

Review of Environmental Factors Alexandria to Kingsford Cable Project

REF - 337 NIG - 12756

Version 1.0

4 Apr 2023



Document control

Document status	FINAL
Document suite	Environment
Release authority	James Hart
Release date	4 Apr 2023
Security classification	UNCLASSIFIED
Proposal name	Alexandria to Kingsford Cable Project
Proposed activity	Construct, operate and maintain an underground 132kV cable and spare conduits between the Beaconsfield Bulk supply point and Kingsford Substation. Decommission existing fluid filled cables between Beaconsfield Bulk supply point and Kingsford Substation.
Document code	REF - 337
Network investment governance	NIG - 12756
Proponent name	Ausgrid Operator Partnership, trading as Ausgrid
Proponent address	24-28 Campbell, Sydney NSW 2000
REF Prepared by	Daniel Halton
Title	Environmental Officer
Qualifications	Bachelor EnvSc (Hons Adv)
HPRM reference	2021/53790

Disclaimer

This document shall remain the property of Ausgrid. The document may only be used for the purposes for which it was commissioned. Unauthorised use of this document in any form whatsoever is prohibited.

The review of environmental factors is based on information provided to the author, including the scope of works as outlined in the proposal description. The review of environmental factors is provided strictly on the basis that information provided for its preparation can be relied on and is accurate, complete and adequate.

Contact: T: (02) 9394 6659
F: (02) 9394 6662
E: jhart@ausgrid.com.au

Ausgrid ABN 78 508 211 731
24-28 Campbell Street
Sydney NSW 2000

Document history

REF revision history		
Version	Date	Nature of revision
0.0		New issue
0.5	23/02/2022	Issued for project team review
0.6	11/07/2022	Project team reviewed
0.7	16/08/2022	Integration of specialist reports and feedback
0.8	17/08/2022	REF workshop with project team pending draft public exhibition
0.9	30/08/2022	REF review with Manger- Environmental Services pending draft public exhibition
0.10	27/03/2023	Legislative changes. Update post public exhibition. Inclusion of site compounds and Code of Practice reporting. Contractor workshop amendments.
1.0	4/04/2023	Final approved version
2.0		Addendum report included

Contents

Glossary	8
Executive summary	14
The proposal	14
Background and need.....	14
Proposal alternatives	14
Statutory planning and legislation	15
Environmental impact assessment	15
Proposal justification and conclusions	15
1 Introduction	17
1.1 Purpose of the environmental impact assessment.....	17
1.2 The proposal	17
1.3 Background and need	19
1.4 Related projects	19
1.5 Study area	20
1.6 Description of the proposal	21
1.7 Physical structures	22
1.8 Construction activities	22
1.9 Operation and maintenance requirements.....	32
2 Consultation	33
2.1 Overview	33
2.2 Statutory notification requirements.....	33
2.3 Community consultation	36
3 Investigation of alternatives for the proposal.....	41
3.1 Assessing alternative options.....	41
3.2 Do nothing	41
3.3 Demand management.....	41
3.4 Network options	41
3.5 Route options	42
3.6 Preferred route option	43
4 Environmental legislation	44
4.1 Environmental Planning and Assessment Act 1979.....	44
4.2 State Environmental Planning Policy (Transport and Infrastructure) 2021	44
4.3 State Environmental Planning Policy (Resilience and Hazards) 2021	45
4.4 Vegetation Clearing SEPPs	45
4.5 State Environmental Planning Policy (State and Regional Development) 2011	45
4.6 Environment Protection and Biodiversity Conservation Act 1999	45
4.7 Electricity Supply Act 1995.....	46
4.8 Protection of the Environment Operations Act 1997	46
4.9 Biodiversity Conservation Act 2016	46
4.10 Summary of legislative requirements	47
5 Environmental assessment	51
5.1 Land use	51
5.2 Climate change	53

5.3	Electric and magnetic fields	56
5.4	Noise and vibration	62
5.5	Air quality	66
5.6	Hydrology	68
5.7	Geology and soil	72
5.8	Contamination	73
5.9	Waste	78
5.10	Flora and fauna	81
5.11	Bush fire	86
5.12	Aboriginal heritage	87
5.13	Non-Aboriginal heritage	89
5.14	Visual and aesthetics	93
5.15	Traffic and access	96
5.16	Social and economic	98
5.17	Cumulative impact.....	99
6	Consideration of environmental factors.....	102
6.1	Clause 171 factors	102
6.2	Matters of national environmental significance	103
6.3	Ecologically sustainable development	104
7	Summary of impacts	105
8	Environmental management plan	106
8.1	Construction environmental management plan.....	106
8.2	Operation environmental management plan	108
8.3	Environmental mitigation measures	108
9	Certification	109
Appendix A	Drawings and plans	111
Appendix B	Consultation Documentation	112
Appendix C	Magnetic Fields Report	113
Appendix D	Geotechnical Investigation and Waste Classification	114
Appendix E	Arboricultural Investigation	115
References	116
Tables		
Table 1-1:	Related Project List	19
Table 2-1:	Consultation responses	34
Table 2-2:	Community consultation issues summary	37
Table 4-1:	Summary of legislative requirements	49
Table 5-1 –	Land uses adjacent to the proposed cable route.....	52
Table 5-2:	Land use mitigation measures.....	53
Table 5-3:	Climate change mitigation measures	55
Table 5-4:	Magnetic field measurements and ranges associated with various appliances and cables	57

Table 5-5: Magnetic field Reference Levels at 50Hz for IEEE and ICNIRP	58
Table 5-6: Predicted magnetic field contribution post 2036 of the new cables.....	60
Table 5-7: EMF mitigation measures	61
Table 5-8: Noise impacted receivers - standard operating hours	63
Table 5-9: Noise impacted receivers - out of hours	63
Table 5-10: Noise and vibration mitigation measures.....	64
Table 5-11: Air quality mitigation measures.....	68
Table 5-12: Hydrology quality mitigation measures.....	71
Table 5-13: Geology and soil mitigation measures.....	73
Table 5-14: Sites mapped as potentially contaminated in proximity to the proposal ...	74
Table 5-15: Contamination mitigation measures	76
Table 5-16: Waste mitigation measures	79
Table 5-17: Flora and fauna mitigation measures	84
Table 5-18: Bush fire mitigation measures	86
Table 5-19: Aboriginal heritage mitigation measures	88
Table 5-20: Non-Aboriginal Heritage items.....	89
Table 5-21: Non-Aboriginal heritage mitigation measures.....	92
Table 5-22: Visual mitigation measures.....	95
Table 5-23: Traffic and access mitigation measures	97
Table 5-24: Social and economic mitigation measures	98
Table 5-25: Summary of cumulative impacts.....	99
Table 5-26: Cumulative impacts mitigation measures	101
Table 6-1: Consideration of clause 171 factors	102
Table 6-2: Consideration of Matters of NES	103
Table 8-1: Implementation mitigation measures.....	108

Figures

Figure 1-1: The preferred cable route between Beaconsfield Bulk supply point and Kingsford Substation.....	18
Figure 1-2 Horizontal Directional Drilling methodology.....	25
Figure 1-3 Horizontal Directional Drilling locations adjacent to Southern Cross Drive. Option 1 in Red and Option 2 in Yellow.....	26
Figure 1-4 Typical trenching methodology.....	28
Figure 1-5- Site compounds at Alexandria (left-green) and Homebush (right- blue/red) to facilitate construction.	30

Figure 5-1: Existing visual environment at select locations along the preferred route
(From top, left to Right; Gardeners Road, Alexandria, Birmingham Street, Harcourt
Parade (West), Harcourt Parade (East), Borrodale Road) 94

Glossary

Term	Meaning
A	amp: the unit of measure for current (or load) which is the amount of electricity flowing through the wires.
Aboriginal heritage	Any: <ul style="list-style-type: none"> • deposit, object, place or material evidence (including remains of Aboriginal people) relating to Aboriginal habitation; or • places having particular or special significance to Aboriginal people in accordance with Aboriginal culture and traditions, and which has been declared by the Minister to be protected under the NPW Act, EPBC Act, or Aboriginal and Torres Strait Islander Heritage Protection Act 1984.
ACM	Asbestos containing material
AHD	Australian Height Datum
Blue Book	<i>Managing Urban Stormwater - Soils and Construction</i> (Landcom, 2004)
BC Act	<i>Biodiversity Conservation Act 2016</i>
BSP	<i>Bulk supply point</i>
Power cable (or cable)	<i>Constitutes a electrical circuit between two points, and can include cables comprising both multiple conductors or single conductor.</i>
CEMP	construction environmental management plan
Classified road	The <i>Roads Act 1993</i> provides for roads to be classified as Freeways, Controlled Access Roads, Tollways, State Highways, Main Roads, Secondary Roads, Tourist Roads, Transitways and State Works.
Climate Change	Describes both changed average climatic conditions, such as increased temperature and lower average rainfall, as well as changes in the patterns of extreme events, including increased frequency and intensity of storms.
CPESC	Certified Professional in Erosion and Sediment Control
cm	Centimetre
CNVIA	Construction Noise and Vibration Impact Assessment
CNVMP	Construction Noise and Vibration Management Plan
CO₂	carbon dioxide
Conduits	Hollow plastic pipes installed underground to facilitate the installation, operation and maintenance of electricity cables.
DA	development application
dB(A)	decibels (A) weighted
DPE	Department of Planning and Environment (formerly the Office of Environment and Heritage or OEH, and Department of Planning, Industry and Environment)
Determining authority	Minister or public authority and, in relation to any activity, means the Minister or public authority by or on whose behalf the activity is or is to be carried out or any Minister or public authority whose approval is required in order to enable the activity to be carried out. <i>Note: In practice, this will mean either the Minister, the local Council, Ausgrid (when self-determining works under Part 5), or other public authority from whom Ausgrid requires concurrence.</i>
DM	demand management

Term	Meaning
DTS	distributed temperature sensing
Easement	A collection of rights allowing an entity to undertake certain activities. Easements acquired by Ausgrid are created by a lease, a transfer granting easement, an instrument registered with a deposited plan, or by acquisition.
EEC	Endangered Ecological Community: an assemblage of plant species that is recognisably different from other communities due to differences in species present and structure. The species form complex interactions with not only other species, but also elements of the landscape including underlying geology, aspect and altitude, and external influences such as fire frequency. Many ecological communities have limited natural distributions and are vulnerable to change, while others historically occurred over a wider area and are threatened by changes due to broad scale clearing, fragmentation, invasion by weeds, fire frequency or hydrological regime.
EIS	environmental impact statement
ELF	extremely low frequency
Embodied energy	Embodied energy corresponds to the energy consumed by all of the processes associated with the production of building materials and components.
Embodied carbon	Embodied carbon includes the release of greenhouse gases during chemical processes and through other human-induced 'natural' releases into the atmosphere.
Embodied water	Embodied water is the volume of water required to produce a commodity or service.
Emergency works	Works for the purpose of maintaining or restoring infrastructure facilities or equipment in order to ensure public safety or to protect buildings or the environment due to: a sudden natural event, including a storm, flood, tree fall, bush fire, land slip or coastal inundation, or accident, equipment failure or structural collapse, or damage caused by vandalism or arson, provided the works involve no greater disturbance to soil or vegetation than necessary and are carried out in accordance with all applicable requirements of the Blue Book.
EMF	Electric and Magnetic Fields: are part of the natural environment and are also produced wherever electricity or electrical equipment is in use. Power cables, electrical wiring, household appliances and electrical equipment all produce EMF. The electric field is proportional to the voltage and remains constant. The magnetic field is proportional to the load and varies continually depending on the time of day, week and year. As electric fields are naturally shielded, the electricity network generally contributes very little to the electrical fields measured inside a home or office building. For this reason most discussion on EMF usually focuses on magnetic fields.
ENA	Energy Networks Australia

Term	Meaning
Environmental impact	Any change in the environment whether adverse or beneficial, wholly or partially resulting from the development and use of land. The environment includes: <ul style="list-style-type: none"> • ecosystems and their constituent parts, including people and communities; and • natural and physical resources; and • the qualities and characteristics of locations, places and areas; and • heritage values of places; and the social, economic and cultural aspects of these things.
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW). Provides the legislative framework for land use planning and development assessment in NSW.
EP&A Regulations	<i>Environmental Planning and Assessment Regulation 2021</i>
EPA	Environment Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
EPI	Environmental Planning Instruments: made under Part 3 of the EP&A Act.
ES Act	<i>Electricity Supply Act 1995</i> (NSW)
ESCP	erosion and sediment control plan
ESD	Ecologically sustainable development: is development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased.
Flood liable land	Land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled <i>Floodplain Development Manual: the management of flood liable land</i> (NSW Government, 2005). Such land is commonly identified in Local Environmental Plans or Development Control Plans.
GHG	greenhouse gas
HDD	Horizontal Directional Drilling
Hz	Hertz
HCA	Heritage Conservation Area
HDPE	high-density polyethylene
IARC	International Agency for Research on Cancer
ICES	International Committee on Electromagnetic Safety
ICNG	<i>Interim Construction Noise Guideline (DECC, 2009)</i>
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IECA	International Erosion Control Association
Transport and Infrastructure SEPP	<i>State Environmental Planning Policy (Transport and Infrastructure) 2021</i>
ISO	International Organization for Standardization
kg	Kilogram

