. Figure 5.22 shows a view north-west from Hindmarsh Drive road reserve of Black Mountain.

## Visual features of interest and value

The significance of Canberra as the nation's capital attracts specific planning and design considerations to maintain the integrity of key visually prominent features such as the inner hills described previously. Views north towards these features are particularly significant along approach routes such as Monaro Highway and Canberra Avenue. Closer to the city centre, view lines, landscaping and urban design is more tightly controlled than further away in the outskirts.



Figure 5.20 View south-east from Hindmarsh Drive of mountain ranges



Figure 5.21 View north from Hindmarsh Drive overpass towards Mount Pleasant, Mount Ainslie and Mount Majura



Figure 5.22 View north-west from Hindmarsh Drive road reserve towards Black Mountain

### 5.7.3 Investigations

The methodology for this assessment has been developed with reference to current accepted practice as derived from:

- Environmental impact assessment practice note EIA-N04 - Guideline for landscape character and visual impact assessment, Version 2.1 (Roads and Maritime 2018)
- Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (Landscape Institute and Institute of Environmental Management & Assessment 2013).

Broadly summarised, the LVIA methodology involved the following key tasks:

- Identify the landscape and visual existing environment:
  - An understanding of the Project was established; namely the location, form and scale and any supporting infrastructure, and the relative physical differences between the current visual landscape and that of the proposed transmission line
  - An understanding and description of the existing landscape and visual character of the study area as a means of establishing a baseline via:
    - desktop studies to identify potential visual receptors likely to be impacted
    - A site inspection was undertaken on the 17 and 21 April 2020. The LVIA specialists did not visit the site due to COVID-19 travel restrictions. Site inspection and photography was undertaken by a member of the GHD project team
  - Landscape and visual baseline assessments
  - Identification of landscape character zones and viewpoint selection
- Impact assessment:
  - Landscape effects.
  - Visual effects.

## **Landscape character zones**

Landscape character zones (LCZ) are areas sharing the same homogenous environmental or cultural qualities or pattern such as topography, vegetation, hydrology, land use and settlement, built form scale and character, cultural and recreational characteristics. Within the study area, six LCZs have been identified and include the following:

- Undulating farmland.
- Main roads.
- Creek corridor.
- Recreation.
- Industrial.
- Institutional.

A description of the LCZs are provided in the LVIA in Appendix I. Figure 5.23 shows the LCZs within the study area.

## **Viewpoint selection**

Based on the analysis of the existing landscape and visual environment, sensitive visual receivers were identified, and viewpoint locations selected as representative locations for assessment.

Seven viewpoints that cover the main viewing locations of the Project from publicly accessible locations within the study area were identified. Table 5.17. outlines the locations and descriptions of the viewpoint locations, with further details provided in the LVIA in Appendix I. Figure 5.24 shows the location of these viewpoints.

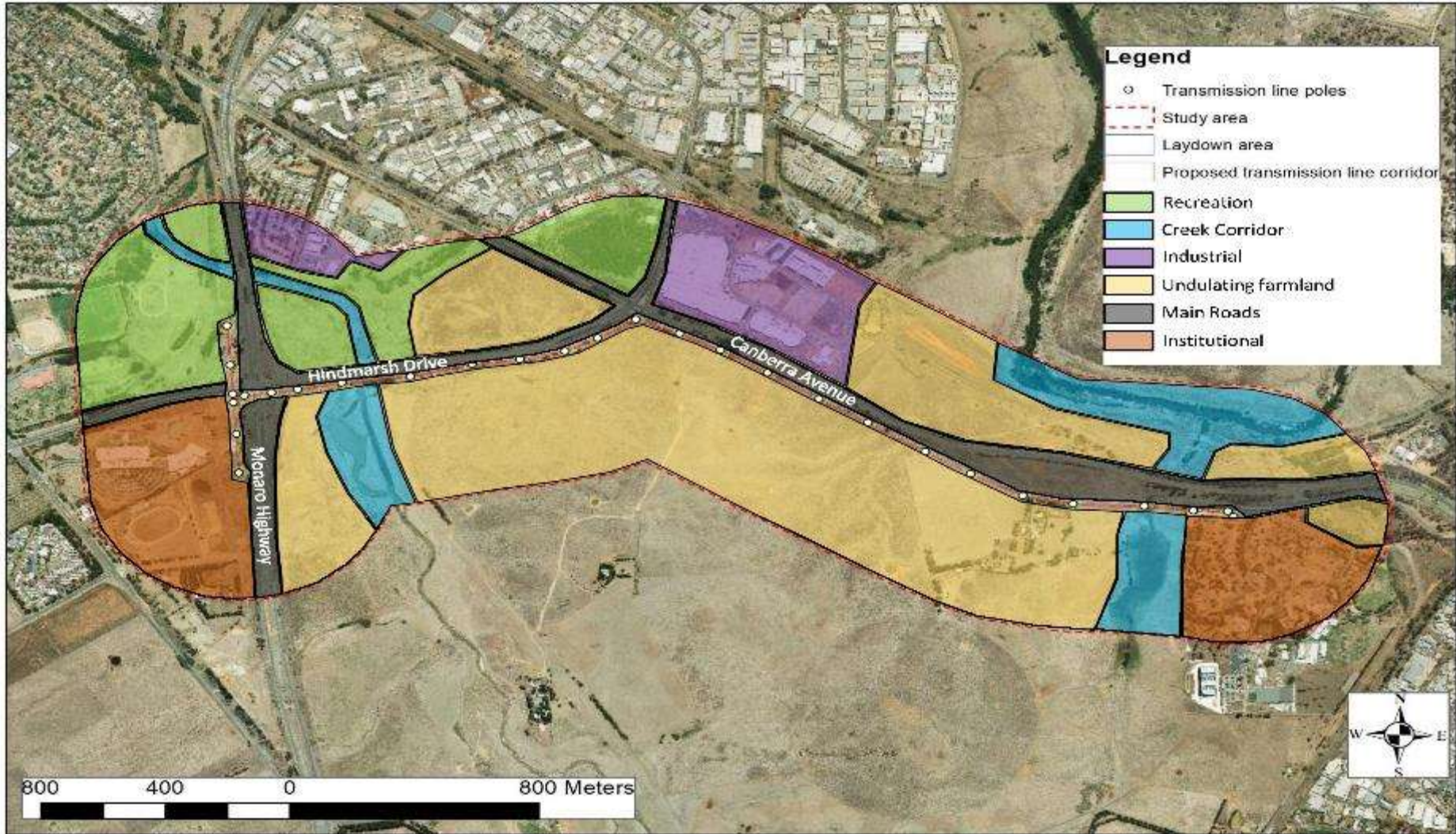


Figure 5.23 Landscape character zones

Table 5.17 Viewpoint locations

Viewpoint	Location	Description
VP 1	Monaro Highway #1	<p>VP 1 is located next to the southbound exit ramp from Hindmarsh Drive onto Monaro Highway.</p> 
VP 2	Monaro Highway #2	<p>VP 2 is located next to the southbound entry ramp from Hindmarsh Drive onto Monaro Highway.</p> 
VP 3	Hindmarsh Drive #1	<p>VP 3 is located next to the eastbound carriageway of Hindmarsh Drive, approximately 500 m east of the intersection of Hindmarsh Drive and Monaro Highway.</p>

Viewpoint	Location	Description
		
VP 4	Hindmarsh Drive #2	<p>VP 4 is located next to the westbound carriageway of Hindmarsh Drive, approximately 450 m south-west of the intersection of Hindmarsh Drive and Canberra Avenue.</p> 

Viewpoint	Location	Description
VP 5	Canberra Avenue #1	<p>VP 5 is located on the northern side of the intersection of Hindmarsh Drive and Canberra Avenue.</p> 
VP 6	Canberra Avenue #2	<p>VP 6 is located next to Canberra Avenue, approximately 400 m south-east of the intersection of Canberra Avenue and Hindmarsh Drive.</p> 

Viewpoint	Location	Description
VP 7	Canberra Avenue #3	<p data-bbox="548 215 1713 247">VP 7 is located next to Canberra Avenue, opposite the north-east corner of the HMAS Harman site boundary.</p> 