Term	Meaning
kV	Kilovolts
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan: a type of EPI made under Part 3 of the EP&A Act.
LGA	Local Government Area
Likelihood	A qualitative description of probability or frequency.
Local heritage item	<p>A place, building, work, relic, tree, moveable object, precinct, archaeological site or Aboriginal object that is:</p> <ul style="list-style-type: none"> • identified as a heritage item (or by a similar description) in a local or regional environmental plan; or • an item of local heritage significance, as defined by the <i>Heritage Act 1977</i>, that is the subject of an interim heritage order in force under that Act; • or is listed as an item of local heritage significance in the State Heritage Inventory under that Act. <p>Local heritage significance means significance to an area in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item.</p>
m	Metre
m²	metres squared
m³	metres cubed
mm	Millimetre
mG	Milligauss
MVA	mega volt amps
NES	national environmental significance
NIEHS	National Institute of Environmental Health Sciences
Non-Aboriginal heritage	Any deposit, object or material evidence which relates to the settlement of NSW, not being Aboriginal settlement, with local or state significance under the <i>Heritage Act 1977</i> .
NPI	<i>Noise Policy for Industry (EPA, 2017)</i>
NPW Act	<i>National Parks and Wildlife Act 1974</i>
NPWS	National Parks and Wildlife Service (DPE)
NRPB	National Radiation Protection Board
OCPs	Organochlorine pesticides
OEMP	operation environmental management plan
PCB	Polychlorinated biphenyls
POEO Act	<i>Protection of the Environment Operations Act 1997 (NSW)</i>
PVC	polyvinyl chloride

Term	Meaning
Principal contractor	Work Cover defines a principal contractor as a person conducting a business or undertaking (PCBU – the new term that includes employers) that commissions a construction project. A construction project can only have one principal contractor at any specific time. A principal contractor with management or control of a workplace must: manage risks associated with the construction work secure the workplace so unauthorised persons cannot enter comply with all safe work method statement (SWMS) requirements for high risk construction work.
Proponent	The person proposing to carry out the activity, and includes any person taken to be the proponent of the activity by virtue of section 110B of the EP&A Act.
REF	review of environmental factors
Road	Includes the airspace above the surface of the road, the soil beneath the surface of the road and any bridge, tunnel, causeway, road-ferry, ford or other work or structure forming part of the road. The road reserve is inclusive of the carriageway and the footpath.
Roadwork	Includes any kind of work, building or structure (such as roadway, footway, bridge, tunnel, road-ferry, rest area, transit way station or service centre or rail infrastructure) that is constructed, installed or relocated in the vicinity of a road for the purpose of facilitating the use of the road as a road, the regulation of traffic on the road or the carriage of utility services across the road, but does not include a traffic control facility. Carry out road work includes any activity in connection with the construction, erection, installation, maintenance, repair, removal or replacement of a road work.
ROL	Road Occupancy License
SEPP	State Environmental Planning Policy: a type of EIP made under Part 3 of the EP&A Act.
SHR	State Heritage Register
SHI	A place, building, work, relic, tree, moveable object, precinct, archaeological site or Aboriginal object that is: an item of state heritage significance, as defined by the Heritage Act 1977, that is the subject of an interim heritage order in force under that Act; or is listed as an item of state heritage significance in the State Heritage Inventory under that Act. State heritage significance means significance to the State in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item.
TfNSW	Transport for NSW (which now includes Roads and Maritime Services)
TGS	Traffic guidance scheme (formerly a traffic control plan)
TMC	Transport management centre
TMP	traffic management plan
TPZ	Tree Protection Zone: the radius of the TPZ equals 12 times the diameter of the trunk at 1.4 m above the ground. For palms and ferns, the TPZ radius should not be less than 1m outside the drip zone.
TSB	thermally stable backfill (also referred to as fluidised thermal backfill)
TWA	time weighted average
Typical Daily Maximum Load	The electricity loading which is not exceeded more than 15% of the time for that year. Also referred to as the 85th Percentile.

Term	Meaning
Unserved energy	is a measure of the amount of customer demand that cannot be supplied within a region due to a shortage of generation, demand-side participation or interconnector capacity.
V	volt: the unit of measure for voltage which is the pressure that electricity is pushed through the wire.
Vibration	Mechanical oscillations about an equilibrium point. Vibration can be caused by many different external sources, including industrial, construction and transportation activities. The vibration may be continuous (with magnitudes varying or remaining constant with time), impulsive (such as in shocks) or intermittent (with the magnitude of each event being either constant or varying with time).
WH&S	Workplace Health & Safety
WHO	World Health Organisation

Executive summary

The proposal

This review of environmental factors assesses the proposal to;

- Construct, operate and maintain an underground 132kV cable between Beaconsfield Bulk supply point and Kingsford Substation.
- Decommission existing fluid filled cables between Beaconsfield Bulk supply point and Kingsford Substation.

New cross-linked polyethylene cables will replace existing cables fluid-filled cables.

The works would involve the installation of conduits and new cables utilising traditional trenching methods and horizontal directional drilling techniques. Associated infrastructure such as joint bays, communication pits, temperature sensing and pulling pits also form part of this assessment.

Construction of the proposal would commence in mid 2023 with commissioning expected in 2025, subject to assessment and approval. Cable decommissioning works would follow the installation and commissioning of the new cables.

There are several other projects related to the Alexandria to Kingsford Cable Project. These are outlined in Section 1.4 of this document. It should be noted that these projects are subject to separate environmental impact assessments and approvals.

Background and need

Commissioned in 1977, Feeder 264 runs from Transgrid's Beaconsfield Bulk supply point to Ausgrid's Kingsford Substation. This feeder forms an important connection from New South Wales transmission network to the Eastern Suburbs distribution network area.

The existing 132kV fluid-filled cables which form Feeder 264 utilise old and obsolete technology, requiring specialist skills to repair and maintain, outage times can be lengthy, and spare cable and cable accessories are not readily available. Consequently, a progressive reduction in supply reliability is expected to occur over time. Having been given a moderate risk rating, the cable has been prone to failure in the past. Recent analysis of the feeders' condition identified an increased risk of prolonged outages. The cost benefit is now justified to pursue its immediate replacement. Forming part of Sydney's Inner Metropolitan subtransmission network, its replacement will ensure a safe and reliable supply of electricity continues to the region.

To ensure supply reliability continues to the Eastern Suburbs network area, the most cost-effective solution is to replace Feeder 264.

Proposal alternatives

The design and location of the proposal resulted from an options investigation. Three credible options were considered:

- the like-for-like in situ replacement of Feeder 264 between Beaconsfield Bulk supply point and Kingsford Substation,
- the decommissioning of Feeder 264, and
- replacement of Feeder 264.

The preferred option is the replacement of Feeder 264 between Transgrid's Beaconsfield Bulk supply point to Ausgrid's Kingsford Substation, with inclusion of a spare conduit between Beaconsfield Bulk supply point and Gardeners Road at O'Riordan Street, Alexandria.

Following the selection of the preferred option, this REF has assessed the proposal to ascertain whether there would be a significant impact upon the environment to meet the requirements of section 5.5 of the *Environmental Planning and Assessment Act 1979* and clause 171 of the *Environmental Planning and Assessment Regulation 2021*. Proposal alternatives are described in section 3.

Statutory planning and legislation

This REF has been prepared in accordance with Part 5 of the *Environmental Planning and Assessment Act 1979* and clause 171 of the *Environmental Planning and Assessment Regulation 2021*. Additional key legislation includes the *State Environmental Planning Policy (Transport and Infrastructure) 2021*, *Electricity Supply Act 1995* and *Protection of the Environment Operations Act 1997*.

Other licences required for the proposal include obtaining relevant Road Occupancy Licenses from the Transport Management Centre.

Further information on the legislation applicable to this proposal is in section 4 and the consultation undertaken is in section 2.

Environmental impact assessment

This REF investigates the potential environmental impacts associated with the construction, operation and maintenance of a new 132kV underground cable and associated conduits between Beaconsfield Bulk supply point and Kingsford Substation.

Key issues associated with the proposal were identified as crossing Southern Cross Drive at Mascot, community expectations around Electric and Magnetic Fields (EMF) during operation and effectively managing construction work with due consideration to work hours, roadside vegetation, non-aboriginal heritage and traffic impacts during construction.

Several specialist assessments were undertaken to assist in assessing the environmental impacts (section 5). Mitigation measures have been identified to address the impacts and minimise any residual issues.

Proposal justification and conclusions

The proposal is driven by condition and reliability issues with the existing 132kV cables that run between Beaconsfield Bulk supply point and Kingsford Substation. Supply reliability would be reduced if the proposal were not constructed. This work would help maintain a reliable supply of electricity, hence meeting Ausgrid's obligations in terms of safety, reliability, quality, and supply.

Based on this REF, it is concluded that the proposal:

1. is not likely to significantly affect the environment (including critical habitat) or threatened species, populations or ecological communities, or their habitats
2. is not on land that is, or is a part of, critical habitat or a wilderness area
3. is not likely to have a significant impact on matters of national environmental significance, or a significant impact on the environment (for actions on Commonwealth land) or a significant impact on the environment on Commonwealth land (for actions outside Commonwealth land).

In making these conclusions, consideration of environmental significance was made with regard to clause 171 of the *Environmental Planning and Assessment Regulation 2021* and *the Code of Practice for Authorised Network Operators*¹.

1 Introduction

1.1 Purpose of the environmental impact assessment

The purpose of this review of environmental factors (REF) is to assess the potential environmental impacts of the proposal and determine appropriate mitigation measures to reduce those impacts. The findings of this REF would be considered when assessing:

- whether the proposal is likely to have a significant impact on the environment and therefore the necessity for further environmental assessment as described under section 5.7 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act)
- the significance of any impact on threatened species as defined by the NSW *Biodiversity Conservation Act 2016* (BC Act), in section 5A of the EP&A Act and the requirement for a species impact statement (SIS)
- the potential for the proposal to significantly impact a matter of national environmental significance or Commonwealth land and the need to make a referral to the Commonwealth Minister for the Environment in accordance with the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Ausgrid's determination of the proposal under Part 5 of the EP&A Act would be prepared separately to this REF.

1.2 The proposal

This REF assesses the proposal to construct, operate and maintain a 132kV underground cable between Beaconsfield Bulk supply point (BSP) and Kingsford Substation. A set of spare conduits would also be installed in parallel for a portion of the route to allow for future network enhancements in the Mascot area.

New XLPE cables will replace the existing Self-Contained Fluid Filled (SCFF) cables between Beaconsfield BSP and Kingsford Substation.

Other infrastructure that would be constructed as part of the project includes communication and distributed temperature sensing and link box pits, joint bays and temporary pulling bays.

Decommissioning the existing SCFF cables between Beaconsfield BSP and Kingsford Substation will require accessing only discrete locations along the cable route and is addressed further in Section 1.8.5.

1.2.1 Proposal location

For this assessment, the study area is defined as the area of both existing and preferred cable route. The proposed route is shown in *Figure 1-1*.

Both the existing and preferred route for the underground cable, which are both approximately 5.3km in length. The preferred cable route would primarily require trenching in roads. Small sections would be installed using horizontal directional drilling techniques adjacent to Southern Cross Drive, refer to Section 1.8.3 for further detail.

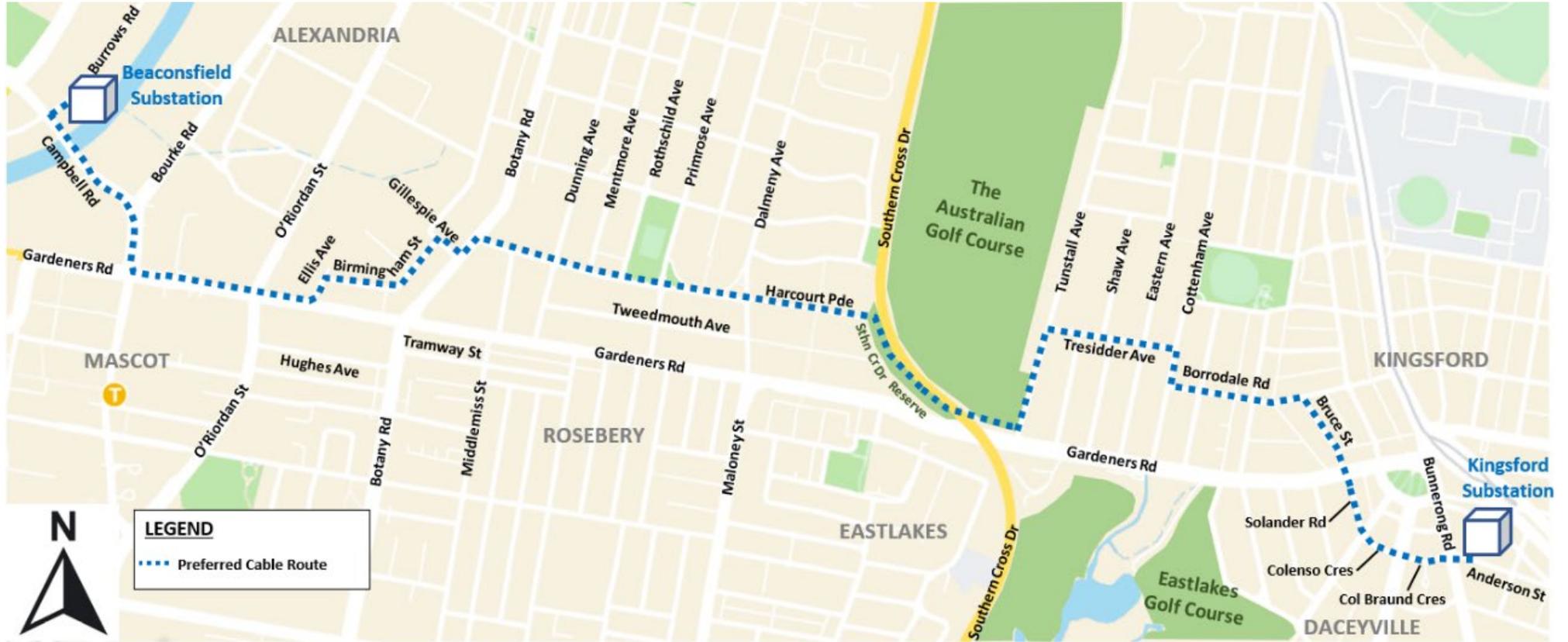


Figure 1-1: The preferred cable route between Beaconsfield Bulk supply point and Kingsford Substation

1.2.2 Proposal objectives

The objective of the proposal is to construct, operate and maintain a new underground cable between Beaconsfield BSP and Kingsford Substation to improve the electricity supply and reliability for the Eastern Suburbs supply area, including the decommissioning of existing supply cables. This meets Ausgrid’s licensing requirements to provide a satisfactory standard of supply to consumers and cater for any forecast future load growth.

Other objectives of the proposal are to:

- comply with relevant laws and standards,
- meet Ausgrid’s duty of care,
- meet Ausgrid’s obligations to plan for and supply reliable electricity,
- maximise social, economic and environmental benefits, and
- minimise environmental, social and cultural impacts.

1.3 Background and need

Electricity to the area is currently supplied by the existing underground feeder which services the Eastern Suburbs Supply area and associated ring network.

This aging fluid filled underground feeder 264 is approaching its end-of-life, causing the existing network to experience a compromised supply reliability, increased environmental risk and a failing aged technology.

Consequences of this can include:

- damage to the network or consumer equipment,
- an increased risk of injury to staff and the general public,
- a reduction in supply reliability, and
- avoidable environmental incidents.

1.4 Related projects

Ausgrid proposals typically have related projects due to the interconnected nature of the electricity network. These related projects (outlined in Table 1-1) would be subject to separate environmental impact assessments due to factors such as differences in risk, funding, construction timeframes and design.

Refer to section 5.17 for additional information on cumulative impacts.

Table 1-1: Related Project List

Project
Replacement of 132kV cables 9SA and 92P between Ausgrid’s zone substations in Waterloo and Surry Hills.
Decommissioning of 132kV cables between Transgrid’s Beaconsfield BSP and

Project
Ausgrid substation in Waterloo.
Replacement of 132kV cables between Ausgrid's substations in Matraville and Maroubra.
Replacement of 132kV fluid filled cable 270 between Maroubra and Kingsford substations.
Decommissioning of 132kV cable 262 between Double Bay and Clovelly substations

The above-noted projects associated with the proposal will be assessed separately under the relevant provisions of the EP&A Act. They are governed by further risk assessment, funding, existing network configurations and therefore subject to change. These projects are forecast within the next decade, no further information is provided at this stage.

Other related projects which have been recently completed include the replacement of cables 260/2 and 261/2, with new cable 26C between Kingsford and Clovelly substations and the ongoing replacement of cables 265 between Ausgrid's zone substations in Matraville and Maroubra. These projects included installing spare conduits for future underground connections also enabling the decommissioning of the existing fluid filled cables.

1.5 Study area

The study area is the environment that could be directly or indirectly affected by the proposal. For this REF, the study area is defined as the preferred cable route, including a buffer area (the size is dependent on the issue being assessed).

Some potential impacts do not have clear physical boundaries. These are assessed on a broader scale and include land use, climate change, air quality, hydrology, waste disposal, fauna (including migratory birds), visual aesthetics, social and economic impacts.

The proposal site and surrounds are described in section 5.1.

1.6 Description of the proposal

1.6.1 Overview

The proposal is for the installation of a 132kV underground cable between Beaconsfield BSP and Kingsford Substation. The new cable would replace existing cables between Beaconsfield BSP and Kingsford Substation.

Generally, the conduits would be installed by standard trenching methods and the trenches backfilled with a thermally stable material. The 132kV cables would be pulled through the conduits in sections and cable jointing undertaken in joint bays which would be installed along the route. The route length of the preferred cable route would be approximately 5.3km.

Other infrastructure that would be constructed as part of the project includes communication, distributed temperature sensing and link box pits, joint bays, temporary cable pulling bays.

Decommissioning the existing fluid filled cables between Beaconsfield BSP and Kingsford Substation will require accessing only discrete locations along the cable route and is addressed further in Section 1.8.5.

The following sections detail the physical structures (section 1.7), construction activities (section 1.8) and operation and maintenance requirements (section 1.9) associated with the proposal.

1.6.2 Design

A map of the preferred route is contained in Appendix A. The detailed design would be completed by the successful contractor, so some changes could be made in the final design either prior to, or during construction. These changes would generally be of a minor nature (such as adjustments to route alignments along the preferred cable route, construction techniques and methodologies, and joint bay and ancillary pit locations) and would not materially affect the outcome of this environmental assessment.

If there were significant changes proposed, the impacts would be reassessed, unless the modifications reduced the overall environmental impact.

1.6.3 Easements

Easements, leases, licences and rights of way / carriageway over land are established to protect the future security and tenure of Ausgrid's assets including substations and distribution lines of all voltages, both overhead and underground.

Section 53 of the *Electricity Supply Act 1995* (ES Act) details the protection of certain electricity works which are not already protected by easements.

An easement would not be required for much of the proposal because the cable would be located within public land, public roads and existing electricity easements. Realignment of the existing easements may be required and subject to final cable design alignment, subject to consultation with potentially impacted landowners, refer to Section 2.

1.7 Physical structures

1.7.1 Underground cables and spare conduits

The proposal would install a single underground feeder between the two substations, which would be accommodated within a predominantly single circuit ductline. The new underground feeder would comprise of three independent single core cables each installed within its own conduit. The power cables would transfer electricity at 132kV.

A spare ductline will be installed between Beaconsfield BSP and the intersection of Gardeners Road at O'Riordan Street, Mascot. This spare ductline will facilitate the future replacement of another underground feeder from the Mill Pond area in the next 5-10 years.

The proposal will look to repurpose existing 650m of existing dual feeder ductline, which resides between Burrows Road and Gardeners Road. It is proposed to extend these conduits as part of this project.

1.7.2 Joint bays, cable pulling pits, ancillary pits and cable installation

Joint bays would be required along the preferred route to join sections of underground cable. The joint bays would be approximately 10 m long by 2 m wide by 1.5 m deep. The final location of the joint bays would be determined during the detailed design stage.

Other infrastructure that would be constructed as part of the project includes:

- communication pits, generally located in the footway,
- DTS pits, generally located in the footway,
- cable pulling pits, generally located near corners and bends, and
- link box pits, generally located near power cable joint bays.

1.7.3 Cable sealing end termination structures at Kingsford Substation and Beaconsfield bulk supply point

At Transgrid's Beaconsfield BSP new cables would be hauled into the basement and connected to existing switchgear.

Outside Ausgrid's Kingsford Substation, an existing joint bay resides in Anderson Street, the joint bay would be opened, the existing cable joint cut out, and the new cables jointed to the section of cables already entering the substation. Smaller fibre optic cables would need to be taken from the street directly into the substation basement.

1.8 Construction activities

The precise construction methodology would be determined after contract award and during the detailed design phase of this proposal.

The works would be undertaken by a contractor, selected by a competitive tendering process as a design and construct package. The contractor would be responsible for detailed design and planning all construction processes, including scheduling and overall timing of the works. The specifications included in the competitive tendering

process would include a requirement to comply with the scope and mitigation measures detailed in this REF. The mitigation measures detailed in this REF must be included in the contractor construction environmental management plan (CEMP).

The anticipated activities involved in the works would include:

- survey work,
- establishing structures, such as temporary fencing and hoarding,
- installing pre-construction mitigation measures, such erosion, sediment and water quality controls, fencing sensitive areas,
- relocating utilities, services and signage,
- saw cutting to recycle concrete or asphalt pavement,
- establishing temporary storage areas,
- establishing temporary construction facilities,
- constructing parking areas,
- excavating cable trenches,
- underboring/ horizontal directional drilling (HDD)
- laying conduit and backfilling,
- pulling cables through the conduits,
- storing and stockpiling equipment,
- dewatering,
- jointing,
- testing and commissioning,
- draining and capping sections of redundant underground cables being left in situ,
- decommissioning redundant underground cables in situ,
- reinstating roads or pavements,
- rehabilitating topsoil and re-vegetation, and
- restoring the site (including general site clean-up and removing site compounds, temporary construction facilities' and temporary environmental controls).

1.8.1 Construction access, parking and site compounds

Being a linear project, the construction site would be highly transient. Construction access during work would be restricted to and from the designated work site within the public roadway. A traffic management plan (TMP) would be prepared prior to commencement of work and would allow for site access. Traffic routes to and from the construction area would be noted in the TMP.

Each construction area would require a temporary storage area containing basic amenities, plant and material storage areas. These temporary storage areas would be strategically located to minimise the number of times relocation is required. Siting of a temporary storage area would involve consultation with the neighbouring properties, maximising separation from sensitive receivers and protection of surrounding infrastructure and environment (including trees) whilst maintaining access to private properties.

At any given time, the worksite would be approximately 100m in length, inclusive of traffic management, equipment storage (e.g. excavators, conduits and waste bins etc.) and safety barriers. The typical width of the construction site would be approximately two lanes of traffic wide, depending on the location. There may be multiple worksites along the project route at any given time.

Before commencement of works, Ausgrid's contractor would undertake a dilapidation assessment of all nearby council assets and public infrastructure, e.g. kerbs, footpaths and fences. This would include a dilapidation inspection of the external and internal

(subject to property owners providing access to these areas) areas of private properties directly along the route. This would likely be in the form of digital photographs.

Surface materials such as asphalt, cement, grass or vegetation would be removed to expose the underlying ground. Generally, soil to an approximate width and depth of 1400mm would be removed and, where unsuitable for backfill, would be transported and disposed of off-site. Any spoil requiring on site storage would be subject to the controls in the CEMP and the conditions of this REF.

Reinstatement of the affected areas would be undertaken in consultation with the relevant authority (e.g., Council or TfNSW).

1.8.2 Construction fencing and signage

Temporary construction fencing would be placed around the construction site to secure the site. During construction, signage would be displayed in accordance with WHS Regulations for construction sites. This would include danger and protective equipment signs.

1.8.3 Installation of underground cables

The works would involve a combination of horizontal directional drilling (HDD) and traditional trenching methods. Each cable would be pulled through conduits installed during the civil build.

Horizontal Directional Drilling

Horizontal Directional Drilling (HDD) works would be required to install the conduits below Southern Cross Drive, from within Southern Cross Drive Reserve to Tunstall Avenue. These HDD works would also enable the effective passing of the Australian Golf Club, several mature trees and steep embankments. Figure 1-2 shows the HDD process.

Other sections where HDD works may be required include;

- Bruce Street to cross Gardeners Road into Solander Road, Kingsford, and
- Col Braund Crescent to cross Bunnerong Road into Anderson Street, Kingsford

Each HDD proposed by the contractor would be detailed for construction impacts through their associated CEMP in consultation with Ausgrid.

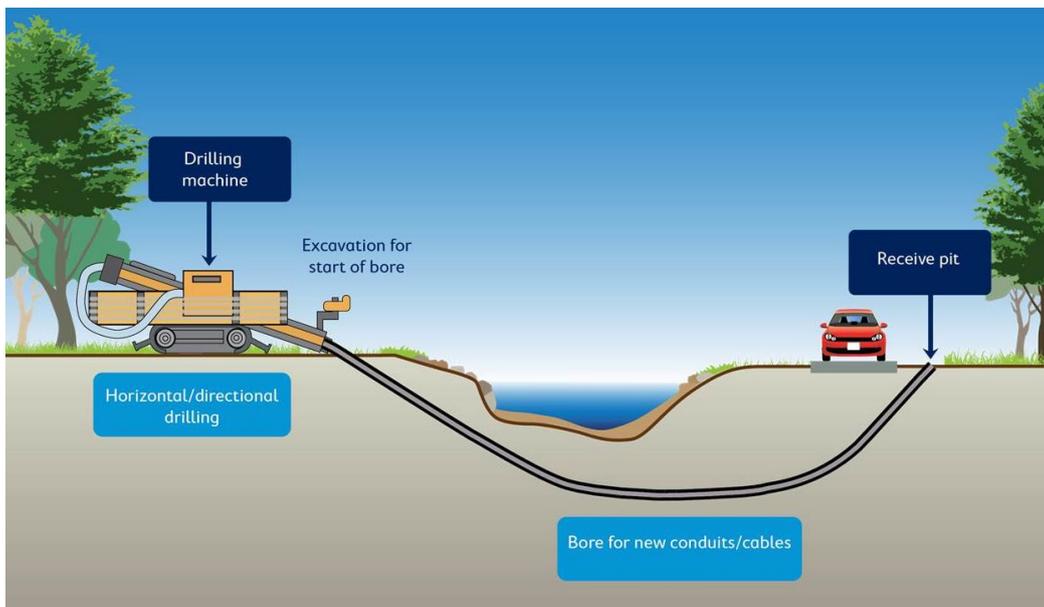


Figure 1-2 Horizontal Directional Drilling methodology.

HDD enables the installation of conduits along a prescribed path from the surface with minimal impact on the surrounding environment. The process is generally conducted in four main stages:

1. design of the bore,
2. drilling of a pilot bore which involves the location and steering of a drill bit along the pre-determined bore path from the entry pit to the exit pit,
3. staged reaming to open the borehole to the required size, and
4. installing the conduit by pulling through the pre-reamed borehole.

The HDD would require the establishment of a send and receive pit. The send and receive pits would be approximately 2 m long, 2m wide and 2 m deep.

Concerning the largest and most complex HDD, subject to approvals from Transport for NSW, two options have been considered to complete the HDD, refer to Figure 1-3:

Option 1

This would be delivered in two stages:

Stage 1: Perform a HDD between Southern Cross Drive Reserve east of Tweedmouth Avenue and Southern Cross Drive Reserve near Gardeners Rd.

Stage 2: Perform a HDD between Tunstall Avenue and Southern Cross Drive Reserve near Gardeners Rd.

Option 2

Perform a HDD directly between Southern Cross Drive Reserve east of Tweedmouth Avenue and Tunstall Avenue. Condensing the HDD to one stage makes this the most desirable option and likely proceed through detailed design into construction.



Figure 1-3 Horizontal Directional Drilling locations adjacent to Southern Cross Drive. Option 1 in Red and Option 2 in Yellow.

The drilling and recycling unit would be located at send pits and would be housed with noise barriers.

The conduits would be welded together on the receive pit sides prior to installing the conduit by pulling through the pre-reamed borehole.

A drilling fluid is used during pilot holes drilling, reaming and product installation processes. Drilling fluid comprises carrier fluid (water) and drill additives such as Bentonite and Polymers. The basis of using drilling fluids (not just water) when drilling/reaming is to help suspend the cutting, seal the hole to prevent flow into the surrounding native ground formation, minimise the risk of frac-outs by maintaining fluid circulation and carrying solids from the under bore, stabilise the under bore by providing positive hydrostatic pressure, cool the drill head and transmitter, and help in lubrication of the product during installation.