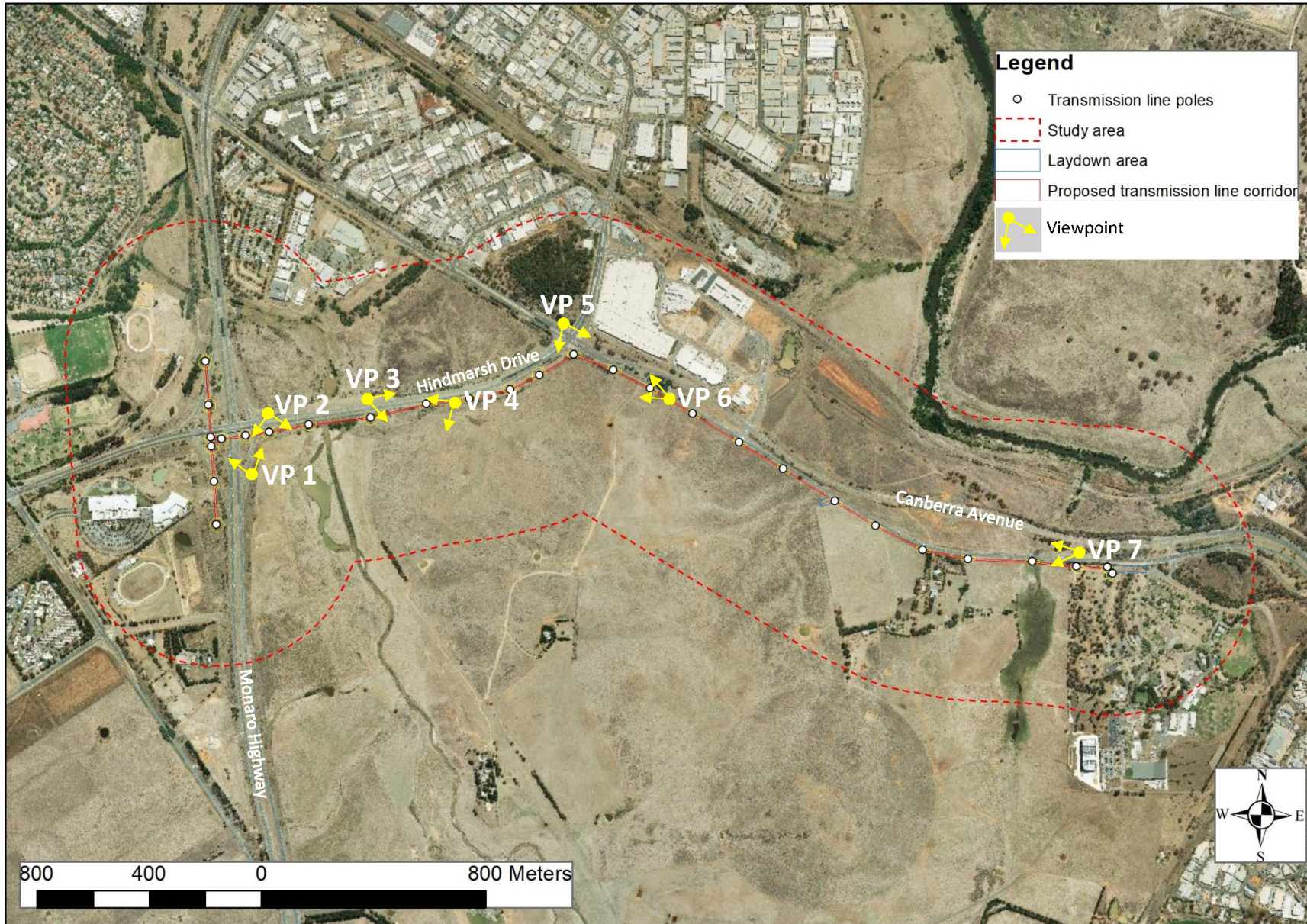


Figure 5.24 Viewpoint locations

## Impact Assessment

### Landscape effects

Assessment of landscape effects deals with the effect of change and development on landscape as a resource. The concern is with how the Project will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character.

The consideration of potential impacts on landscape character is assessed based on the sensitivity of the existing landscape to change and the magnitude of change that is likely to occur.

The sensitivity and magnitude of landscape effects address the following specific criteria:

- Sensitivity of landscape to proposed change, based on the susceptibility to change, and the value of landscape (refer Table 5.18).
- Magnitude of landscape effect, based on the size or scale of change, the geographical extent of effects, and the duration and reversibility of effects (refer Table 5.19).

A judgement is made on the overall level of significance of the landscape effect in relation to the existing conditions (refer Section 5.7.4).

**Table 5.18**      *Sensitivity criteria (landscape)*

Rating	Criteria
High	Landscape character elements in good or above average condition and/or that make a strong positive contribution to the landscape character. May include nationally important features. The type of development proposed could have a detrimental effect on the landscape character, condition or value. Mitigation measures are unlikely to reduce the impacts of the change.
Moderate	Landscape character elements in reasonably good condition and/or that make an average contribution to the local character, which may include locally important features. Any change caused by the proposed development would be unlikely to have a significant adverse effect on the landscape character, condition or value that could not be mitigated.
Low	Landscape character elements in average condition and/or that are not particularly distinctive local features. Development of this type is unlikely to have an adverse effect on the landscape character, condition or value. Mitigation measures would be effective in neutralising adverse effects.
Negligible	Elements in below average condition and/or that are not distinctive local features. Development of this type is very unlikely to have an adverse effect on the urban landscape character, condition or value. Mitigation measures would be effective in neutralising adverse effects and/or improve the urban landscape character.

**Table 5.19**      *Magnitude of change criteria (landscape)*

Rating	Criteria
High	A substantial/obvious change to the landscape character due to total loss of, or change to, elements, features or characteristics of the landscape. Would cause a landscape to be permanently changed and its quality diminished.
Moderate	Discernible changes in the landscape character due to partial loss of, or change to elements, features or characteristics of the landscape, however, has potential to be partly mitigated. The change would be out of scale with the landscape character, and at odds with the local pattern and landform and would leave an adverse impact on the landscape character.
Low	Minor loss or alteration to one or more key landscape character elements, features or characteristics, or the introduction of components that may be new but may not be uncharacteristic within the existing landscape character.
Negligible	Almost imperceptible or no change in the landscape character as there is little or no loss of/or change to the elements, features or characteristics of the landscape.

### Visual effects

The evaluation of potential impacts on visual amenity is based on the sensitivity of the viewpoint (and the visual receiver it represents) to change, and the magnitude of change that is likely to occur.

Steps undertaken to assess visual effects include:

- Identify and map viewpoint locations.
- Undertake assessment of visual effects, comprising:
  - Sensitivity of visual receiver to proposed change, based on susceptibility of visual receivers to change, and value attached to views (refer Table 5.20).
  - Magnitude of visual effect, based on size or scale of change; geographical extent of effects, and duration and reversibility of effects (refer Table 5.21).

An assessment is undertaken of the overall level of significance of the visual effects in relation to the existing view (refer Section 5.7.4).

**Table 5.20** Sensitivity criteria (visual)

Rating	Criteria
High	Occupiers of residential properties, at home or going to or from, with long viewing periods, within close proximity to the proposed development; Communities that place value upon the landscape and enjoyment of views of their setting.
Moderate	Outdoor workers who have a key focus on their work who may also have intermittent views of the study area; Viewers at work when outdoor recreation areas are located within close proximity but viewing periods are limited; Occupiers of residential properties with long viewing periods, at a distance from or screened from the study area.
Low	Road users in motor vehicles or on transport routes that are passing through or adjacent to the study area and therefore have short term views; Viewers indoor at their place of work, schools or similar.
Negligible	Viewers from locations where there is screening by vegetation or structures where only occasional screened views are available and viewing times are short; Road users in motor vehicles, trains or on transport routes that are passing through/adjacent to the study area and have partially screened views and short viewing times.

**Table 5.21** Magnitude of change criteria (visual)

Rating	Criteria
High	A substantial/obvious change to the existing view due to total loss of, or change to, elements, features or characteristics of the view. Would cause a view to be permanently changed and its quality diminished.
Moderate	Discernible changes in the existing view due to partial loss of, or change to elements, features or characteristics of the view, however, has potential to be partly mitigated. The change would be out of scale with the existing view and would leave an adverse impact on the view.
Low	Minor loss or alteration to one or more key view elements, features or characteristics, or the introduction of components that may be visible but may not be uncharacteristic within the existing view.
Negligible	Almost imperceptible or no change in the view as there is little or no loss of/or change to the elements, features or characteristics of the view.

### Significance of impacts

The combination of sensitivity and magnitude identifies the significance of the impact on the landscape character or representative viewpoint. Refer to Table 5.22 for the matrix used to assess the significance of impact.

**Table 5.22** LVIA significance of impact matrix

	Magnitude of impact			
	High	Moderate	Low	Negligible
Sensitivity	High	High-Moderate	Moderate	Negligible
Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
Low	Moderate	Moderate-Low	Low	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

## 5.7.4 Potential impacts

Risks of the Project as they relate to landscape and visual amenity were identified in the preliminary risk assessment (Section 4.3) to be:

- Visual impacts on approach routes and iconic visual features in the ACT.
- Visual disturbance caused by the temporary storage of machinery and materials along approach routes.

Potential impacts to landscape and visual as a result of construction and operation of the Project are discussed below.

### Construction

The visual impact to road users, retail or commercial properties and landscape impacts to LCZs during construction would consist of the following elements and activities:

- The presence of fencing, barricades and lighting at construction zones, site compounds and administration buildings.
- The temporary presence of work crew, vehicles and machinery at designated laydown areas and materials storage at designated areas.
- During the construction phase, the visual amenity would be temporarily interrupted by installation equipment or vehicles. Stockpiling of materials would be limited due to the progression of construction along the alignment. The stockpiling of spoil excavated from the pole holes would be minor and temporary, and would involve immediate removal from site or reuse as backfill following the standing of poles. As the foundations for poles would be bored instead of trenched, this reduces the need for stockpiling of soil.
- Construction vehicles moving along existing roads enroute to the construction site.
- There may be additional dust generated as a result of construction works which may have a visual impact.
- Lighting impacts from construction activities are not likely to occur as construction would typically be undertaken during the hours of 7:00 am to 6:00 pm. Work would only be undertaken outside of these hours for emergencies.

The construction activities and elements described above would be temporary in nature, occurring 7 – 12 months, expected to begin in April 2023. It would also be limited to a relatively small area at a time as construction crews work along the alignment to install the new transmission line. Given the temporary nature of these activities, the landscape and visual impact from construction would be low.

The clearing of vegetation for construction would comprise the following:

- Some vegetation clearing would be carried along the Project alignment to facilitate construction and ensure adequate clearances are enabled for the transmission line works.
- Vegetation clearing is to occur if it encroaches on clearances of the new transmission line.

Given that vegetation clearance is common within a highly modified landscape, the visual impact of vegetation clearance is expected to be low.

### Operation

The assessment of each LCZ to understand the landscape effect is shown in Table 5.23 and the visual impact assessment is shown in Table 5.24. The visual impacts during operation would be reduced from the realignment and undergrounding of the existing 11 kV distribution line. The 11 kV line would be relocated from above ground, on the southern side of Canberra Avenue, to underground on the northern side and median of Canberra Avenue as part of a separate project.