The HDD would be approximately 3m or more underneath the surface of Southern Cross Drive.

Equipment required for the HDD includes the drilling unit, a recycling unit and a sucker truck. An excavator would be used to excavate the send and receive pits and also to assist with cleaning out the pit when the drilling slurry accumulates.

Other smaller HDD's may be completed for discrete locations along the cable route where deemed to reduce impact of open trenching. Each HDD proposed by the contractor would be detailed for construction impacts through their associated CEMP in consultation with Ausgrid.

Trenching, conduit installation and reinstatement

Trenching works would be progressive with short lengths of approximately 60m (per work crew) being open at a time. The trench would be dug using an excavator and would typically be 1.4m deep by 1.4 m wide to Gardeners Road, then 1.4m deep by

0.7m thereafter. Where the cables need to pass over or under existing underground services. The conduits would be laid in the trench in an inverted trefoil arrangement.

Once each segment of trench and conduit installation is completed it would be backfilled and a new excavation opened for the next segment of the route. The cables would then be pulled through in lengths of between 600-1200m. The cables would be winched from cable drums (on a truck) through the conduits from one joint bay to the next. Cable pulling pits (commonly referred to as caterpillar pits) maybe required in between joint bays to assist installation of the cable in each section. Each length of cable would take approximately two weeks to install.

Thermally stable backfill (TSB) would be placed around the cables to provide a good operating environment for the cables. Once the trench is completed, the lower portion of the trench would be backfilled with TSB to above the conduits and then covered with either soil, excavated from the trench alignment (if deemed suitable) or new backfill.

Temporary road reinstatement would take place shortly after the trench has been backfilled to minimise any environmental or traffic impacts. Permanent reinstatement would be undertaken at a later date, after the cables have been jointed, tested and commissioned.

Figure 1-4 is a depiction of the typical underground cable installation process.



Figure 1-4 Typical trenching methodology

1.8.4 Joint bays, cable pulling pits, ancillary pits and cable installation

Construction of joint bays, cable pulling pits and ancillary pits would require excavation at each site. The preferred construction type for each joint bay or pit would be 'precast'. If this is not possible, the joint bays or pits would be formed in-situ by a combination of blockwork, reinforcement and pouring of concrete.

Construction of pre-cast joint bays would take approximately three days. Formed in-situ joint bays would take an estimated two to three weeks to complete at each site. Smaller ancillary pits would take a few days to complete.

Generally, the joint bays would be covered with a steel road plate for the time between excavation and cable pulling and jointing works.

When cables are ready to be pulled through conduits and jointed, an enclosure would be installed over each joint bay to protect the cables from environmental elements. Jointing activities are expected to take up to six weeks at each location. A generator may be required to supply electricity during jointing activities. Other pits to be installed include communication pits, DTS pits and cable pulling pits. These are much smaller excavations than are required for the joint bays.

During these activities, temporary security fencing, road barricades and containers would be installed around the sites to manage traffic, restrict unauthorised access and protect staff working at the site.

Following cable jointing works, the joint bays would be backfilled with sand and the roadway would be temporarily reinstated.

1.8.5 Decommissioning of existing fluid-filled cables and ancillary equipment

The existing fluid-filled cables that run between Beaconsfield BSP and Kingsford Substation would be decommissioned, drained of free fluid, sealed and left in-situ. Ancillary equipment, such as tanks and gauge panels would also be drained of fluid and removed. These works would require some excavation work to access existing joint bays in public streets or within existing easements. There would be works required at each remote-end substation.

Activities associated with the handling and transportation of the fluid and fluid filled equipment would be subject to the conditions of this REF, Ausgrid Network Standards, and relevant legislative requirements. This will also be reflected in a CEMP. Some of these conditions include:

- handling and transporting removed fluid and fluid-filled equipment in an environmentally safe manner and with due care to prevent spillage
- ensuring all personnel involved in the handling and transport of fluid and fluid-filled equipment are familiar with the procedures for using the spill kit
- promptly and appropriately cleaning up spills and leaks, notifying the relevant personnel and disposing of contaminated materials and equipment, appropriately.

1.8.6 Vegetation clearing

The preferred cable route is in proximity to street trees at a number of locations. Construction controls would be implemented in Tree Protection Zones to reduce the impacts on root systems. Where measures are unable to be implemented tree removal may be required.

Refer to Section 5.10.3 for a list of mitigation measures and the due diligence process developed for tree removal.

An Arboricultural Report was prepared by *Accurate Tree Assessment* to assess any potential impacts on trees near the proposed works, as well as to make recommendations for amendments to the design or construction methodology where necessary (see Appendix E)

1.8.7 Temporary utilities

Whilst mains supply is preferred and to be investigated by the contractor, a temporary portable generator may be installed during construction to supply electricity to the construction sites. The type, use and size of which would be specified by the contractor as part of their CEMP, refer to Section 8.1.

1.8.8 Site Compounds

Two site compounds would be utilised for the duration of construction:

- Burrows Road, Alexandria, and
- Homebush Bay Drive, Homebush

Figure 1-5 below shows the location of each site compound.

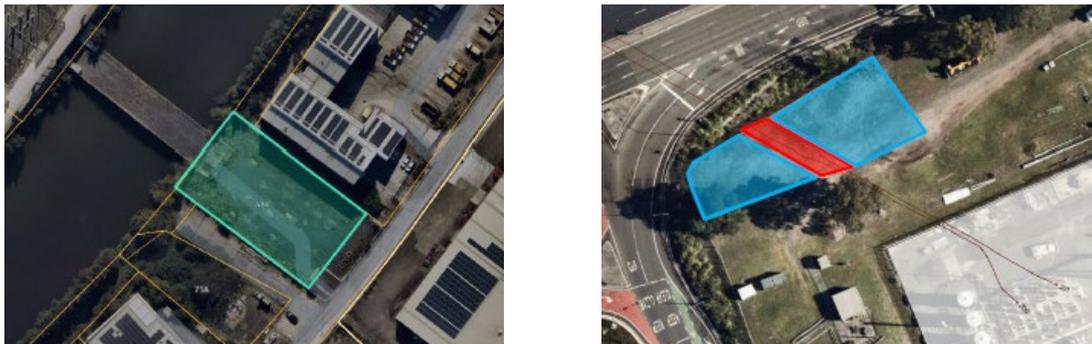


Figure 1-5- Site compounds at Alexandria (left-green) and Homebush (right- blue/red) to facilitate construction.

Notwithstanding their usage under license agreement, each site is to be managed in accordance with:

- The contractors site management plan which is to outline (and depict) all activities undertaken at both sites (material bays, waste storage, plant and equipment, fuels oils chemicals, sediment control devices etc),
- the relevant components of Ausgrid's site inspection and Workplace inspection checklists, submitted to Ausgrid on a monthly basis, and
- Be subject to a pre and post qualitative baseline reports submitted to Ausgrid after occupation.

Any incidents at the site(s) are to be reported to Ausgrid's Environmental Services immediately.

The contractor is responsible for any incident response and/ or remediation of the site to pre-existing condition consultation with Ausgrid.

Ausgrid's WebGIS Environment Layers has identified potential environmental constraints at each site, see Appendix A for reports. These reports should be taken into

consideration in the contractors site management plan when further detail is known about each compound.

1.8.9 Installation of temporary environmental controls

Temporary environmental controls would be required and installed during the construction phase to mitigate potential environmental issues identified in Section 5. Temporary controls for the proposal to mitigate such issues as noise and sediment would be installed where appropriate. These controls would be removed once construction is complete.

1.8.10 Timing and working hours

Subject to assessment and approval, work would commence in mid 2023 and the installation and commissioning of new cables would take approximately 18 months to complete. This would be followed by the decommissioning of existing underground cables.

Works that would generate audible noise at any sensitive receivers would be undertaken between 7am and 6pm Monday to Friday and 8am and 1pm on Saturday. Audible works outside these hours may be undertaken where the following requirements are met:

- Council designates alternate construction hours which increase allowable work times beyond the requirements of this REF; or
- the works are emergency works, unplanned or unavoidable and the affected residents have been notified as far as reasonably practicable; or
- the works fall into one of the following categories and the affected residents are provided with a notification letter at least five days prior to the works:
- the delivery of oversized plant or structures that cannot be undertaken during standard hours,
- maintenance and repair of essential public infrastructure that cannot occur during standard hours (e.g. emergency road repair),
- public infrastructure works that shorten the length of the construction phase and are supported by the affected community (this would require community consultation),
- it is a requirement of a regulatory authority,
- where there is a demonstrated and justified need to operate outside the recommended standard operating hours and this is supported by Ausgrid's Project Manager, Community Relations Section and Environmental Services, and
- where it is environmentally and socially beneficial and this is supported by Ausgrid's Project Manager, Community Relations Section and Environmental Services.

1.8.11 Resources and equipment

There would be approximately 40 staff employed during the construction phase. Ongoing maintenance requirements during operation would be undertaken by Ausgrid field personnel and contractors.

The following equipment may be used on site but is not limited to:

- large rock breaking equipment,
- large and small excavators,
- concrete form work,
- directional borer with slurry cart,
- horizontal borer,
- crane,
- truck mounted borer,
- truck mounted augers and cranes,
- trucks for material transport including soil, concrete and cable,
- saw cutting machine with vacuum and transport utility,
- grader,
- cable winch (for high voltage),
- portable / roller compactor,
- compressor,
- traffic control vehicles,
- fire suppression,
- power generator,
- construction fencing,
- street sweeper vehicles,
- dust suppression vehicles,
- water tankers,
- skip bins,
- tipper,
- site and compound sheds,
- temporary construction facilities, and
- associated minor construction equipment.

Materials that may be required for the proposal include, but are not limited to:

- asphaltic concrete,
- sheet metal or timber boards for shoring trench walls,
- conduits,
- Polythene membrane,
- ladders,
- imported soil for engineered fill and topsoil,
- energy sources such as fuel and oils,
- pollution prevention materials
- TSB,
- Power cables, and
- communication cables.

1.9 Operation and maintenance requirements

Access to the underground cable would only be required when the cable needs repair or maintenance. Repair events would happen on an infrequent basis and would require excavation to gain access. Most of the cable would be located beneath the roadway allowing ready access for timely repairs. However, works could cause some temporary impacts to traffic movement in the immediate area.

Likely maintenance and operation activities associated with the cable include, but are not limited to:

1. unplanned fault and breakdown repairs,
2. underground cables and conduit repairs and maintenance, and
3. staff attendance for routine inspection, operation and maintenance activities

2 Consultation

2.1 Overview

Consultation defines the processes Ausgrid uses to seek views or provide information about our works and seek community feedback. Consultation can include a range of communication activities such as notification to community members and relevant authorities, community information displays, individual contact with residents and meetings with community and authority representatives. These activities are designed to ensure Ausgrid is aware of potential issues so essential electricity network upgrades can be conducted with minimal impact on the local community.

The consultation undertaken as a part of this REF meets the Code of Practice for Authorised Network Operators.

Consultation spans the entire proposal from the initial concept stage through to construction and as the new infrastructure is brought into service.

2.2 Statutory notification requirements

Under the ES Act Ausgrid is required to undertake 40 days notification to the local council for proposed works (other than routine repairs or maintenance works) so that Council has an opportunity to comment on the proposal.

Under the *State Environmental Planning Policy (Transport and Infrastructure) 2021* (Infrastructure SEPP), Ausgrid is the determining authority for electricity developments under Part 5 of the EP&A Act. While the work undertaken does not require council consent, the Infrastructure SEPP requires Ausgrid to undertake 21 days notification to Council where works involve a substation or may impact upon Council infrastructure, the community or local heritage items. Works involving a substation also require 21 days notification to occupiers adjoining that land. In some instances, other public authorities need to be notified.

Under the Infrastructure SEPP and ES Act, the stakeholders listed in Table 2-1 were consulted about the proposal and asked to provide comment. The feedback received is summarised in Table 2-1. No submissions were received as a result of the draft REF public exhibition period.

Specific licences, permits and approvals that require consultation are outlined in Table 4-1

Table 2-1: Consultation responses

Respondent	Notification requirement	Comment raised	Ausgrid’s response
Randwick City Council	ES Act Infrastructure SEPP	No objection to the project.	Ausgrid continues to consult with Randwick City Council regarding the project.
Bayside City Council	ES Act Infrastructure SEPP	<p>Bayside City Council raised concerns about the impact of this project on active projects in the Mascot area. These projects include:</p> <ol style="list-style-type: none"> 1. Mascot Station upgrade by TfNSW 2. Gateway Project at Sydney Airport by TfNSW 3. duplication of the Port Botany Goods Train by ARTC, and 4. the Cycleway Project from Centennial Park to Kingsford by Randwick Council and TfNSW. 5. Council requests that restoration work is undertaken by Bayside Council. 6. Council advised that the sections of the cable route located in the Bayside Council LGA are not flood affected, have no endangered flora or fauna, and have no heritage and indigenous considerations. 	<p>Ausgrid will consult with TfNSW about the upcoming major projects in the area.</p> <p>Ausgrid is aware of the Cycleway Project from Centennial Park to Kingsford and is in discussions with Randwick Council pertaining to the project. Ausgrid has taken this into consideration and will continue to work with Council on the necessary detail required to facilitate restoration.</p> <p>Ausgrid has considered all factors likely to impact the environment in this REF.</p>

Respondent	Notification requirement	Comment raised	Ausgrid's response
City of Sydney Council	ES Act Infrastructure SEPP	Council requested more information about the specific works taking place within the Southern Cross Drive Reserve. This comprises further detail on the scope of the work, plan of the area, flora and fauna impacts, access routes and a traffic/pedestrian management plan.	<p>Ausgrid will provide Council with further details on the work that is planned to take place within the Southern Cross Drive Reserve. Ausgrid will also continue to work with Council on the necessary detail required to facilitate restoration.</p> <p>Ausgrid has engaged geotechnical consultants to undertake ground investigation work along the proposed cable route. This will assist us in finalising our construction plans and determining the restoration that will be required as part of this project.</p>
Transport for NSW (which includes Roads and Maritime Services)	Roads Act 1993 (Section 138)	Comments remain pending, however would not materially change the outcomes of this assessment.	<p>Ausgrid;</p> <ol style="list-style-type: none"> 1. are required to meet TfNSW engineering requirements prior to the commencement of works. 2. continues to consult with TfNSW regarding the project and engineering requirements. 3. will obtain TfNSW express approval prior to the crossing of Southern Cross Drive.