Table 5.23 LCZ assessment

LCZ	Anticipated Change	Sensitivity to Change	Magnitude of Change	Significance of Impact
LCZ 1 Undulating farmland	There would be negligible change to this landscape character zone as the alignment would be located within the road reserves.	The sensitivity of this LCZ to change would be <b>low</b> as it is typically a highly modified landscape which has experienced a process of ongoing change since European settlement. Linear features such as transmission lines and fence lines are common within this landscape character zone. The Project would therefore not appear out of place.	<b>Negligible</b> given that the alignment would be mostly if not wholly contained within the road reserves.	<b>Negligible</b>
LCZ 2 Main roads	There would be some temporary construction activity located within the road reserves. This would include the presence of vehicles and machinery as the transmission poles are installed and the lines are strung.  The long-term changes include the introduction of the transmission line. The change along Hindmarsh Drive would result in a new roadside element. The change along Canberra Avenue would see the replacement of the 11 kV distribution line with a new 132 kV transmission line.	The sensitivity of change would be <b>low</b> given the existing roadside infrastructure already present.	The magnitude of change would be <b>low</b> given that the alignment, once constructed, would be confined to the road reserves and limited to the area around each transmission pole.	<b>Low</b>
LCZ 3 Creek corridor	The anticipated change to this LCZ is negligible. Where the transmission line crosses Jerrabomberra Creek it would be located within the road reserve that passes directly overhead. This would be a similar case for the crossing point of the transmission line over the unnamed watercourse. There would be no change to the Molonglo River.	The sensitivity to change would be <b>moderate</b> . Although some watercourses have a high amenity value such as Jerrabomberra Creek north of Hindmarsh Drive, others such as the unnamed watercourse and Jerrabomberra Creek south of Hindmarsh Drive have negligible amenity value.	The magnitude of change is considered to be <b>negligible</b> as the Project would not occur within this LCZ and would not affect any key features of this LCZ.	<b>Negligible</b>
LCZ 4 Recreation	There would be no changes to this LCZ as it is located at a distance (over approximately 200 m) from the Project area.	The sensitivity of this LCZ to change is considered to be <b>high</b> as it is used for recreation and visitors would be highly impacted by changes to this type of environment.	The magnitude of change is considered <b>negligible</b> , as the Project would be located a substantial distance (over approximately 200 m) away, and key elements of this LCZ would not be impacted.	<b>Negligible</b>
LCZ 5 Industrial	There would be no changes to this LCZ as it is located at a distance (the closest being approximately 150 m) from the Project area.	The sensitivity of this LCZ to change is <b>negligible</b> as it is a highly modified environment.	There would be a <b>negligible</b> change to this LCZ as it is located at a distance (approximately 150 m) from the Project area.	<b>Negligible</b>

LCZ	Anticipated Change	Sensitivity to Change	Magnitude of Change	Significance of Impact
LCZ 6 Institutional	The change would replace the existing 11 kV distribution line with the proposed 132 kV transmission line. The proposed poles, although larger would be fewer and further apart.	The sensitivity to change would be <b>low</b> as the Project would be unlikely to have an adverse effect on the character of this LCZ.	The magnitude of change to the HMAS Harman site would be <b>low</b> as it is essentially replacing the existing distribution line with a taller one with fewer poles.	<b>Low</b>

Table 5.24 Visual impact assessment

Viewpoint	Location and view direction	Anticipated Change to View	Sensitivity to Change	Magnitude of Change	Significance of Impact
VP 1	VP 1 is located next to the southbound entry ramp from Hindmarsh Drive onto Monaro Highway. The Project would be north-west from this location along the southern side of Hindmarsh Drive.	The Project would result in the addition of a transmission line running directly across this view and would connect with the existing transmission line on the western side of Monaro Highway. There is likely to be some vegetation cleared to make way for the construction work area. This may include vegetation located on both sides of Monaro Highway. A photomontage which demonstrates the change to the view from this location is provided as Figure 5.25	<b>Moderate.</b> This viewpoint is situated along a designated approach route within the rural outskirts of Canberra. It is likely to impact transient viewers such as road users, the main group of viewers. They may be sensitive to visual changes given the significance of the journey towards the national capital. Views of prominent geographical features such as Mount Pleasant, Mount Ainslie and Mount Majura are visible but already partially obscured by road infrastructure.	<b>Low.</b> The Project would be visually similar in scale and form to the existing roadside infrastructure such as the light poles and Hindmarsh Drive overpass. The height of the proposed transmission line would appear at a similar scale to the existing light poles. The extent of vegetation cleared would not affect the overall level of vegetation coverage in this view.	<b>Moderate</b>
VP 2	VP 2 is located next to the southbound exit ramp from Monaro Highway onto Hindmarsh Drive. The Project would be located south-east from this location.	The Project would be located across this view and would represent a moderately substantial change to a relatively uninterrupted view of the broader landscape and distant views of mountain ranges to the south-east. Vegetation clearance is expected to be negligible at this location. A photomontage which demonstrates the change to the view from this location is provided as Figure 5.26.	<b>Moderate.</b> Given the relatively uninterrupted view of the broader landscape and the location of this viewpoint close to a designated approach route into Canberra. The impact to viewers is transient, such as road users would be the visual receivers. They may be sensitive to visual changes given the significance of the journey away from the national capital.	<b>Moderate,</b> the existing view is currently partially impacted by the presence of roadside infrastructure. However, the introduction of the proposed transmission line would result in a substantial change to this view.	<b>Moderate</b>

Viewpoint	Location and view direction	Anticipated Change to View	Sensitivity to Change	Magnitude of Change	Significance of Impact
VP 3	VP 3 is located next to the eastbound carriageway of Hindmarsh Drive, approximately 500 m east of the intersection of Hindmarsh Drive and Monaro Highway. The Project would be located south-east from this location.	<p>The Project would be a noticeable addition to the view in the form of the transmission line running along the southern side of Hindmarsh Drive. There is likely to be some vegetation cleared to make way for the construction work area. This may include vegetation located on the southern side of Hindmarsh Drive. An access track may also be visible on the hill along the southern side of Hindmarsh Drive.</p> <p>A photomontage which demonstrates the change to the view from this location is provided as Figure 5.27.</p>	<p>The sensitivity to change is considered <b>low</b> as the key sensitive receivers would be road users who would have short term, transient views. Existing roadside infrastructure such as light poles, guard rails and a road sign are present within this view and this location is not on an approach route.</p>	<p><b>Moderate</b>, although there are existing light poles, guard rails and a road sign, the proposed transmission lines would be a new element which would be out of scale with the existing elements. The view is generally unmodified by development apart from these minor infrastructure elements. The hill in the middle distance prevents long range views out across the landscape toward distant the distant mountain ranges of Mount Jerrabomberra, Cuumbeun and other mountain ranges beyond those. The extent of vegetation cleared is not expected to have an effect on the overall level of vegetation coverage in this view. The access track would be difficult to discern given its distance away.</p>	<p><b>Moderate-low</b></p>

Viewpoint	Location and view direction	Anticipated Change to View	Sensitivity to Change	Magnitude of Change	Significance of Impact
VP 4	VP 4 is located next to the westbound carriageway of Hindmarsh Drive, approximately 450 m south-west of the intersection of Hindmarsh Drive and Canberra Avenue. The view is facing south-west along Hindmarsh Drive.	<p>The Project would occupy an area to the left of Hindmarsh Drive, within the road reserve. It is likely that the transmission line cables would be directly overhead and partially impact views towards the geographical features in the distance such as Isaacs Ridge and Mount Mugga. These have been identified as features of significance in the NCP and are of high visual amenity. The level of vegetation clearance is expected to be negligible given that the construction work area would be located between the road and the group of shrubs. An access track would be developed from the existing track leading to Hindmarsh Drive.</p> <p>A photomontage which demonstrates the change to the view from this location is provided as Figure 5.28.</p>	<p>The sensitivity to change is considered <b>moderate</b>, as the sensitive receivers would be retail or commercial properties (from a distance) and road users who are passing through the study area and would have short term, transient views. Receivers may be sensitive to visual changes given the availability of clear views across the landscape towards significant geographical features such as Isaacs Ridge and Mount Mugga which have been identified as features of significance within the National Capital Plan NCP.</p>	<p><b>Moderate</b>, as the transmission line would run parallel to Hindmarsh Drive and be a new element out of character within the existing view. However, views across the landscape to the significant geographical features such as Issacs Ridge and Mount Mugga would still be available through the spaces between the poles. The impact of vegetation clearance and the access track would be negligible.</p>	<b>Moderate</b>
VP 5	VP 5 is located on the northern side of the intersection of Hindmarsh Drive and Canberra Avenue. This viewpoint looks toward the south-east.	<p>The Project would involve the replacement of the existing 11 kV distribution line (as part of a separate project) that can be seen on the other side of the intersection, in front of the vegetation. It would include replacing the existing poles with taller ones that are spaced further apart. Vegetation clearance and the construction of an access track is also likely to occur along the southern side of the intersection. A photomontage which demonstrates the change to the view from this location is provided in Figure 5.29.</p>	<p><b>Moderate</b>, as from this elevated location, there are long distance views of the mountain ranges to the south-east towards Mount Jerrabomberra, Cuumbeun and other mountain ranges beyond those. Sensitive receivers include road users and some retail / commercial properties at the northeast intersection of Newcastle St and Canberra Ave (for buildings with windows on the southern edge). They would be sensitive to visual changes given the significance of the journey towards or away from the national capital. However, the road user views would be short term and there are numerous elements of roadside infrastructure such as traffic signals, signage and light poles which already detract from long distance views across the landscape. It is generally a vehicle dominated, busy traffic intersection.</p>	<p><b>Low</b>, given that the Project involves installing a transmission line where there was an existing distribution line with poles that would be taller but spaced further apart. The poles would be 30 m in height, however typically 22-26 m would be above ground. The impact of vegetation clearance and the introduction of the access track would be low given the highly modified environment.</p>	<b>Moderate-low</b>

Viewpoint	Location and view direction	Anticipated Change to View	Sensitivity to Change	Magnitude of Change	Significance of Impact
VP 6	VP 6 is located next to Canberra Avenue, approximately 400 m south-east of the intersection of Canberra Avenue and Hindmarsh Drive. This viewpoint is looking north-west along Canberra Avenue.	From this location, the Project would be installed where there was an existing distribution line which can be seen in the centre of the view with poles that are taller but spaced further apart. Vegetation clearance is expected to be negligible at this location. There are also no proposed access tracks.	<b>Low.</b> Road users would be the sensitive receivers. They would be sensitive to visual changes given the significance of the journey towards the national capital. However, given that the typical features in the designated approach routes aren't available in this view, the sensitivity to change would be low. There is a hill in the centre of the view which limits the visibility of anything beyond the intersection of Hindmarsh Drive.	<b>Low</b> , given that the Project essentially involves installing a transmission line where there was an existing distribution line (being removed as a separate project) with poles that are taller but spaced slightly further apart.	<b>Low</b>
VP 7	VP 7 is located next to Canberra Avenue, opposite the north-east corner of the HMAS Harman site boundary. This viewpoint looks north-west along Canberra Avenue.	From this location, the Project would involve replacing the existing distribution line which can be seen running along the left side of Canberra Avenue. The new transmission line would have poles that are taller but spaced further apart. Vegetation clearance is expected to be negligible at this location. The alignment would run to the south of the row of trees on the southern side of Canberra Avenue. There are also no proposed access tracks.	<b>Low.</b> Road users would be the main group of viewers. Although this viewpoint is located along an approach route into Canberra and the viewer sensitivity would be high, typical features in the designated approach routes aren't available in this view, so the sensitivity to change would be low. Features are not easily distinguishable from this location. Vegetation in the left foreground would partially conceal the Project view.	<b>Low</b> , given that the Project essentially involves the replacement of the existing distribution line with poles that are taller but spaced slightly further apart.	<b>Low</b>



EXISTING VIEW



PROPOSED DESIGN

Figure 5.25 Photomontage showing VP 1 next to the southbound entry ramp from Hindmarsh Drive onto Monaro Highway

EXISTING VIEW



PROPOSED DESIGN



Figure 5.26 Photomontage showing VP 2 next to the southbound exit ramp from Monaro Highway onto Hindmarsh Drive

EXISTING VIEW



PROPOSED DESIGN



Figure 5.27 Photomontage showing VP 3 next to the eastbound carriageway of Hindmarsh Drive



EXISTING VIEW



PROPOSED DESIGN

Figure 5.28 Photomontage showing VP 4 next to the westbound carriageway of Hindmarsh Drive



EXISTING VIEW



PROPOSED DESIGN

Figure 5.29 Photomontage showing VP 5 on the northern side of the intersection of Hindmarsh Drive and Canberra Avenue

## 5.7.5 Mitigation measures

Mitigation and management measures to minimise landscape and visual impacts are provided in Table 5.25.