2.3 Community consultation

2.3.1 Planning

Ausgrid has involved the community in the detailed planning of the proposal. Ausgrid's approach has been to nominate the preferred route and seek feedback to allow community members to influence Ausgrid's decision on the final project plans. Ausgrid seeks to balance community feedback with other project considerations in finalising the route and construction program.

Ausgrid is undertaking a range of activities to ensure community members are aware of the proposed activities and have an opportunity to provide feedback on the project.

Community engagement activities undertaken to date for this proposal include:

- Engaging with the adjoining residents and the local community to outline the proposed works during the design process. This includes Members of Parliament in the areas where the new cables and spare conduits could be laid. During this process, Ausgrid explained the project need and details of the preferred route. This consultation enabled Ausgrid to achieve the most acceptable outcome for the wider community whilst minimising the social and environmental impacts of the proposal.
- Delivering statutory notifications to properties adjoining the substations in Kingsford and Alexandria in February 2022.
- Inviting interested community members to community information sessions (February and March 2022) directly through a project newsletter. The initial project newsletter was delivered to 3,635 properties along and around the preferred cable route.
- Holding two online community information sessions in February and March 2022 for residents and interested members of the wider community. This was held following COVID-19 lock-down regulations.
- Considering questions raised during the community information session related to route options, construction impacts, project timelines and Electric Magnetic Fields (EMF).
- Presenting the project by members of Ausgrid's project team at both community information sessions. A copy of which can be viewed on the project webpage. The presentation provided an opportunity for community members to learn more about the proposal and provide feedback to Ausgrid.
- Summarising all feedback received to date on the Alexandria to Kingsford cable replacement project, refer to Table 2-2.
- Providing a toll free 1800 information line and email address for people wanting more information on the proposal, to ask questions or to raise issues during construction.
- Developing a project information page on Ausgrid's website.
- Placing this Review of Environmental Factors as draft on public exhibition for community comment and submissions before the project is assessed for construction approval.

A corresponding community information session may be held during the Review of Environmental Factors public exhibition period for residents and interested members of the wider community.

A summary of the issues raised during community consultation as they relate to the Review of Environmental Factors is contained in Table 2-2. See also Appendix B.

Table 2-2: Community consultation issues summary

Issue	Response
Project justification	<p>Transgrid’s Beaconsfield BSP and Ausgrid’s Kingsford Substation are connected by a 132,000 volt Self Contained Fluid Filled (SCFF) underground cable that is nearing the end of its service life.</p> <p>Ausgrid is planning to replace this existing cable by installing a new 132,000 volt underground XLPE cables in conduits between Transgrid’s bulk supply point and Ausgrid’s Kingsford Substation. A bank of spare conduits from Transgrid’s Beaconsfield BSP to Gardeners Road, Mascot would also be installed facilitating future potential network connections into new substation facilities in Mascot’s east.</p> <p>The project is part of a program to retire fluid filled cables across the Ausgrid network to minimise the risk of fluid leaks.</p>
Route selection process	<p>Ausgrid considered several different factors when planning the new cable route, including:</p> <ul style="list-style-type: none"> • Location of existing underground utilities such as water and sewer pipes, gas mains, telecommunications cables, and other electrical cables. • Community impacts, such as noise and out-of-hours construction work. • Ausgrid have selected streets that are not major thoroughfares to avoid extensive traffic impacts and minimising night work, which affects residents. • Environmental impacts, such as tree removal. • Cost effectiveness. We have tried to minimise costs, so savings are passed on to our customers. • Technical requirements, including cable ratings and network security.

Issue	Response
<p>Construction impacts</p>	<p>Ausgrid is committed to minimising the impact of its activities on local communities and the environment.</p> <p>During construction, Ausgrid and our contractor for the civil component would be required to comply with the approval conditions of the project. To facilitate compliance, a Construction Environmental Management Plan (CEMP) would be completed by the successful contractor and outline the required site-specific measures to address construction impacts. In addition, during construction, the community engagement team would be available via the community information phone line (or via email or our project website) to discuss any concerns about the project.</p> <p>There would be some temporary changes to traffic and parking arrangements along the preferred cable route. Ausgrid would work closely with Councils and Roads and Maritime Services (RMS) to minimise our impact on the local road network.</p> <p>A detailed Traffic Management Plan will be prepared in consultation with Council, RMS and other key stakeholders.</p> <p>Ausgrid has prepared this environmental assessment to determine the potential impacts of the project. The assessment outlines the required measures to mitigate any impacts.</p> <p>All work would be completed in line with the environmental assessment, the Construction Environmental Management Plan and Ausgrid’s certified Environmental Management System.</p>
<p>Traffic impacts</p>	<p>It is expected that there will be some temporary changes to traffic and parking arrangements along the preferred cable route. Ausgrid will work closely with Councils, Transport for NSW (TfNSW), State Transit and emergency services to minimise our impact on the local road network and the community. This includes:</p> <ul style="list-style-type: none"> • preparing a detailed Traffic Management Plan in consultation with the key stakeholders. • issuing local construction notifications between 4 and 14 clear business days before works begin; and • having traffic crews on site daily to safely guide pedestrians and vehicles around the construction activities. <p>For reducing the impact on local schools, in past projects, Ausgrid would reach out to schools along cable routes to confirm their term timetable and schedule construction works nearby works during the school holiday periods.</p>
<p>Will the project in any way increase the level of EMF emitted by the substations in Burrows Road and Anderson Street?</p>	<p>No, the project would not be augmenting the primary equipment at the substations. EMF levels will not change.</p> <p>It is expected that the EMF produced by the cable will be a small fraction of the 2,000mG public exposure limit. Refer to Section 5.3 for additional information on EMF.</p>

Issue	Response
Restoration process	<p>Ausgrid is obliged by legislation to make good areas disturbed by the installation of electrical infrastructure. All affected areas, including roads and grass verges, will be restored to as close to their previous condition as possible.</p> <p>Restoration typically involves two stages:</p> <ul style="list-style-type: none"> • Temporarily resurfacing; excavated sections of the road will be progressively backfilled and to allow normal use by traffic. • Permanent resurfacing; once all cables have been installed and tested, final reinstatement would be done in consultation with the relevant authority. <p>Ausgrid commenced discussions with the City of Sydney Council and Randwick City Council about the project and our preferred cable route in mid-late 2021.</p> <p>These meetings will continue throughout all stages of the project to keep Council updated on our plans and to coordinate works where possible to try to minimise having to excavate after any council road restoration.</p>
Process for decommissioning existing 132kV cable	<p>The existing 132,000 volt cable between Transgrid's Beaconsfield BSP and Ausgrid's Kingsford Substation would be decommissioned once the new cable has been installed and commissioned.</p> <p>The decommissioning process would involve excavation work at three existing pits along the existing cable route to purge the fluid from the cables using water. Once the fluid has been purged, Ausgrid would seal the cables and leave them in the ground. Refer to Section 1.8.5 for additional information.</p>

2.3.2 Construction

Community engagement activities would continue as the project enters the construction phase. This would include:

- a dedicated community liaison officer would be part of the project team during construction. This officer would work closely with construction personnel and the community to ensure the community is informed about upcoming works and potential impacts, and to address any construction related issues as quickly as possible,
- standard notification to be provided to receivers along the project route between 4 and 14 clear business days before to starting work,
- early notification to be provided to residents affected by any planned night works, 5 days before to the commencement of works,
- notification and door knocking at properties close to joint bays to provide these stakeholders with more information on potential impacts,
- a community information line, project email address and web page,
- signage along the route and at site compounds to ensure community members are aware of who is carrying out the work. Signage would include details of the project community information line,

- notifications to residents and other neighbours before the start of work in their local area to provide information about the proposed construction activities, timing, work hours and any changes to traffic and parking arrangements, as well as details of how to find out more information or raise any issues direct with both the contractor and Ausgrid project team, and
- specific notification and consultation requirements for any noisy works outside standard construction hours.

2.3.3 Complaints handling procedure

An effective complaint handling procedure will allow complaints to be quickly and effectively resolved, allowing works to proceed. The procedure also ensures that the community get a fair hearing when it comes to registering their complaints relating to construction works.

For all construction works likely to affect the community:

- provide a complaints line during works, project email address and web page.
- have a documented complaints process, including an escalation procedure so that if a complainant is not satisfied there is a clear path to follow
- keep a register of any complaints, including details of the complaint such as date, time, person receiving complaint, complainant's contact number, person referred to, description of the complaint, time of verbal response and timeframe for written response where appropriate.

The contractor undertaking works to provide a 24 hour project specific contact number during works. Contact number must be provided on the following:

- on all community notification letters
- clearly displayed at all times on the construction site fence

3 Investigation of alternatives for the proposal

3.1 Assessing alternative options

As part of developing this proposal, consideration was given to alternative routes, designs, construction and management options.

3.2 Do nothing

The first option considered to address the objectives of this proposal is to refrain from undertaking any further development of the network in the area (do nothing).

Benefits of this option would include reduced capital expenditure and no construction or operation impacts as described in section 5 of this REF.

The consequences of doing nothing as the existing cables continue to age, would be supply interruptions (causing black outs) occurring more frequently and affecting more people. It would be extremely disruptive to commercial enterprises and residences throughout the area and contravene Ausgrid's regulatory obligations and corporate objectives to reduce the time and number of supply interruptions.

The 'do nothing' option is not a viable alternative.

3.3 Demand management

An analysis of non-network options considered how demand management could defer the timing of the preferred network solution and whether the estimated unserved energy at risk could be cost effectively reduced.

The analysis used the same unserved energy model and cost benefit assessment developed to assess network options to compare the net present value (NPV) of the preferred network option against the non-network alternative. The cost benefit assessment has shown that non-network alternatives were not cost effective due to the magnitude of the load reduction required.

3.4 Network options

The design and location of the proposal resulted from an options investigation. Three credible options were considered:

- the like-for-like in situ replacement of Feeder 264 in situ between Beaconsfield BSP and Kingsford Substation,
- the decommissioning of Feeder 264, and
- replacement of Feeder 264.

The preferred option is the replacement of Feeder 264 between Beaconsfield BSP and Kingsford Substation.

3.4.1 Option 1: Replacement of Feeder 264 in situ

While this option would improve reliability and solve the existing asset condition issues and mitigate identified risks, it was not considered feasible because of the need to maintain supply during construction. Given the construction duration and outage needed on the feeder to facilitate replacement, the remainder of Sydney's Inner Metropolitan subtransmission network would be placed at risk and likely result in supply disruptions for extended periods.

3.4.2 Option 2: Decommission 132kV Feeder 264

This was determined not to be a viable option as Feeder 264 is one of the major supply feeds to the Eastern Suburb 132kV network and therefore severely compromise a reliable supply of electricity to customers across this part of the network.

3.4.3 Preferred network option: Decommission 132kV Feeder 264 by installing a new cable from Alexandria to Kingsford

This option is the one preferred by Ausgrid because it would:

- meet the requirements of the Eastern Suburbs Area Plan,
- assist in maintaining supply reliability during construction,
- further reinforce the Eastern Suburbs 132kV network ring configuration, and
- be the most cost-effective option.

3.5 Route options

Route selection of the preferred network option includes environmental attributes, electrical considerations, standards, guidelines and consultation. The following route options were considered as part of this proposal.

3.5.1 Gardeners and Bunnerong Roads

Under this option, new cables would be installed via a more direct route along Gardeners Road and Bunnerong Road.

This route is relatively flat and straight making cable hauling simple with minimal bends and large cable lengths could be achieved.

The shorter more direct route option would also generate less spoil.

Ausgrid found this route was not appropriate for the following reasons:

- both Gardeners and Bunnerong Roads are State Classified Roads. This would require a greater depth of cover and a higher standard of reinstatement,
- this route impacts approximately 50% more community members,
- this route would have a greater impact on transportation routes and subject to approvals from the NSW Transport Management Centre,
- in Ausgrid's experience, the TMC would specify out of hours works to minimise impacts to traffic resulting in a significant amount of night works,

- night works in a single 250m area may only be permitted two consecutive nights per week, and
- project progress via night works across the entire project route would be cost prohibitive.

3.5.2 Mascot east network connection

Taking a route to the southern side of Gardeners Road to facilitate future potential network connections into potential new substation facilities at Mascot's east.

New substation facilities in this region are currently not proposed and as such, there is no clear benefit when compared to utilisation of those roads to the north of Gardeners Road.

3.6 Preferred route option

The proposed route was selected as the preferred option due to several benefits, including:

- the proposed infrastructure is predominantly located in the previously disturbed road reserve which is Ausgrid's preferred location for transmission feeders,
- easy access for construction and maintenance,
- the feeders can be constructed using standard trenching techniques,
- least commercial and schedule risk to the proposal,
- the feeder(s) / power line(s) do not traverse private property, meaning no easement acquisitions are required,
- determined to be the lowest cost option,
- lower impact on TfNSW road(s),
- greater opportunity for construction work during standard operating hours (i.e. dayworks),
- width of many road would enable suitable contra-flows to be established, and
- lowest number of community members impacted during construction

Following the selection of the chosen route, Ausgrid prepared this REF to assess the environmental impacts of the proposal and to ascertain whether there would be a significant impact upon the environment to meet the requirements of sections 5.5 and 5.7 of the EP&A Act and clause 171 of the EP&A Regulations.