Table 5.25 Landscape and visual mitigation measures

Potential impact	Mitigation	Timing
Visual amenity during construction	Reinstatement of access roads and construction site compounds would commence progressively post construction and will be undertaken as soon as practicable.	Pre-construction and Construction
Visual amenity during construction	Storage of construction materials would be minimised as far as practical.	Pre-construction and Construction
Visual amenity during construction	All temporary above ground infrastructure would be removed at the completion of construction.	Pre-construction and Construction
Visual amenity during construction	If any lighting is required, it would be managed in general accordance with the requirements in Australian Standard AS 4282:2019 Control of the Obtrusive Effects of Outdoor Lighting. Generally, lighting would be designed to minimise off-site light spill.	Pre-construction and Construction
Visual amenity during construction	Vegetation buffers would be maintained between site compounds, laydown areas and public roads wherever practicable.	Pre-construction and Construction
Operation	Where vegetation is cleared to make way for the construction work area, it should be replaced with a similar species to the extent practical. This should be undertaken whilst maintaining the necessary safety clearances from the transmission poles.	Operation
Landscape and Management	<p>A Landscape Management and Protection Plan (LMPP) would be developed as part of the CEMP. The LMPP must detail, and number which trees are proposed for removal and demonstrate how the adjacent trees will be protected for the duration of works. The LMPP is required to be endorsed by TCCS prior to the commencement of any works on the site.</p> <p>If any trees proposed for removal are within unleased land, with the exception of the pest plants listed in Table 5.42, Evoenergy will need to contact TCCS via TCCS.UrbanTreesDDCoord@act.gov.au at least three weeks before the trees are scheduled for removal, so that arrangements can be made to provide them with the appropriate signage. The signs will need to be posted on the trees for a minimum of 14 days prior to them being removed, in line with Transport Canberra and City Services public notification process.</p>	Pre-construction

## 5.7.6 Residual risk assessment

Based on the mitigation measures identified, an assessment of the residual landscape and visual risks associated with the Project have been considered. These residual risks are identified in Table 5.26.

Table 5.26 Landscape and visual – residual risk assessment

Identified risk (Section 4)	Preliminary risk rating	Residual risk assessment		
		Residual likelihood	Residual consequence	Residual risk rating
Visual impacts on approach routes and iconic visual features in the ACT.	Medium	Likely	Minor	Medium
Visual disturbance caused by the temporary storage of machinery and materials along approach routes.	Low	Likely	Minimal	Low

## 5.8 Water quality and hydrology

### 5.8.1 Overview

This section outlines the potential risks to water quality and hydrology, impacts and mitigation measures associated with the Project. Using a desktop assessment, this section specifically addresses the following water quality and hydrology requirements of the Scoping Document:

- Include consideration of water quality as a result of sediment and erosion entering drainage lines, waterways and road drainage infrastructure
- Describe any mitigation measures required to prevent sediment and erosion from impacting on water quality.

### 5.8.2 Environmental conditions and values

#### Hydrology and surface water

The Project is located in the Molonglo catchment which extends from the Murrumbidgee River, just downstream of Uriarra Crossing, to the headwaters of the Molonglo and Queanbeyan Rivers and Jerrabomberra Creek, an area of about 2,000 km<sup>2</sup>.

Jerrabomberra Creek runs in a south to north direction as it intersects the western portion of the proposed alignment before flowing to the Molonglo River. The Molonglo River is located to the north-east and outside of the study area, running from the south-east to north-west.

An unnamed watercourse and depression runs along the western boundary of HMAS *Harman*, crossing the proposed alignment at Canberra Avenue to flow north to the Molonglo River. A series of drainage lines and ponds are located within the study area, flowing into either Jerrabomberra Creek or the Molonglo River.

Jerrabomberra Creek arises in the hills surrounding the rural residential area of Royalla along the south-eastern side of the ACT border. This reach, including a number of small tributaries, has varying degrees of riparian condition ranging from healthy sections, areas through rural subdivisions with very little riparian vegetation and sections with deep gully erosion.

The Molonglo catchment includes the urban areas of Queanbeyan and inner Canberra, villages such as Captains Flat and rural residential areas and farmland including Burra, Royalla and Carwoola. There is new residential development occurring at Googong, south-east of Queanbeyan, and around the lower Molonglo River in the Molonglo Valley. Non-residential areas include native and pine forests, wetlands, national parks and the foreshores of Googong Dam.

Parts of the Project area fall within the one per cent Annual Exceedance Probability (AEP) flood extent, including a portion of the western extent of the site near the intersection of the Monaro Highway and Hindmarsh Drive, as well as a portion in the north-east extent of the site on the Northern Side of Canberra Avenue. The main watercourses of the area are shown in Figure 5.30..

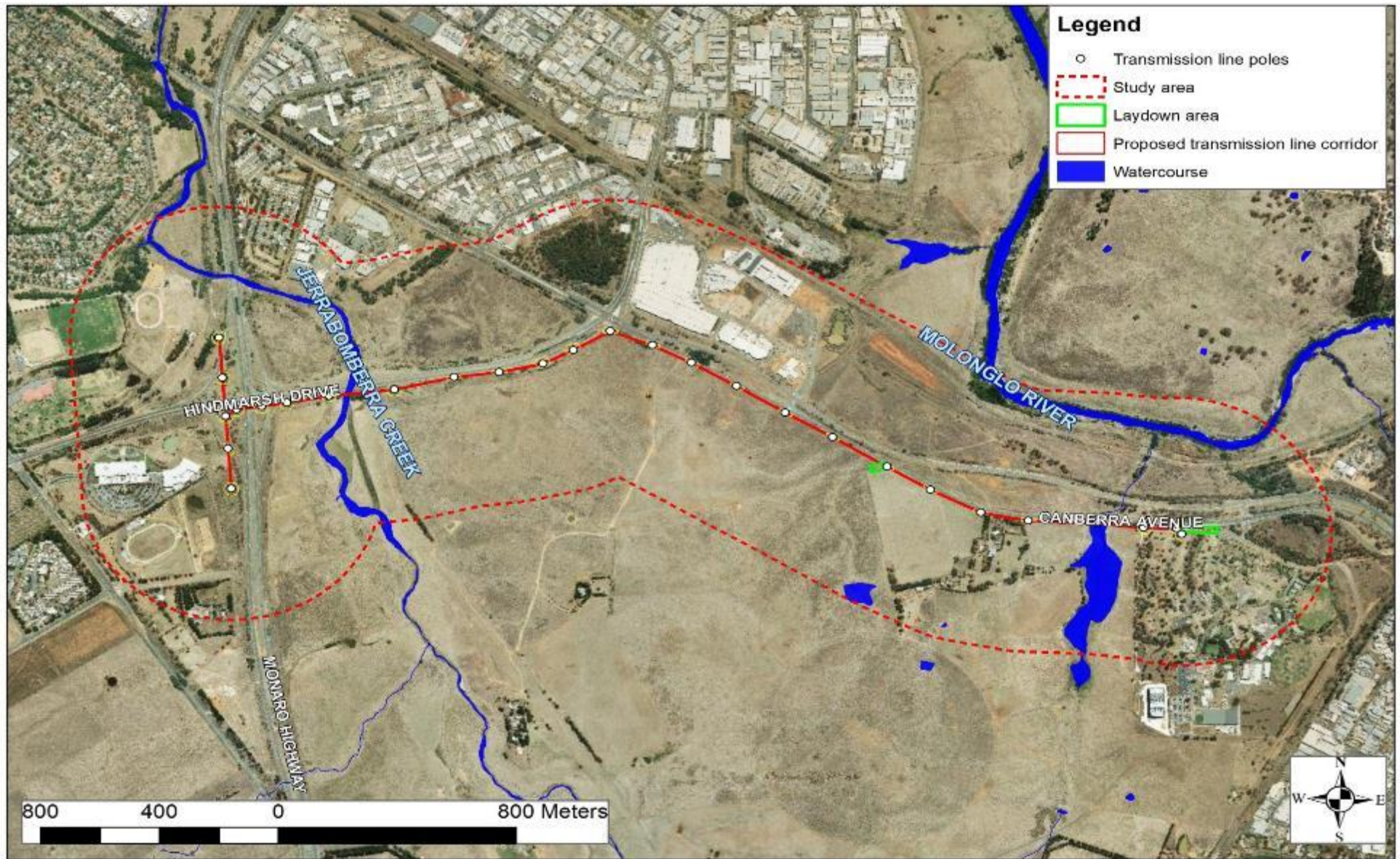


Figure 5.30 Site hydrology

## Groundwater

Groundwater is reported to exist within unconfined to confined fractured rock aquifers and throughout unconsolidated colluvial and alluvial sediments on slopes and in low-lying areas. Groundwater quality within the Symonston Hydrogeological Landscape (HGL) is reported to be fresh to marginal, generally ranging between <math><800-1,600 \mu\text{S}/\text{cm}</math>, while groundwater in the South Canberra HGL is reported to be generally fresh (<math><800 \mu\text{S}/\text{cm}</math>) (Appendix I).