4 Environmental legislation

4.1 Environmental Planning and Assessment Act 1979

The EP&A Act is the primary legislation regulating land use planning in NSW. It provides the framework for the development of state and local planning instruments which, through their hierarchy, determine the statutory process for environmental impact assessment. This proposal satisfies the definition of an activity under Part 5 of the EP&A Act since it:

- may be carried out without development consent,
- is not exempt development, and
- would be carried out by a determining authority or requires the approval of a determining authority.

Under Part 5 of the EP&A Act, activities require a determining authority to take into account all matters affecting or likely to affect the environment by the proposed activity. As Ausgrid is an authorised network operator under the *Electricity Network Assets (Authorised Transactions) Act 2015*, where it is carrying out development for the purposes of an electricity transmission or distribution network (within the meaning of State Environmental Planning Policy (Transport and Infrastructure) 2021) to be operated by the authorised network operator, Ausgrid is prescribed as a public authority under s198 of the *Environmental Planning and Assessment Regulation 2021*.

Environmental planning instruments (EPIs) are legal documents that regulate land use and development, including the type of assessment process required. EPI is the generic term used to describe state environmental planning policies (SEPP) and local environmental plans (LEP).

The following EPIs that apply to the proposal area were considered:

- SEPP – Infrastructure
- SEPP – Major Development
- SEPP – State and Regional Development
- SEPP 19 – Bushland in Urban Areas
- SEPP 44 – Koala Habitat Protection
- SEPP 55 – Remediation of Land
- Randwick Local Environmental Plan 2012
- SEPP (Resilience and Hazards)

4.2 State Environmental Planning Policy (Transport and Infrastructure) 2021

Subject to certain exemptions, the Transport and Infrastructure SEPP allows development for the purpose of an electricity transmission or distribution network to be carried out by or on behalf of an electricity supply authority or public authority without development consent on any land.

Having regard to the Resilience and Hazards SEPP, this proposal falls within the scope of the Transport and Infrastructure SEPP as an activity permissible without development consent. Consultation requirements under the Transport and Infrastructure SEPP are addressed in section 2.

4.3 State Environmental Planning Policy (Resilience and Hazards) 2021

State Environmental Planning Policy (Resilience and Hazards) 2021 will exclude the application of the Transport and Infrastructure SEPP for some developments which are located on land identified as “coastal wetlands” or “littoral rainforest”, or development which is coastal protection works. There are no “coastal wetlands” or “littoral rainforest” located within the area of the proposal, nor is the land identified as a proximity area for coastal wetlands or littoral rainforest. As such the proposal would not impact upon land captured by the Resilience and Hazards SEPP.

4.4 Vegetation Clearing SEPPs

State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017 (Vegetation SEPP) requires certain approvals from either Council or the Native Vegetation Panel prior to clearing of certain vegetation. Clause 8 provides that authority to clear vegetation is not required under this Policy if it is clearing of a kind that is authorised under section 60O of the Local Land Services Act 2013 (LLS Act). As this proposal is authorised under s60O(b)(ii) of the LLS Act, being [an activity carried out by a determining authority within the meaning of Part 5 of that Act after compliance with that Part], consent under the Vegetation SEPP is not required.

State Environmental Planning Policy No 19—Bushland in Urban Areas (Bushland SEPP) applies where works are proposed on urban land which is bushland zoned or reserved for public open space purposes, or adjacent to such land.

4.5 State Environmental Planning Policy (State and Regional Development) 2011

The *SEPP (State and Regional Development) 2011* declares certain development to be State Significant Development (SSD) and State Significant Infrastructure (SSI), including Critical SSI. Applications for SSD and SSI must be accompanied by an Environmental Impact Statement (EIS).

The proposal is not a type of development listed in the schedules of the *SEPP (State and Regional Development) 2011* as being SSD or SSI. The proposal would not have a significant impact on the environment (refer to section 6) and therefore does not require an EIS and as such would not be considered SSI.

On this basis, the *SEPP (State and Regional Development) 2011* is not applicable to the proposal and it can be assessed under Part 5 of the EP&A Act through the operation of the Transport and Infrastructure SEPP.

4.6 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act prescribes the Commonwealth’s role in environmental assessment, biodiversity conservation and the management of protected species, populations and communities and heritage items. The approval of the Commonwealth Minister for the Environment is required for the following controlled actions:

- an action that may have a significant impact on matters of national environmental significance (NES)

- actions that are likely to have a significant impact on the environment of Commonwealth land
- actions taken on a Commonwealth land that are likely to have a significant impact on the environment anywhere.

The EPBC Act lists nine matters of NES which must be addressed when assessing the impacts of a proposal. An assessment of how the proposal may impact on matters of NES is provided in Table 6-2.

The assessment of the proposal's impact on matters of NES and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant matters of national environmental significance. Accordingly, the proposal has not been referred to the Department of Agriculture, Water and the Environment.

4.7 Electricity Supply Act 1995

The ES Act sets out the licensing regime on Ausgrid and provides a framework for the development and maintenance of electricity infrastructure. The ES Act allows Ausgrid to trim and remove trees, carry out works on public roads and acquire land.

The ES Act also requires that works (other than routine repairs or maintenance works) must not be undertaken without a minimum of 40 days consultation with relevant local councils. Any submission must be considered by Ausgrid. Consultation requirements under the ES Act are addressed in section 2.

4.8 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) provides a framework for the licensing of certain activities and is administered by the Environment Protection Authority (EPA) (the statutory authority of DPE). Under the POEO Act, the EPA is the Appropriate Regulatory Authority for Ausgrid.

Schedule 1 of the POEO Act lists activities that require an Environment Protection Licence to operate. The need for a licence would be evaluated and sought prior to the commencement of construction, once a detailed construction method has been finalised. Refer to section 4 for licences that may be required for the proposal. Regardless of whether a licence is required, the following restrictions during construction and operation of the proposal apply:

- works must not pollute the environment
- waste must be classified, handled, transported and disposed appropriately
- environmental incidents involving actual or potential harm to human health or the environment must be reported to DPE.

4.9 Biodiversity Conservation Act 2016

Section 1.7 of the EP&A Act provides that the Act is subject to the provisions of Part 7 of the *Biodiversity Conservation Act 2016* (**BC Act**) and Part 7A of the *Fisheries Management Act 1994* (**FM Act**). The BC Act and FM Act contain additional requirements with respect to assessments, consents and approvals under the EP&A Act, concerning certain terrestrial and aquatic environments.

Where an activity being assessed under Part 5 is likely to significantly affect threatened species, s 7.8 of the BC Act requires that a species impact statement, or biodiversity development assessment report must be prepared by the proponent. Where there are other likely significant effects on the environment, then an environmental impact statement would instead be required.

With respect to a development being assessed under Part 5, s 7.2 of the BC Act provides that development or an activity is likely to significantly affect threatened species if:

- it is likely to significantly affect threatened species or ecological communities, or their habitats, or
- it is carried out in a declared area of outstanding biodiversity value.

Section 7.3 of the BC Act lists a number of factors to be considered in determining whether the proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. This includes, for example, whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The Schedules to the BC Act prescribe the following lists of species, ecological communities, and other matters relevant to this determination:

- Threatened species;
- Threatened ecological communities;
- Extinct species, species extinct in the wild and collapsed ecological communities;
- Key threatening processes;
- Protected animals; and
- Protected plants.

A desktop assessment indicated that no threatened flora or fauna species, population or ecological community are in proximity to the proposal. Further ecological investigation and assessment was not warranted on this basis.

4.10 Summary of legislative requirements

Additional pieces of environmental legislation that apply to Ausgrid's network area were considered in the preparation of this REF, including:

- *Biodiversity Conservation Act 2016 (NSW)*
- *Biosecurity Act 2015 (NSW)*
- *Coastal Management Act 2016 (NSW)*
- *Crown Lands Act 2016 (NSW)*
- *Fisheries Management Act 1994 (NSW)*
- *Forestry Act 2012 (NSW)*
- *Heritage Act 1977 (NSW)*
- *Hunter Water Act 1991 (NSW)*
- *Mine Subsidence Compensation Act 1961 (NSW)*
- *National Greenhouse and Energy Reporting Act 2007 (NSW)*
- *National Parks and Wildlife Act 1974 (NSW)*
- *Native Title Act 1993 (Commonwealth)*
- *Noxious Weeds Act 1993 (NSW)*

- *Roads Act 1993 (NSW)*
- *Rural Fires Act 1997 (NSW)*
- *Water Act 1912 (NSW)*
- *Water Management Act 2000 (NSW)*
- *Water NSW Act 2014*
- *Wilderness Act 1987 (NSW).*

Specific licences, permits, approvals and notifications required for the construction, maintenance and operation of the proposal are outlined in Table 4-1.

Table 4-1: Summary of legislative requirements

Legislation	Authority	Requirement	Comment	Responsibility
<i>Biosecurity Act 2015</i>	DPI	General: There is a general duty to prevent, eliminate or minimise biosecurity risks, which are broadly defined in s 13. Schedule 1 imposes a specific duty to prevent, eliminate or minimise any biosecurity risk posed or likely to be posed by weeds on or near roads, watercourses, rivers, inland water, or irrigation areas.	Biosecurity is addressed in section 5.10.	Ausgrid / Contractor
<i>Contaminated Land Management Act 1997</i>	DPE	Notification: under s. 60, by a person whose activities have contaminated land or a landowner whose land has been contaminated is required to notify DPE when they become aware of the contamination.	If contamination is discovered the duty to report would be determined.	Ausgrid
<i>Crown Land Management Act 2016</i>	Crown Lands	Approval: under s. 2.18, by the Minister to grant a 'relevant interest' (i.e. lease, licence, permit, easement or right of way) over a Crown Reserve for new works.	Some new works on Crown lands requires an assessment of tenure. However, assessment of tenure is not required where that work is on a public road.	Ausgrid
Environmental Planning and Assessment Regulation 2021 (EP&A Regs)	Ausgrid	Consideration: under cl. 171, of the factors to take into account concerning the impact on an activity on the environment.	This REF has considered factors under cl. 171 in section 6.1.	Ausgrid
Environmental Planning and Assessment Regulation 2021 (EP&A Regs)	DPE	Reporting: Ausgrid must record, at the conclusion of the construction phase how and whether environmental conditions and measures were observed.	The contractor is to provide for a Post Construction Compliance Report, detailing compliance with conditions of this REF. Any non-compliances issued during construction of the project either by Ausgrid or others must be detailed. This is to be signed by the contractors Project Manager and provided to Ausgrid as part of practical completion.	Ausgrid/ Contractor
ES Act	Local Council	Notification: under s.45, of 40 days' notice for the proposed electricity works.	For Notification given, see section 2 .	Ausgrid

Legislation	Authority	Requirement	Comment	Responsibility
<i>Heritage Act 1977</i>	DPE	Approval: under s. 60, to impact items listed on the State Heritage Register Permit: under s. 140, for activities with potential to excavate or disturb a relic.	No approval considered necessary as part of the planning approvals process. Construction methodology is to inform any further assessment on the matter.	Contractor
Transport and Infrastructure SEPP	Local Council	Notification: under s. 13-15, 21 days' notice for substantial impact on council related infrastructure and local heritage or works in flood liable land that will change flood patterns other than to a minor extent.	Notice was given at the same time as the ES Act notification, see section 2.	Ausgrid
<i>National Greenhouse and Energy Reporting Act 2007</i>	Clean Energy Regulator (Commonwealth)	Reporting: under s. 19 a registered corporation is required to report information on energy production, energy consumption and the amount of greenhouse gas emissions for the facilities under their operational control on an annual basis by 31 October following the financial year for which they are reporting.	Reporting will be undertaken by 31 October each year.	Ausgrid Contractor
POEO Act	DPE	General: under s. 120, no 'dirty water' discharge into a stormwater drain.	Water management is addressed in section 5.	Ausgrid / Contractor
POEO Act	DPE	Licence: under s. 49, for scheduled activities not based on a premise for the transport of more than 200 kg of category 1 or 2 trackable waste in any load.	No approval considered necessary as part of the planning approvals process. Construction methodology is to inform any further licence requirements.	Contractor
POEO Act	DPE	Licence: under s. 122, for scheduled activities that may cause water pollution.	No approval considered necessary as part of the planning approvals process. Construction methodology is to inform any further licence requirements.	Contractor
<i>POEO (Waste Regulation) 2005</i>	DPE	General: under cl. 24, Ausgrid must track transportation of certain waste.	Waste management is addressed in section 5.9.	Ausgrid
<i>Roads Act 1993</i>	TfNSW and Local Councils	Approval: under s. 138, for road work on a Classified Road.	Approval for the crossing of / temporary closure / connection to TfNSW classified roads would be required prior to the commencement of construction.	Ausgrid / Contractor

5 Environmental assessment

This section describes the existing environment of the study area and assesses the potential impacts of the proposal during construction, maintenance and operation. This section also prescribes the specific mitigation measures necessary to manage and control environmental impacts which consist of:

- specific mitigation measures prescribed in this REF (to be implemented during the design, construction, operation phases of the proposal or in combination)
- controls detailed in Ausgrid's NS174C Environmental Handbook for Construction and Maintenance.

Where there is an inconsistency, the proposal specific mitigation measures would prevail. Only specific mitigation measures are included in this REF, where required to minimise potential impacts.

Once the detailed construction methodology is known, the principal construction contractor would be responsible for developing further mitigation measures as required to meet both legislative requirements and the commitments in this REF. Section 8.1 outlines the requirements for preparing the construction environmental management plan (CEMP).

5.1 Land use

5.1.1 Existing environment

The Alexandria to Kingsford Cable Project is located within the following Local Government Areas;

- City of Sydney Council-
Burrows Road, St Peters to Southern Cross Drive, Rosebery
- Randwick City Council-
The Australian Golf Club to Gardeners Road, Daceyville and Anderson Street, Kingsford, and
- Bayside Council-
Department of Communities and Justice – Housing

The land adjacent to work areas is comprised of;

- Commercial industrial in the Alexandria area through to Harcourt Parade, Rosebery,
- Commercial industrial and low-density residential interface to Harcourt Parade at Turruwul Park, Rosebery,
- Low-density residential via the Australian Golf Club through to Gardeners Road, Daceyville, and
- Department of Housing on the southern side of Gardeners Road through to Ausgrid's Kingsford Substation on Anderson Street.