A review of the licenced bore register was conducted in ACTmapi on 26 June 2020 indicated that five registered groundwater bores are present within a 1 km radius of the Project area (Figure 5.31):

- Final static level of 1.93 m, final bore depth 60 m below ground surface (mBGS), located 730 m north-west of the Project alignment junction between the existing and proposed transmission lines on Hindmarsh Drive/Monaro Highway.
- Final static level of 2.1 m, final bore depth 60 mBGS, located 550 m north-west of the Project alignment junction between the existing and proposed transmission lines on Hindmarsh Drive/Monaro Highway.
- Final bore depth 84 mBGS located 560 m west of the Project alignment junction between the existing and proposed transmission lines on Hindmarsh Drive/Monaro Highway.
- Final static level 6.91 m, final bore depth 60 mBGS located 1.03 km west of the Project alignment junction between the existing and proposed transmission lines on Hindmarsh Drive/Monaro Highway.
- Final static level of 15.9 m, final bore depth 90 mBGS, located 500 m west of the HMAS Harman boundary in between the opposing roads of Canberra Avenue.

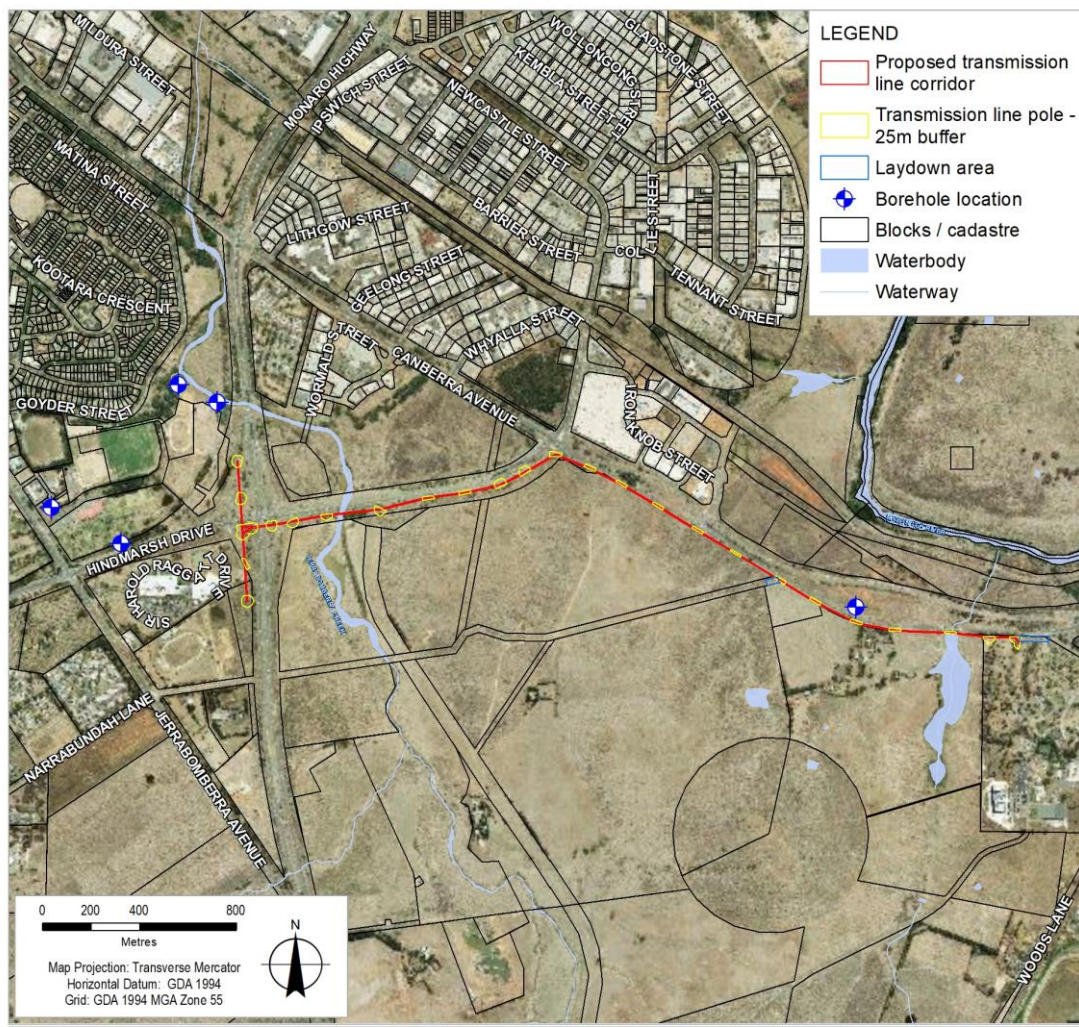


Figure 5.31 Groundwater bores located in the study area

### 5.8.3 Investigations

An assessment of water quality and hydrology was carried out by reviewing publicly available sources including ACTmapi data, Upper Murrumbidgee Catchment Health Indicator Program (Upper Murrumbidgee Waterwatch 2019), aerial photographs, Geotechnical Investigation Report (Appendix I) and the Scoping Document Application Report (Appendix A).

The assessment has also considered the ACT Water Strategy 2014–44 (EP 2014) that has the following three outcomes:

- Outcome 1: Healthy catchments and waterbodies.
- Outcome 2: A sustainable water supply used efficiently.
- Outcome 3: A community that values and enjoys clean, healthy catchments.

The water quality and hydrology assessment was based on a desktop review of existing information as referenced below.

#### Surface water quality

The Molonglo catchment has a large population with urban waterways flowing in concrete channels. This is a key issue for urban catchments where there is little riparian vegetation and habitat to slow down flows and capture and absorb nutrients and sediments.

Of the six priority sub-catchments in the ACT Healthy Waterways project, four are in the Molonglo catchment. These sub-catchments are currently the focus of water quality improvement strategies such as wetlands and water-sensitive urban design.

The Catchment Health Indicator Program (CHIP) for the Upper Murrumbidgee (Upper Murrumbidgee Waterwatch 2019) monitors water quality at two locations along Jerrabomberra Creek. The results of the 2019 monitoring program are shown in Table 5.27.

*Table 5.27 CHIP 2019 water quality monitoring results from Jerrabomberra Creek*

Parameter	Rating	No. Surveys
<b>Water quality</b>	<b>Good</b>	<b>32 (3 dry)</b>
pH	Excellent	
Turbidity	Fair	
Phosphorous	Excellent	
Nitrate	Excellent	
Electrical Conductivity	Degraded	
Dissolved Oxygen	Degraded	
<b>Waterbug</b>	<b>Fair</b>	<b>2</b>
<b>Riparian Condition</b>	<b>Poor</b>	<b>3</b>

The overall CHIP result for 2019 was C+ (Fair) which was unchanged from the 2018 result of C+ (Fair). In 2019, the ACT Government completed three wetland projects in the lower reaches of Jerrabomberra Creek aimed at improving water quality under the ACT Healthy Waterways Program. These wetland projects are located downstream of the proposed transmission line and over time it is anticipated that water quality in Jerrabomberra Creek and the Molonglo River downstream of the wetland projects will improve.

Water quality in the creeks and drainage lines is considered to be affected by adjacent land uses of farming and agriculture. In recent years, the ACT has experienced severe drought, which has reduced the volume and quality of water and affected the health of riverine environments.

## Groundwater

Groundwater inflow was not encountered during drilling of any of the boreholes to the depths investigated. However, fluctuations in groundwater levels may occur due to variation in rainfall, temperature and other factors (Appendix H).

### 5.8.4 Potential impacts

Risks of the Project as they relate to water quality and hydrology were identified in the preliminary risk assessment (Section 4.3) to be:

- Impact on water quality due to potential erosion and sedimentation during and post-construction.

Potential impacts to water quality and hydrology as a result of construction and operation of the Project are discussed below

## Construction

### Hydrology

The change in impervious areas during construction is considered minor within the context of the catchment. As such, impacts are anticipated to be negligible.

### Surface Water

Construction activities present a risk to downstream surface water and groundwater quality if management measures are not implemented and monitored. If inadequately managed, construction activities could impact water quality if they disturb soils or watercourses or result in uncontrolled discharges of contaminating or polluting substances to watercourses.

Potential sources of water quality impacts include:

- Increased sediment loads due to exposed soil transported to downstream watercourses during rain events.
- Increased sediment loads due to discharge of sediment laden water from dewatering of excavations.
- Increased concentrations of nutrients, metals, and other pollutants, transported via sediments to downstream watercourses or via discharge of water to watercourses.
- Chemicals, oils, grease and petroleum hydrocarbon spills from construction machinery directly polluting downstream watercourses.
- Gross pollutants (e.g., litter) from construction activities polluting downstream watercourses.

Impacts to water quality that may result from these activities include:

- Smothering of aquatic life and/or inhibiting critical processes (e.g., photosynthesis) of aquatic and riparian flora.
- Impacts to breeding and spawning conditions of aquatic fauna.
- Changes to water temperature due to reduced light penetration, or from discharge of water that is not at ambient temperature.
- Impacts to downstream ecosystems such as wetlands, and Lake Burley Griffin.
- Increased turbidity and nutrient concentrations leading to a proliferation of nuisance aquatic flora and algae.

The Project would involve works near Jerrabomberra Creek and stormwater drainage lines. Erosion from construction sites can impact downstream watercourses, particularly during rainfall events. The design has located transmission line poles and other construction facilities outside of the Jerrabomberra Creek line with the closest (pole location 10) approximately 60 m away. Similar considerations will be used for pole location 26.

Sediments from bare earth or stockpiles could wash into watercourses, increasing levels of turbidity. Sediment loads in watercourses can increase near hard surfaces (e.g., roads) and compacted areas due to increased surface runoff.

Stockpiles of cleared vegetation could also impact watercourses through leaching of tannins. Runoff high in tannins can increase the biological oxygen demand of the receiving environment, which in turn would decrease the availability of dissolved oxygen. Tannins may also reduce light penetration and alter the pH of receiving waters. These impacts may affect aquatic ecosystems in receiving environments.

During construction, temporary sediment control measures would be used to contain site water. This would localise treatments such as sediment fences and earth bunds/channels to separate on-site and off-site water.

Existing stormwater pits would be protected using drop inlet pits, sandbags, geotextile covers or sediment fences.

Construction work and laydown areas for pole locations 10 and 11 are currently located on elevated road reserve areas on the fringe of the mapped extent of the potential flood zone. River levels will be monitored and if there is a significant rainfall event predicted, plant will be removed from flood zones.

While the Project has the potential to temporarily affect water quality due to pollutants and runoff, it would not be expected to cause significant impacts to the condition of surrounding waterways and is unlikely to result in long-term water quality impacts in, or adjacent to the study area.

With the above measures and those provided below in Section 5.8.5 in place, the impact of the Project on water quality and hydrology during construction is expected to be minor.

During construction, water may be required for dust control and suppression, conditioning of earth-fill and soil compaction and concreting. The required volume of water would depend on climatic conditions during construction.

The construction contractor would investigate the available sources of water and obtain any necessary permits and approvals. No groundwater extraction is proposed during construction.

## **Groundwater**

Surface water runoff may also enter aquifers leading to potential impacts. If runoff enters via infiltration, this will provide effective filtration of polluting particles and sediment. This process means that the risk of contamination of groundwater from pollutants in surface water run-off (e.g., heavy metals) is generally low.

Soluble pollutants such as pH altering solutes, salts, nitrates and hydrocarbons can infiltrate soils and contaminate groundwater aquifers. Under certain conditions, metals may also become soluble and leach into groundwater.

Construction of the Project is not expected to interfere with any groundwater aquifers. Access to groundwater via registered bores would be maintained.

Negligible impacts on groundwater levels are therefore expected, and no major dewatering activities are likely to be required. Construction of the Project is unlikely to impact on groundwater flows.

The safeguards and management measures detailed in Section 5.8.5 would be implemented to minimise the potential for groundwater impacts during construction.

## **Operation**

Changes in surface water flows from any areas that are not adequately stabilised could result in increased erosion and sedimentation impacts. Such impacts could occur in areas that were not previously subject to such flows. The addition of impervious surfaces may result in increased flow volumes and velocities, which also have the potential to increase erosion and sedimentation at discharge locations if not adequately mitigated.

The change in impervious areas resulting from the Project would be minor, comprising the unsealed access tracks and transmission line poles. The Project would not alter flow paths or hydrology to the extent that the 1% AEP flood levels would be affected. With the measures provided below in Section 5.8.5, it is anticipated that the potential operational impacts associated with water quality and hydrology will be negligible.

## 5.8.5 Mitigation measures

Mitigation and management measures to minimise impacts to water quality and hydrology are outlined in Table 5.28.

Table 5.28 Water quality and hydrology mitigation measures

Potential impact	Mitigation	Timing
Water quality	A ESCP would be prepared as part of the CEMP (refer to Section 5.6). There would be no refuelling of vehicles, plant and machinery within 40 m of a watercourse.	Pre-construction and Construction
Hydrology	Construction planning is to consider flood risk and locations of watercourses for all compounds and work sites. The site layout and staging of construction activities would avoid or minimise obstruction of overland flow paths and limit the extent of flow diversion required.	Pre-construction and Construction
Flooding	Flood risk to be considered during construction. Monitoring of extreme rainfall or weather events should be undertaken as necessary, and construction works planned accordingly. No construction should be conducted in times of high-rainfall and flood risk to minimise the impacts of flooding on construction work and health.	Pre-construction and Construction
Groundwater	Maintain access to existing licensed bores and other water infrastructure (such as existing water filling standpipes), to be identified and avoided where possible as part of ongoing design refinement.	Detailed design and construction

## 5.8.6 Residual risk assessment

Based on the mitigation measures identified, an assessment of the residual water quality and hydrology risks associated with the Project have been considered and these are identified in Table 5.29.

Table 5.29 Water quality and hydrology– residual risk assessment

Identified risk (Section 4)	Preliminary risk rating	Residual risk assessment		
		Residual likelihood	Residual consequence	Residual risk rating
Impact on water quality due to potential erosion and sedimentation during and post-construction	Low	Unlikely	Minor	Very low

## 5.9 Socio-economic and health

### 5.9.1 Overview

This section describes the potential socio-economic and health risks, impacts and mitigation measures associated with the Project. Using an EMF impact assessment and desktop review, this section specifically addresses the following socio-economic and health requirements of the Scoping Document:

- Consider the impact of temporary electrical outages upon critical services in proximity to the installation site. Services should include but are not limited to the following:
  - Medica services
  - Emergency services
  - Security services
  - Critical care services.
- Consider any impact upon human health and safety as a result of exposure to electro-magnetic fields (EMF) and frequencies associated with high-voltage power lines.

## 5.9.2 Environmental conditions and values

The Jerrabomberra District of Canberra is situated to the southeast of South Canberra, south of the Molonglo River, east of Woden Valley and northeast of Tuggeranong and west of the New South Wales border.

### Demographics

In the 2016 Census, there were 9,508 people living in Jerrabomberra (State Suburbs). Of these 50.1% were male and 49.9% were female. Aboriginal and/or Torres Strait Islander people made up 1.6% of the population. The median age of people in Jerrabomberra (State Suburbs) was 36 years.

### Key Surrounding Developments

The Southcare Helicopter Base Emergency Services Training Centre is located south of the Project area along the Monaro Highway. Various hotels, aged care residences, the Therapeutic Goods Administration, Mugga Lane recycling centre, Geoscience Australia, Narrabundah College, and local shopping centres are located to the west of the Project area. The Canberra Outlet Centre and the retail and light industry suburb of Fyshwick is located north of the Project area, with Canberra Airport further north. HMAS *Harman* and the NSW suburb of Queanbeyan are located east of the Project area.

## 5.9.3 Investigations

### Services

GHD has undertaken a desktop assessment of the key critical services which may be impacted if there was a power outage as a result of the Project (refer Table 5.30). In undertaking this assessment, the following was noted:

- The existing 11 kV power line which services the area will operate throughout construction to maintain electricity supply to customers. This power line will be decommissioned following successful completion and decommissioning of the Project
- The Project is driven by the need to provide greater electricity capacity to HMAS *Harman*. Moreover, the end point for the 132 kV power line is the ‘end of the line’ with respect to power needs in the area, thus reducing the risk of the Project impacting on critical services.

Table 5.30 Key critical services

Type	Within 5 km Radius
Medical Services	Dr Ross Bills Rutledge Family Medical Centre Cross Roads Clinic Queanbeyan GP Superclinic- General Practice Grant Pacific Health – General Practice
Emergency services	Queanbeyan Police Station Queanbeyan District Hospital - Emergency Department Jerrabomberra Brigade – ACT Rural Fire Services Southcare Helicopter Base Emergency Services
Security services	HMAS <i>Harman</i> Naval Base (connected)
Critical care services, including services for vulnerable people	Queanbeyan High School Queanbeyan West Public School

The Project is not expected to adversely impact the power supply to any key critical services. All connections and decommissioning will be undertaken by suitably qualified contractors under the supervision of Evoenergy.

## EMF

The EMF Assessment (refer to Appendix K) included the following:

- Review of existing information, legislation and guidelines, proposed transmission line and sensitive receivers
- Baseline EMF assessment:
  - Undertake baseline EMF (E- Field & H-Field) survey of existing area.
  - Undertake baseline EMF (E- Field & H-Field) survey at selected locations of concern in the vicinity the transmission power lines (5-6 locations along transmission line and at HMAS Harman Substation location).
- Detailed studies
  - Predictive modelling in in HIFREQ for both E- Field & H-Field via utilisation of baseline monitoring into 132 kV transmission line modelling.

Key issues include:

- Identification of sensitive receiver locations to identify whether there are any that require protection in terms of EMF exposure.
- Identification of public locations to identify whether there are any that require protection in terms of EMF exposure.
- Planned future land uses which may change the potential for EMF exposure. For example, planned but unbuilt residential areas or public spaces.
- Feasibility of proposed measures to avoid or minimise EMF impact such as modification of the alignment or shielding.

According to the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) the ICNIRP ELF and EMF guidelines are consistent with ARPANSA's and their understanding of the scientific basis for the protection of people from exposure to ELF and EMF.

Therefore, the latest Guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz - 100 kHz) (ICNIRP 2010) was used for the assessment of EMF exposure to the public, as shown in Table 5.31.

*Table 5.31 ICNIRP (2010) recommended ELF EMF limits of exposure (ARPANSA endorsed)*

Exposure characteristics	Electric Field Strength (Volt/metre)	Magnetic Flux Density	
		(mG rms)	(µT rms)
Occupational - Whole working day	10,000	10,000	1,000
General Public - Up to 24 h/day	5,000	2,000	200

### 5.9.4 Potential impacts

Risks of the Project as they relate to socio-economic and health were identified in the preliminary risk assessment (Section 4.3) to be:

- Impacts upon critical services and electricity-dependent entities as a result of temporary losses in electricity supply.
- Impacts upon human health and safety as a result of EMF and frequencies associated with high-voltage power lines.

Impacts associated with socio-economic and health have been identified to occur during the operation phase, and subsequently impacts resulting from operation of the Project have been discussed below.

## Operation

GHD has completed an EMF assessment for the proposed 132 kV double circuit from existing feeder A44 to the proposed HMAS *Harman* zone substation as part of a separate project.

Testing was carried out at each site in accordance with pre-defined test plans. Test routes located either parallel or perpendicular to the proposed substation layout were used to record baseline electric and magnetic field levels to ensure highest existing levels were recorded.

The proposed system arrangement of the transmission line Project area was modelled in CDEGS software based on documentation supplied by Evoenergy, aerial photography and site investigation.

Simulations of maximum load condition of the proposed 132 kV double circuit transmission line was completed in CDEGS, and the output was compared with standard safety limits and ambient values.

All simulated magnetic field and electric field values are less than the exposure limits recommended to workers and the public, as provided in the International Commission on Non-Ionizing Radiation Protection (ICNIRP) 2010 guidelines (ICNIRP 2010)

Whilst there are some industrial, commercial and rural residential areas within the wider vicinity of the study area, it is unlikely that there will be any significant socio-economic and health impacts as a result of the Project. Whilst there will be short term impacts associated with the construction and long-term impacts associated with the visual amenity, there are no temporary electrical outages proposed as part of this construction of the Project. Construction works would not be exposed to EMF from the Project because the line would not be energised during construction.