Other land uses within the immediate vicinity of the project include are outlined in Table 5-1 below.

Table 5-1 – Land uses adjacent to the proposed cable route

Land use	Location
Council Depot	Adjacent to Alexandria Canal off Campbell Road Bridge
Childcare Centre	Cnr of Botany Road and Harcourt Parade
Gardeners Road Public School	Botany Road, south of Harcourt Parade
Turruwul Park and Tarakan Reserve	Between Rothschild Ave and Primrose Ave, north of Harcourt Parade
Southern Cross Drive Reserve	West of Southern Cross Drive between Gardeners Road and Harcourt Parade
Australian Golf Club	Between Harcourt Parade and Tunstall Avenue
Shell Service Station	At the corner of Bruce Street and Gardeners Road

A tenure assessment is required to be undertaken to determine if the route is located on Crown land that is not public road or reserve as defined by s. 45 of the *Electricity Supply Act 1995*. Where this is the case and the route is located on unused Crown land that is not required for a public purpose, the land may be subject to an Aboriginal land rights claim under the *Aboriginal Land Rights Act 1983* or native title claim under the *Native Title Act 1993*. Additional consultation and approvals may be required in these instances.

Ausgrid's WebGIS Environment Layers have identified the formed roadways of Bruce Street, Borrodale Ave and Anderson Street to be mapped as Crown Land. Being a formed road, the above assessment of tenure is not required in this instance.

5.1.2 Potential impacts

The proposal is consistent with the current surrounding land use. The proposal is also consistent with the objectives and land use zoning of the Local Environmental Plan (LEP).

Short term impacts on the surrounding land use during the construction phase of the proposal would include increased traffic intensity (section 5.15), noise (section 5.4) and visual (section 5.14) impacts.

Once constructed, the proposal would not restrict any land use access. The proposal would have the benefit of facilitating both existing and future surrounding land uses in the region by providing a reliable supply from the electricity network.

The proposal would not have a significant impact on existing land uses. The access roads and power cables would not form a physical barrier as people, plant and machinery would continue to be able to move along and across the preferred route.

5.1.3 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 5-2.

Table 5-2: Land use mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
Consult with affected stakeholders about the proposal.	✓	✓	
Provide information via a free call 1800 number, email address and Ausgrid's website for people wanting more information.	✓	✓	

5.1.4 Conclusion

The proposal is not likely to significantly affect the environment in relation to land use for reasons including:

- construction related impacts would be minor, localised and short-term,
- a reliable supply of electricity would allow existing land uses to continue, and
- mitigation measures outlined in section 5.1.3 would readily manage potential impacts.

5.2 Climate change

5.2.1 Existing environment

Climate change describes both changed average climatic conditions, such as increased temperature and lower average rainfall, as well as changes in the patterns of extreme events, including increased frequency and intensity of storms.

Greenhouse gas (GHG) emissions are defined by the GHG Protocol² and international standards³ as scope 1 (direct emissions), scope 2 (indirect emissions from the consumption of purchased energy) and scope 3 (other indirect emissions).

5.2.2 Potential impacts

A risk assessment⁴ of predicted climate change impacts on power infrastructure and the assets and services that they provide, considered the following climate change scenarios:

- higher average temperatures,
- more frequent occurrence of extreme temperatures (days over 35 °C),
- lower average rainfall,
- more intense extreme rainfall events,
- increased lightning strikes,
- higher evapo-transpiration,
- higher sea level and storm surge events, and
- more frequent extreme fire danger days.

The risk assessment showed that the key risks to power infrastructure would include extreme events, accelerated degradation of materials and structures, and resource

demand pressures. In relation to the proposal, it is expected that the likely impact of extreme weather events would be low.

Current climate predictions anticipate that extreme heatwaves would increase in frequency and intensity, potentially generating an increase in electricity demand for air conditioning at the same time as the efficiency of the transmission is reduced by up to 30% due to high temperatures⁷. This increased demand has the potential to place pressure on the resource supplied and increase capacity constraints and maintenance requirements of the cable. However, the new cable would increase the reliability of the electricity supply within the region. Therefore, the new supply infrastructure would have a greater ability to withstand the increased pressure on the supply network.

Greenhouse gas emissions

Scope 1 emissions are direct GHG emissions produced from sources within the boundary of the proposal and as a result of the proposal's activities. Emissions arising from the construction of the proposal include those from vehicles and machinery used for materials delivery and handling, excavation, rehabilitation works, waste transport and general construction activities. The major contributor would be the consumption of fuel by transport vehicles.

Ausgrid's assets are subject to regular maintenance and monitoring to ensure all equipment is operating effectively. Minimal staff would be required to attend the asset thus limiting associated vehicle use and scope 1 emissions.

Under the *National Greenhouse and Energy Reporting Act 2007*, Ausgrid is required to report information on energy production, energy consumption and the amount of greenhouse gas emissions for the facilities under their operational control on an annual basis by 31 October following the financial year for which they are reporting.

Scope 2 emissions are GHG emissions generated from the production of electricity, heat or steam that a proposal consumes, but which is physically produced by another facility. These emissions would arise primarily from the consumption of electricity through network losses when the proposal is in operation. Electrical losses are an inevitable consequence of the transmission of electricity through the transmission and distribution network, and the energy consumed in these losses must be generated by power stations. This energy is sourced from the Australian electricity market, which is primarily supplied from coal-fired power stations that emit GHGs.

The proposal would not result in a change in the capacity of the network and hence in scope 2 GHG emissions.

Scope 3 emissions are those GHG generated in the wider economy that are related to a proposal but are physically produced by another facility. The main source of scope 3 emissions related to this proposal is from power stations supplying the National Electricity Market (currently predominantly coal fired) that supply the electricity retailers who sell power to customers in the area supplied by this proposal. The power stations supply electricity from a variety of generation sources with varying emission levels. The end user can influence the level of scope 3 emissions by the amount of electricity they consume and by selecting to receive green power.

The proposal would not result in a change in the capacity of the network and hence in scope 3 GHG emissions.

Since 2003, all electricity retailers in NSW have been governed by licence conditions that require them to reduce greenhouse emissions arising from the energy they sell in NSW. This *Greenhouse Gas Abatement Scheme*⁵ is a compulsory legal framework

under the ES Act that requires the retailers to take actions to reduce emissions through a range of measures in order to meet a benchmark level set by the NSW government. The benchmark currently applicable is 5% below the Kyoto baseline year of 1990, on a per capita basis.

All electricity retailers who would utilise the proposal to transport electricity to customers are bound by this regulatory framework. The framework provides a robust, market-based means to manage scope 3 emissions to the level determined to be appropriate by the NSW government. It should be noted that any effort to reduce emissions from electricity usage supplied by NSW electricity retailers outside this framework would be accompanied by a reduced requirement on the retailers themselves, and no net reduction would result.

Sea level rise

Under clause 171(2)(p) of the EP&A Regulation, Ausgrid is required to consider any impact on coastal processes and hazards, including those under projected climate change conditions. The NSW Government acknowledges that increased sea levels will have significant medium to long-term social, economic and environmental impacts for development located in the coastal zone. However, the proposal is located underground within existing roadways, suitable provisions shall be made for potential future sea level rise in accordance with the relevant NSW Government policies, guidelines and management programs.

5.2.3 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 5-3.

Table 5-3: Climate change mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
Comply with section 8 of NS174C Environmental Handbook.		✓	
Report information on energy production, energy consumption and the amount of greenhouse gas emissions to the Clean Energy Regulator for the facilities on an annual basis by 31 October the following year.			✓
Recycled materials considered and used where cost effective and no impact on engineering properties.	✓	✓	
All plant and equipment would be turned off when not in use.		✓	✓

5.2.4 Conclusion

The proposal is not likely to significantly affect the environment in relation to climate change for reasons including:

- construction related impacts would be minor and short-term,
- Ausgrid designs its network to comply with network standards and relevant Australian Standards,

- in the context of existing GHG, the proposal would result in an insignificant increase to GHG emissions,
- issues such as electricity demand and location of existing electricity infrastructure have been considered in selecting the preferred route, and
- mitigation measures outlined in section 5.2.3 would readily manage potential impacts.

5.3 Electric and magnetic fields

5.3.1 Existing environment

Electric and magnetic fields (EMF) are part of the natural environment and are present in the atmosphere and static magnetic fields are created by the Earth's core. EMF is also produced wherever electricity or electrical equipment is in use. Power cables, electrical wiring, household appliances and electrical equipment all produce EMF. Power-frequency EMF (also known as extremely low frequency, or ELF EMF) has a frequency of 50 Hertz (Hz).

An electric field is a region where electric charges experience an invisible force. The strength of this force is related to the voltage, or the pressure which forces electricity along wires. Electric fields can be present in any appliance plugged into a power point which is switched on. Even if the appliance itself is turned off, an electric field will be present if the power point is on.

Electric fields are strongest close to their source, and their strength diminishes rapidly as we move away from the source. Electric fields are shielded by most objects, including trees, buildings and human skin.

A magnetic field is a region where magnetic materials experience an invisible force produced by the flow of electricity, commonly known as current. The strength of a magnetic field depends on the size of the current (measure in amps) and decreases rapidly with increasing distance from the source. While electric fields are blocked by many common materials, this is not the case with magnetic fields.

Ausgrid's existing sources of EMF in the Eastern Suburbs area include power lines and cables. Given the underground arrangement of the existing cables, the magnetic field exposure along the majority of the route is likely to be dominated by sources within the home and the distribution network.

In terms of exposure within the home, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) advise that:

Magnetic fields within homes can vary at different locations and also over time. The actual strength of the field at a given location depends upon the number and kinds of sources and their distance from the location of measurement. Typical values measured in areas away from electrical appliances are of the order of 0.1 - 2 mG.

Typical magnetic field measurements and ranges associated with various appliances and cables are shown in Table 5-4.

Table 5-4: Magnetic field measurements and ranges associated with various appliances and cables

Magnetic Field Source	Range of Measurement (in mG)
Electric Stove	2-30
Computer Screen	2-20
Television Screen	0.2-2
Electric Blanket	5-30
Hairdryer	10-70
Refrigerator	2-5
Electric Toaster	2-10
Electric Kettle	2-10
Electric Fan	0.2-2
Street Distribution Line (directly underneath)	2-20
HV Transmission Overhead Line (directly underneath)	10-200

Source: Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), Measuring magnetic fields.

5.3.2 Potential impacts

The question of EMF and health has been the subject of a significant amount of research since the 1970s. This large body of scientific research includes both epidemiological (population) and laboratory (at both a cellular and an organism level) studies.

Research into EMF and health is a complex area involving many disciplines, from biology, physics and chemistry to medicine, biophysics and epidemiology.

EMF at levels well above the recognised international exposure guidelines can cause both synaptic effects perceived as magneto-phosphenes in the sensitive retinal tissue (magnetic fields) and micro-shocks (electric fields). The exposure guidelines are in place to protect against these biological effects.

No single study considered in isolation will provide a meaningful answer to the question of whether or not EMF can cause or contribute to adverse health effects. In order to make an informed conclusion from all of the research, it is necessary to consider the science in its totality. Over the years, governments and regulatory agencies around the world have commissioned many independent scientific review panels to provide such overall assessments.

As part of the Health and Aging Portfolio, Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) is a Federal Government agency charged with the responsibility for protecting the health and safety of people, and the environment, from EMF.

ARPANSA⁶ advises that:

“The scientific evidence does not establish that exposure to the electric and magnetic fields found around the home, the office or near powerlines causes health effects”

These findings are consistent with the views of other credible public health authorities. For example, the World Health Organization (WHO)⁷ advises that:

“Despite the feeling of some people that more research needs to be done, scientific knowledge in this area is now more extensive than for most chemicals. Based on a recent in-depth review of the scientific literature, the WHO concluded that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields.”

Similarly, the U.S. National Cancer Institute concludes that:

“Currently, researchers conclude that there is little evidence that exposure to ELF-EMFs from power lines causes leukaemia, brain tumours’, or any other cancers in children.”

“No mechanism by which ELF-EMFs could cause cancer has been identified. Unlike high-energy (ionizing) radiation, ELF-EMFs are low energy and non-ionizing and cannot damage DNA or cells directly.”

“Studies of animals exposed to ELF-EMFs have not provided any indications that ELF-EMF exposure is associated with cancer, and no mechanism has been identified by which such fields could cause cancer.”

International Commission On Non-Ionizing Radiation Protection - 2010⁸

“It is the view of ICNIRP that the currently existing scientific evidence that prolonged exposure to low frequency magnetic fields is causally related with an increased risk of childhood leukaemia is too weak to form the basis for exposure guidelines. In particular, if the relationship is not causal, then no benefit to health will accrue from reducing exposure.”

EMF health guidelines

The two internationally recognised exposure guidelines are ICNIRP and IEEE.

- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 2010, and
- International Committee on Electromagnetic Safety, Institute of Electrical and Electronics Engineers (IEEE) in the USA 2002.

ARPANSA’s advice⁹ is that “The ICNIRP ELF guidelines are consistent with ARPANSA’s understanding of the scientific basis for the protection of people from exposure to ELF EMF.”

The following table summarise the magnetic field exposure Reference Levels for IEEE and ICNIRP.

Table 5-5: Magnetic field Reference Levels at 50Hz for IEEE and ICNIRP

	IEEE 2002	ICNIRP 2010
GENERAL PUBLIC		
Exposure general	Not specified	2,000 mG
Exposure to head and torso	9,040 mG	Not specified
Exposure to arms and legs	758,000 mG	Not specified
OCCUPATIONAL		
Exposure general	Not specified	10,000 mG
Exposure to head and torso	27,100 mG	Not specified

	IEEE 2002	ICNIRP 2010
Exposure to arms and legs	758,000 mG	Not specified

Prudent avoidance

Since the late 1980s, many reviews of the scientific literature have been published by authoritative bodies. There have also been a number of Inquiries such as those by Sir Harry Gibbs in NSW¹⁰ and Professor Hedley Peach in Victoria¹¹. These reviews and inquiries have consistently found that:

- adverse health effects have not been established,
- the possibility cannot be ruled out, and
- if there is a risk, it is more likely to be associated with the magnetic field than the electric field.