Positive economic impacts include the employment during construction as well as increasing network capacity to stimulate further economic growth. During peak construction activities, the Project would employ around 115 to 125 workers, with an average workforce anticipated to be around 25 to 35 workers. Accordingly, social and economic impacts are not considered a key issue for the Project. Evaluation of simulated outputs of the proposed 132 kV transmission line and ICNIRP limits are included in Table 5.32 for magnetic fields and Table 5.33 for electric fields.

**Table 5.32** Site with proposed 132 kV transmission line – magnetic fields

Exposure Characteristics	Maximum simulated value Strength	ICNIRP limit
Occupational - Worker in and around Transmission Line Easement. Whole working day	378.31 mG = 37.831µT	10000 mG = 1000 µT
Members of the public - Outside the easement. Up to 24 h/day	40 mG = 4.0 µT	2000 mG = 200 µT

**Table 5.33** Site with proposed 132 kV transmission line – electric fields

Exposure Characteristics	Maximum simulated value Strength	ICNIRP limit
Occupational - Worker in and around Transmission Line Easement. Whole working day	4654V/m	10000V/m
Members of the public - Outside the easement. Up to 24 h/day	20V/m	5000V/m

The presence of general public in the alignment for the Project is very low. Therefore, the exposure is negligible. Further, the maximum simulated value inside and outside the easement is less than the ICNIRP exposure limits for the occupational exposure and members of the public.

## 5.9.5 Mitigation measures

As the Project is not expected to adversely impact the power supply to any key critical services, no specific mitigation measures are proposed.

All simulated magnetic field and electric field values are less than the exposure limits recommended to workers and the public, as provided in ICNIRP (2010) guidelines. Hence, the proposed 132 kV line is compliant with ARPANSA requirements and no mitigation measures are proposed to address EMF impacts.

It is noted by Health Protection Services ACT that future developments near the transmission lines must have the appropriate set back distances in accordance with International Commission on Non-Ionizing Radiation Protection (ICNIRP) and ARPANSA exposure standards)

## 5.9.6 Residual risk assessment

An assessment of the residual socio-economic and health risks associated with the Project have been considered and these are identified in Table 5.34.

Table 5.34 Socio-economic and health – residual risk assessment

Identified risk (Section 4)	Preliminary risk rating	Residual risk assessment		
		Residual likelihood	Residual consequence	Residual risk rating
Impacts upon critical service and electricity-dependent entities as a result of temporary losses in electricity supply	Medium	Unlikely	Major	Medium
Impacts upon human health and safety as a result of electro-magnetic fields (EMF) and frequencies associated with high-voltage power lines.	Medium	Remote	Major	Low

## 5.10 General hazards and risk

### 5.10.1 Overview

This section describes the potential general hazards and risks, impacts and mitigation measures associated with the Project. Using a bushfire assessment report (Appendix L) and Evoenergy safety procedures, this section specifically addresses the following hazard and risk requirements of the Scoping Document:

- Provide an analysis of the potential causes and impacts of infrastructure failure and how the associated risks will be managed. Consider any potential risks to construction and service workers as a result of exposure to, and working in proximity to high voltage power lines both during installation and operation.
- Consider the risk of electromagnetic induction hazards and potential impact upon materials and persons in proximity to any infrastructure.
- Consider the risk of Earth potential rise (EPR) and associated Step, Touch and Transfer potential hazards, both from power lines and the proposed Harman zone substation.
- Provide details of mitigation and safety measures and evidence of compliance with Australian Standards AS 7000 and AS/NZS 4853, and other relevant standards.
- Consider the risk of fires starting in the grasslands.
- Provide detailed bushfire protection measures to be implemented in proximity to infrastructure, including asset protection zones and vegetation management/fuel load reduction strategies.

### 5.10.2 Environmental conditions and values

The Hindmarsh Drive and Canberra Avenue road reserves in which the proposed alignment comprise bitumen-sealed four-lane dual carriageway arterial roads.

Along both Hindmarsh Drive and Canberra Avenue, the transmission line alignment is within the southern road reserve. Private lands immediately adjoining the road reserves in which the proposed transmission lines are proposed, are naturally open grassland areas dissected by Jerrabomberra Creek and access roads to private properties with agricultural infrastructure including stock fences, dams and water troughs for livestock grazing.

The cleared, open grassland areas adjoining the proposed transmission line Project area extend to:

- Canberra Avenue (four lane dual carriageway arterial road, Molonglo River corridor and Fyshwick (retail/light industry suburb) to the north.
- West Queanbeyan/Jerrabomberra to the east.
- Lanyon Drive (four lane dual carriageway arterial road) to the south.
- Monaro Highway (four lane dual carriageway arterial road/highway) to the west.

The terrain is generally gently undulating with minor creek lines, floodplains and the Molonglo River to the north. The highest point of the Project area is 612 m above sea level (ASL) and lowest point is 562 m ASL.

The Project includes both new works and connections to existing infrastructure and is sited within an existing and future electrical easement.

### 5.10.3 Investigations

Evoenergy has in place Electrical Safety Rules that specify the safe working requirements and minimum standards for workers working on, near or in the vicinity of Evoenergy's electrical apparatus within the ACT and the surrounding region.

Evoenergy's compliance with these Electrical Safety Rules assists in meeting obligations imposed by the *Work Health and Safety Act 2011*, the *Utilities (Technical Regulation) Act 2014* and the electricity distribution licence issued to Evoenergy by the Independent Competition and Regulatory Commission.

#### **Working near High Voltage power lines**

Contact with energised transmission lines can be fatal. An electric shock can also occur without contact with overhead electric lines; therefore safe distances must be maintained. The risk of flashover increases as the line voltage increases.

#### **Electro-magnetic induction hazards**

Electromagnetic induction is the production of an electromotive force (i.e., voltage) across an electrical conductor in a changing magnetic field.

There are risks associated with induced voltages when working on de-energised or non-commissioned electric lines, within close proximity to existing energised high voltage lines.

#### **Earth potential rise**

EPR means a voltage difference between a system earth and a reference point. EPR may cause hazardous voltages to appear on equipment and apparatus.

#### **Bushfire**

The Bushfire Assessment (refer Appendix L) notes that the ACT Government has mapped the Project area as bushfire prone land, due to the grassland vegetation cover, as shown in Figure 5.32

Due to the natural grassland landscape, the Project area is essentially treeless, and canopy vegetation and shrubs have been assessed to be sparse through much of the alignment.

The alignment commences at the HMAS *Harman* Naval Base and proceeds west along Canberra Avenue. Ground-cover vegetation in this area is in a grassland formation with scattered occurrence of woody shrubs, mostly dominated by weed species. A large patch of planted non-locally native trees and shrubs occurred adjacent to the HMAS *Harman* Naval Base in the road reserve of Canberra Avenue (between pole 28 and 27). This

included plantings of Cootamundra Wattle (*Acacia baileyana*) (Pest Plant), Silver Wattle (*Acacia dealbata*), Southern Blue Gum (*Eucalyptus globulus*) and White Cedar (*Melia azedarach*).

Isolated patches of woody vegetation occur within the Project site. At the intersection of Canberra Avenue and Hindmarsh Drive, a patch of planted Yellow Box (*E. melliodora*) with Red Box (*E. polyanthemos*) and Apple Box (*E. bridgesiana*) is present. A planted woodland patch containing Yellow Box and Red Box occurs at the intersection of the Monaro Highway and Hindmarsh Drive. Vegetation surveys identifying species present across the site are documented in Section 5.11. Woody shrub occurrence is sufficiently sparse that fires occurring in the Project area, and adjoining bushfire prone land would be classified as grass fires.

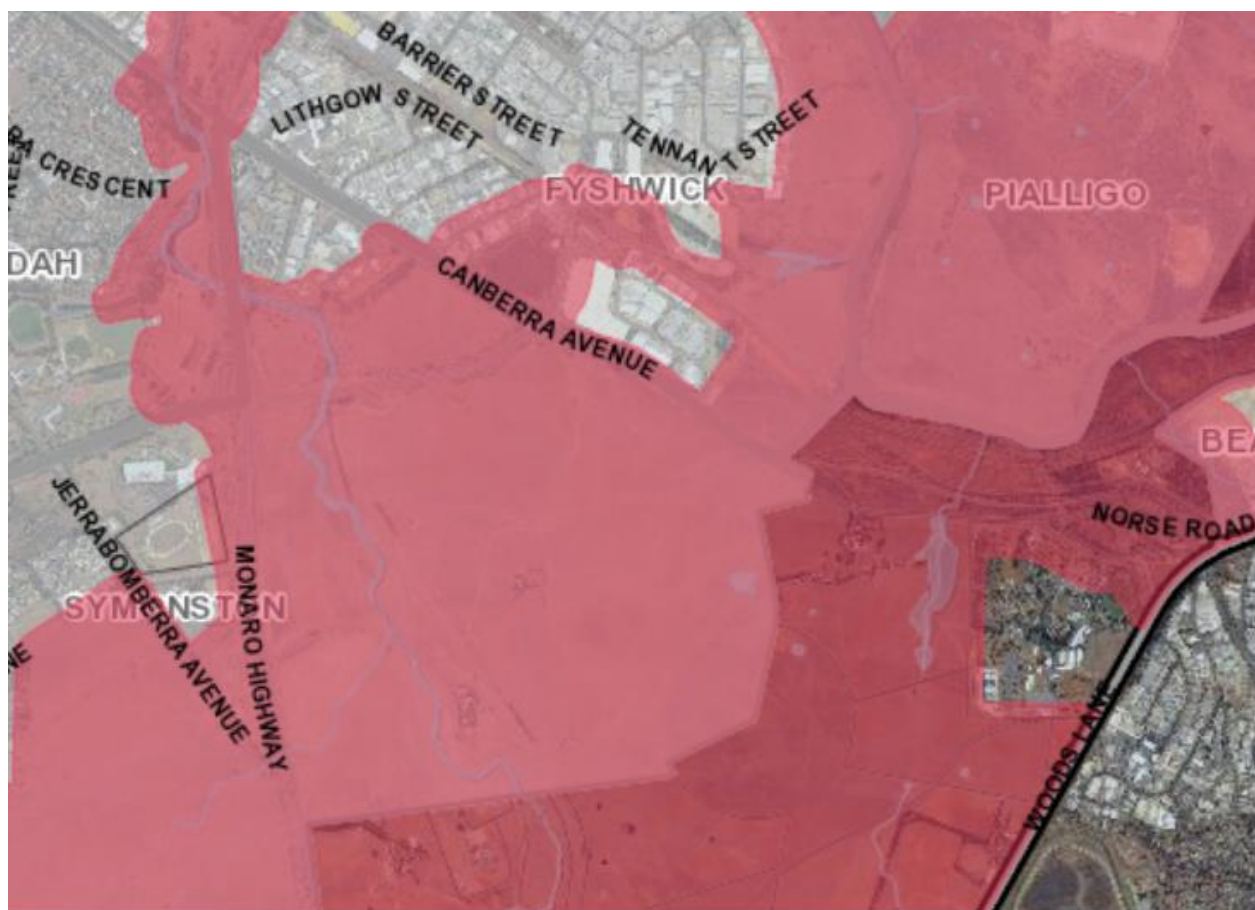


Figure 5.32 ACT Government mapping showing the Project area is bushfire prone

### Bushfire season and weather

As noted in the ACT Strategic Bushfire Management Plan 2019 – 2024 (ESA 2019), typically the bushfire season in the ACT extends from the beginning of October until the end of March, noting that this can be amended at the discretion of the ACT Emergency Services Agency (ESA) Commissioner.

Elevated fire danger conditions (severe, extreme or catastrophic) occur when the Fire Danger Index is greater than 50. At those levels, bushfires are unpredictable, fast moving and difficult to control, if not uncontrollable. Days of elevated fire danger conditions are not common in the ACT. Historically they average less than three days a year, usually in January.

This average is increasing in line with the ACT's changing climate. Research by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Bureau of Meteorology indicates that southeast Australia will see an increase in the number of high fire weather days and a longer bushfire season.

### Local fire history

Local fire history does not record any fires in the Project area.

Bushfires affecting the ACT during severe fire seasons in 2003 and 2020 did not reach or start within the Project area or the adjoining properties around Jerrabomberra Creek. The nearest fire to the Project area was the recent

Beard Fire which occurred in January 2020, burning approximately 424 ha of land between the Canberra Airport/Pialligo area on the northern perimeter of Queanbeyan. The fire burnt across grassland and bushland areas and crossed the Molonglo River, impacting an area of bushland area near Beard (near HMAS *Harman*) but the fire was contained on the northern side of Canberra Avenue.

## 5.10.4 Potential impacts

Risks of the Project as they relate to general hazards and risks were identified in the preliminary risk assessment (Section 4.3) to be:

- Impacts upon construction workers and service personnel as a result of exposure to high-voltage power lines.
- Risks associated with electromagnetic induction upon human health and safety.
- Risks associated with EPS upon human health and safety.
- Potential risk of bushfire during construction.
- Potential for transmission lines to cause bushfires.

### Working near high voltage power lines

Most of the construction of the Project will be on a de-energised line so safety risks associated with working near high voltage power lines are minimised.

Safety risks are increased when working near the existing Monaro Highway 132 kV transmission line due to the potential for electricity flashing over a gap which means a worker or piece of machinery can be some distance away and still be at risk. In addition, aerial lines swing in wind and sag due to heat. This movement must be allowed for in any clearance distance between the conductors and nearby infrastructure.

Safety risks will also be increased during commissioning of the transmission line extension.

Evoenergy requires all workers to observe an appropriate safe approach distance when working, or operating vehicles or mobile plant, near electrical apparatus. Work in the vicinity of electrical apparatus must be carried out in a safe manner and control measures taken must be consistent with the risk and work performed. Safe distances information is provided in Section 5.10.5.

### Electro-magnetic induction hazards

Due to the significant electromagnetic fields present around energised high voltage transmission lines, voltages may be induced onto adjacent de-energised or non-commissioned electric lines. These voltages may be large enough to deliver potentially lethal electric shocks.

Overhead conductors (other than insulated LV service lines) or long lengths of metal busbars must be earthed while they are being erected, dismantled, or replaced if there is any possibility of contact with, or induction from, adjacent energised conductors of any description. They must be earthed by an approved device before work is commenced and must remain earthed until the work is completed. A conductor being erected must be earthed before it is lifted from the ground.

### Earth potential rise

Equipment that may be subjected to EPR must be insulated, isolated, bonded, or other approved measures taken to reduce the risk to a satisfactory level.

EPR impacts were assessed by modelling the overhead earth wire network and earthing systems for poles connected via OHEW to the proposed 132 kV Transmission Line (refer to Appendix M). This identified the actual proportion of fault current entering the local earth system at each pole of the 132 kV Transmission Line. Additionally, services based on DBYD data are included in the models to obtain the voltages on metallic services. The results of the assessment are summarised in Figure 5.38.

## Bushfire

### Construction

Arising from the identified construction activities, there are four potential fire ignition sources identified for risk assessment.

1. *On-site Hot works* (if any), such as metal grinding, cutting and welding, at the Project site – noting that all hot works are subject to a hot works permit process, and all hot works are prohibited on days of declared Total Fire Ban which includes days when the Fire Danger Index is 50 or higher (Severe, Extreme or Catastrophic).
2. *Catalytic converter-fitted vehicle exhaust system contact with tall flammable grass* – noting that all vehicular access for works is to be via existing roads and power line tracks or temporary tracks constructed for the Project.
3. *Sparks from metal on metal or rock friction* during ground engaging machinery operation (earthworks works/hole boring works) – noting that all earthworks and hole boring works are prohibited on days of declared Total Fire Ban which includes days when the Fire Danger Index is 50 or higher (Severe, Extreme or Catastrophic).
4. *Discarded cigarette butts from smokers* – noting that smoking is prohibited on work sites except in designated smoking areas.

A risk assessment of the above potential fire ignition sources showed that these risks are Low (refer to Appendix L). Bushfire risk reduction measures are focussed on fire prevention. Fire suppression at the ignition site at the time of ignition is a contingency measure.

Table 5.35 Simulated voltages and compliance check

No	Hazard and Contact Scenario	Voltage limit (V)	Simulated Voltage (V)	Outcome risk level Negligible Risk ALARA Region Intolerable Risk	Mitigation Required
1	Touch voltages: The 132 kV transmission line poles, Along Monaro Hwy, Hindmarsh Drive, and Canberra Ave.	3143	1211	Negligible Risk	Recommended to achieve less 5Ω resistance for each pole.
2	Touch voltages: gates, and fences, street furniture including traffic barriers Along Monaro Hwy, Hindmarsh Dr, and Canberra Ave.	3143	2800 Based on EPR	Negligible Risk	Recommended to achieve less 5Ω resistance for each pole.
3	Transfer EPR hazards, streetlight posts, traffic lights. Along Monaro Hwy, Hindmarsh Drive, and Canberra Ave.	3143	1500 Based on EPR	Negligible Risk	Recommended to achieve less 5Ω resistance for each pole.
4	Transfer Touch Voltages to Commercial Properties.	595	1100 Based on EPR	ALARA Region P(f)=1.3x10-5	Recommended to achieve less 5Ω resistance for each pole.
5	Water pipeline operator touch voltage to valves.	427	83	Negligible Risk	Not required
6	Water pipeline operator touch voltage to CP test points.	717	152	Negligible Risk	Not required
7	Water pipeline maintenance worker touch voltages to pipeline leak repair on water pipeline	380	152	Negligible Risk	Not required
8	Gas pipeline operator touch voltage to valves.	678	46	Negligible Risk	Not required

No	Hazard and Contact Scenario	Voltage limit (V)	Simulated Voltage (V)	Outcome risk level Negligible Risk ALARA Region Intolerable Risk	Mitigation Required
9	Gas pipeline maintenance worker touch voltages to pipe Leak repair on gas pipeline	No Limit	Not Applicable	Negligible Risk	Not required
10	General Public Metallic lid—Step voltage. Pipeline, earthed by surge, diversion devices.	1385	73	Negligible Risk	Not required
11	General Public valve or CP test point—Touch voltage	No Limit	Not Applicable	Negligible Risk	Not required
12	Damage the Pipe coating and metal	10000	950	Negligible Risk	Not required
13	Damage to equipment	1000	950	Risk	Further assessment and mitigation are required at detail design stage
14	132 kV Transmission line EPR transfer to telecommunication assets.	1500	1211	Low Risk	Further investigation is required at detail design.

Notes to the Table: “Based on EPR” means, simulated touch voltage calculated conservatively with respect to remote earth.

## Operation

The following design and operating context of the Project is relevant to bushfire risk assessment:

- The proposed transmission line is designed in accordance with AS 7000:2016 *Overhead line design* noting that public safety is a key objective in overhead line design
- The proposed transmission line will form part of Evoenergy’s electricity supply network – effectively a small part of a much larger network - and will be subject to the safety regulation requirements of the Utilities Act 200, and the *Utilities (Technical Regulation) Act 2014*
- The Project will be subject to the same safety management, network operation and maintenance system that other 132 kV transmission lines in Evoenergy’s network are subject to.

## Potential for grass fire ignition by transmission lines

In Australia, while historically the ignition of a number of high consequence bushfires has been attributed to electricity distribution lines, it is very rare for fires to be started by transmission lines (voltages of 132 kV and higher). For example, of the 2009 ‘Black Saturday’ fires in Victoria, which were examined in detail by the Victorian Bushfires Royal Commission, the cause of six fires was ultimately attributed to electricity networks, noting that none of these were associated with transmission lines. A number of high consequence fires attributed to electricity assets in NSW, VIC, and most recently SA have all been attributed to distribution lines that are, typically, 33kV or lower. Nevertheless, bushfire ignition occurrence for transmission networks is not zero, but it is substantially lower than for distribution networks.

There are a number of factors influencing the lower fire ignition risk for transmission lines. Relative to distribution lines, the design of overhead transmission lines requires physically taller, more robust poles/tower structures, wider conductor separation, and heavier duty electrical hardware (such as insulators and links) to suspend the heavier higher voltage conductors. These typically stand higher above vegetation and are placed in maintained cleared easements which are significantly wider than those applied to high voltage distribution lines. Vegetation overhangs are not allowable. High reliability maintenance cycles are aimed at maximising reliability through minimising faults on the transmission network. Accordingly, fire occurrence from network faults or vegetation coming into contact with live transmission lines is rare.