Both Sir Harry Gibbs and Professor Peach recommended a policy of prudent avoidance, which Sir Harry Gibbs described in the following terms:

“... [doing] whatever can be done without undue inconvenience and at modest expense to avert the possible risk ...”

Prudent avoidance does not mean there is an established risk that needs to be avoided. It means that if there is uncertainty, then there are certain types of avoidance (no cost / very low cost measures) that could be prudent. These recommendations have been adopted by the ENA and other electricity transmission and distribution businesses

Energy Network Australia position

The Energy Networks Australia (ENA) is the peak national body for Australia’s energy networks. ENA represents gas and electricity distribution, and electricity transmission businesses in Australia on a range of national energy policy issues.

ENA is committed to taking a leadership role on relevant environmental issues including power frequency EMF. ENA and its members are committed to the health and safety of the community, including their own employees.

The ENA’s position is that adverse health effects from EMF have not been established based on findings of science reviews conducted by credible authorities. ENA recognises that that some members of the public nonetheless continue to have concerns about EMF and is committed to addressing it by the implementation of appropriate policies and practices.

ENA is committed to a responsible resolution of the issue where government, the community and the electricity supply industry have reached public policy consensus consistent with the science.

Policy statement

1. ENA recommends to its members that they design and operate their electricity generation, transmission and distribution systems in compliance with recognised international EMF exposure guidelines and to continue following an approach consistent with the concept of prudent avoidance.

2. ENA will closely monitor engineering and scientific research, including reviews by scientific panels, policy and exposure guideline developments, and overseas policy development, especially with regard to the precautionary approach.
3. ENA will communicate with all stakeholders including assisting its members in conducting community and employee education programs, distributing information material including newsletters, brochures, booklets and the like, liaising with the media and responding to enquiries from members of the public.
4. ENA will cooperate with any bodies established by governments in Australia to investigate and report about power frequency electric and magnetic fields.

Magnetic field calculations

A specialist EMF assessment was undertaken for the proposal by Aurecon (Appendix C).

WHO advise that *“In the absence of a known biophysical mechanism, which would yield a known etiologically relevant metric of exposure, the metric of choice used in most epidemiological studies has been the time-weighted average.”*

In consideration of the above, magnetic fields were calculated at the more relevant time weighted average. These were determined using the highest annual loading in the available forecast period post 2036.

The predicted magnetic field contributions from the cables and joint bays for time weighted average is displayed in Table 5-6. Two scenarios were modelled for joint bay construction as a staggered configuration will be required where existing services or constraints restrict the width.

Table 5-6: Predicted magnetic field contribution post 2036 of the new cables.

Distance from Centreline	Single Circuit Trench Time-Weighted-Average	Flat Circuit Trench Time-Weighted-Average	Flat Joint Bay Time-Weighted- Average
0m	40.7mG	80.2mG	85.3mG
10m	<2mG	2.7mG	4.6mG
15m	<1mG	<1mG	<1mG

Based on the worst case scenario within the preferred alignment window of the cables:

- The highest predicted time-weighted average magnetic field contribution directly above the cable trench is 40.7mG. This is around 2% of the relevant ICNIRP general public exposure guideline level of 2000mG. At a distance of 10m from the centreline, the field contribution is predicted to reduce to a negligible level.
- In highly localised areas above the joint bays, the highest predicted time-weighted average magnetic field contribution directly above a staggered joint bay is 85mG. This is less than 5% of the relevant general public exposure guideline level. At a distance of 10m from the joint bays, the field contribution is predicted to reduce to around 4.6mG, which is less than 0.3% of the relevant general public exposure guideline level.
- A review of the completed detailed survey plan of the preferred route alignment indicates that there are no dwellings within 10m of the cable. Similarly, there are no dwellings within 15m of a joint bay location.

Cumulative impact

Adding magnetic fields from multiple sources is a complex and dynamic exercise. In the residential environment there is a multitude of sources such as existing power lines, service lines, household wiring, appliances and water pipes. Each of these sources has a unique magnetic field profile which changes over time depending on the nature of the source and load it is carrying. This is further complicated by the fact that magnetic fields are vectors that have direction as well as size.

While attempting to define the exact field at a particular point in time is therefore problematic, it can be shown that the addition of two magnetic fields with random orientation is slightly less than the root-sum-of squares. In practice this means that one field has to be only slightly larger than the other to dominate the average result. For example, if one field is half the size of the other field, it makes only a 10% difference to the total. For this reason, it is common practice when calculating fields from a cable (where this is the dominant source), to calculate the field from the cable and ignore other sources.

The predicted time weighted average magnetic fields at the nearest part of the residences from the cables are within the range of typical background levels. As such, exposure within the residences along the route will in many cases be dominated by existing sources within and around the home.

Cumulative impact considerations do not change the conclusions that the project will comply with relevant guidelines and the principles of prudent avoidance.

5.3.3 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 5-7.

Table 5-7: EMF mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
Implement no cost and very low cost measures to reduce magnetic field exposure, including where relevant: <ul style="list-style-type: none"> • using a compact phase configuration (e.g. trefoil), and • using optimum phase arrangement, and • allowing for spare conduits, where installed to be arranged in the optimal phase arrangement, namely inverted trefoil. 	✓	✓	
Within the carriageway locate cables to minimise exposure as far as reasonably practicable (with potential increased temporary construction impacts).	✓	✓	

5.3.4 Conclusion

The proposal is not likely to significantly affect the environment in relation to EMF for reasons including:

- the proposal would meet all relevant International health guidelines, including the, ICNIRP Guideline, and IEEE Standard,

- Ausgrid is proposing a number of mitigation measures (outlined in section 5.3.3) which will substantially reduce the magnetic field exposure,
- the proposed mitigation measures are consistent with the prudent avoidance and precautionary policies and advice of the ENA, ARPANSA and WHO, and
- the predicted time weighted average magnetic field levels from the cables is less than 1mG for all residential dwellings along the route

5.4 Noise and vibration

5.4.1 Existing environment

The normal day time noise and vibration environment near the proposed route is primarily influenced by traffic flows, local fauna, nearby train lines, aircraft and industry.

The existing environment is characterised by a mix of commercial, light industrial, recreational areas and residential receivers.

Apart from residences potential sensitive receivers proximate to the route include a school and childcare centre on Botany Road south of Harcourt Parade.

The construction route is required to cross or travel on;

- Gardeners Road,
- O’Riordan Street,
- Botany Road,
- Southern Cross Drive, and
- Bunnerong Road.

These are roads which are TfNSW (formerly RMS) classified and/ or regionally classified roads. Ausgrid are required to consult with and obtain relevant occupancy licenses from the Transport Management Centre prior to the commencement of works on these roads.

5.4.2 Potential impacts

Noise during construction

*The Interim Construction Noise Guideline (ICNG)*¹² outlines that a quantitative assessment must be undertaken where works are likely to affect an individual or sensitive land use for more than three weeks in total.

The construction work required for this proposal would be highly transitory in nature. It is unlikely that construction works would occur for greater than a three week period in any given location. Thus, a qualitative assessment is sufficient for this proposal. The ICNG makes provision for a qualitative assessment. A qualitative Noise Management Plan would be required to be developed by the contractor as part of their Construction Environmental Management Plan (CEMP), refer to Section 8.1. Further discussion with the successful contractor would be required during the detailed design phase as to whether HDD works require a more detailed quantitative assessment.

Noise generating activities include trenching to install conduit, installation of cable, jointing activities and reinstatement of roadway at the completion of works. The

majority of the works will be undertaken during standard operating hours. The crossing of an working on TfNSW roads will be under relevant Road Occupancy Licence (ROL). This work will likely be undertaken as night work (8pm – 5am). Refer to Section 1.8.9 for timing and work hours. Table 5-8 and Table 5-9 below identify noise impacted receivers for both standard and out of hours works.

Table 5-8: Noise impacted receivers - standard operating hours

Standard activities	Residential and commercial properties within 40m of the construction site
High impact activities	Residential and commercial properties within 100m of the construction site

Table 5-9: Noise impacted receivers - out of hours

Standard activities	Residential properties within 150m of the construction site Commercial properties operating out of hours within 150m of the construction site
High impact activities	Residential properties within 250m of the construction site Commercial properties operating out of hours within 250m of the construction site

The identification of sensitive receivers would be governed by the pre-defined noise catchment areas outlined in Table 5-8 and Table 5-9 and may include places of worship, schools and daycare centres, medical centres other businesses or homes operating as workplaces. Specific community analysis during the construction phase is required to effectively identify the majority of these receivers. Once these receivers are identified, construction works are to consider reasonable and feasible measures look to mitigate impacts. For example, scheduling construction work adjacent to schools, churches and daycare centres during school holiday periods. The contractor would be required to reasonably liaise with identified sensitive receivers with due regard to minimising impact to their operations.

Trenching and joint pit construction have the potential to result an adverse noise impact. Best practice would be to perform such high noise activities during certain hours of the day when background noise is highest to minimise noise impact and potential for sleep disturbance. Pre-cast joint pits are to be utilised for joint bays which reduces the time for construction. A generator would be required at each joint bay for the duration of jointing work. At these locations, a generator may be operational 24/7 for a period of up to two weeks.

Other construction equipment is unlikely to create significant noise impacts and consultation would occur throughout the construction phase to manage noise issues. This may require the adoption of noise barriers as outlined in Section 5.4.3

Vibration during construction

Vibration impacts are anticipated to be less than one week in duration at any one location and as such, best management practice applies during the construction process. Designs indicate that excavation works would be more than 10m from dwellings and most structures for the duration of the works. Condition reports of structures are required within five metres of vibration generating works.

Noise and vibration during operation

Once operational, the cable would not contribute any additional noise or vibration to the surrounding environment.

5.4.3 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 5-10.

Table 5-10: Noise and vibration mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
Comply with sections 4.2 of NS174C Environmental Handbook.		✓	
The contractor is to identify the presence of sensitive receivers within each pre-defined noise catchment area and consider all reasonable and feasible measures to minimise impact on these receivers.	✓	✓	
All workers to be made aware of the presence of sensitive receivers in the area the need to avoid impacts.		✓	
Provide at least four clear business days notice to affected receivers prior to starting work unless it is emergency works or it is discussed with the affected receivers face-to-face. Include the following information in notification letters: <ul style="list-style-type: none"> a description of the works and why they are being undertaken details of the works that will be noisy work hours and expected duration what is being done to minimise the impacts (eg respite periods) 24 hour contact number.		✓	
Consult with any affected sensitive receivers (eg schools, restaurants, hospitals, childcare, etc)	✓	✓	
Plan the site layout to minimise movements that would activate audible reversing and movement alarms.	✓	✓	
Provide respite periods for affected receivers: <ul style="list-style-type: none"> one hour respite after every three consecutive hours of high impact activities one day respite after every three consecutive days of high impact activities.		✓	
Do not affect a receiver for more than two nights in a one week period.		✓	

Mitigation measures	Implementation of mitigation measures		
Due to unavoidable work requirements or due to a regulatory licence requirement (eg RMS) out of hours and/or night works may be required.	✓	✓	
Where the ROL stipulates out of hours work the works must meet the requirements of NS174C Environmental Handbook, out of hours work criteria or a site specific noise management plan.	✓	✓	
Develop and comply with a Construction Noise and Vibration Management Plan where works are likely to exceed three weeks in duration at one location or a certain receiver or cause offensive noise within a sensitive area or where high impact activities would be required. The NVMP must be in accordance with the Interim Construction Noise Guidelines (NSW DECC, 2009).	✓	✓	
For out of hours work, consider notifying local council.	✓	✓	
Provide information via a free call 1800 number, email address and Ausgrid's website for people wanting more information.	✓	✓	
Provide signage outside the worksite detailing who is undertaking the works and a 24 hour contact number.		✓	
Have a documented complaints process, including an escalation procedure so that if a complainant is not satisfied there is a clear path to follow	✓	✓	
Keep a register of any complaints, including details of the complaint such as date, time, person receiving complaint, complainant's contact number, person referred to, description of the complaint, time of verbal response and timeframe for written response where appropriate.		✓	
Undertake condition reports of structures that may be at risk of vibration generating works.	✓	✓	
Reinstate joint bays as soon as practicable to minimise the time that road plates are left in place.		✓	
Once installed pits lids must not rock and make noise. Impact absorbing material must be installed between pit lids to prevent noise nuisance as a result of joint pits.		✓	
Recess road plates flush with the road surface when not in use for more than 2 nights on high traffic (namely, TfNSW) roads and all joint bay locations.		✓	
Comply with the attached Construction Noise and Vibration Management Plan.	✓	✓	

Mitigation measures	Implementation of mitigation measures		
Pre-cast joint bays are to be utilised to reduced timing of construction. If joint bay construction is take more than three weeks a quantitative noise assessment in accordance with the ICNG will be required at each location.	✓	✓	
Mains supply should be used at joint bays were practicable. Where mains supply is not reasonable, low noise generators are to be used at joint bays and accompanied with noise barriers surrounding the generator, which are; <ul style="list-style-type: none"> • positioned close to the noise source • continuous with no gaps, • break the line of sight between the source and receiver, and constructed of material sufficient to dampen or reduce noise from the source.		✓	
Construction works should adopt Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) practices as addressed in the ICNG. BMP includes factors discussed within this report and encouragement of a project objective to reduce noise emissions. BATEA practices involve incorporating the most advanced and affordable technology to minimise noise emissions.	✓	✓	

5.4.4 Conclusion

The proposal is not likely to significantly affect the environment in relation to noise and vibration for reasons including:

- the construction would be temporary and transitory,
- potential noise impacts would be in accordance with the OEH ICNG,
- potential vibration impacts would comply with the OEH *Assessing Vibration: A Technical Guidelines* (2006), and
- mitigation measures outlined in section 5.4.3 would readily manage potential impacts.

5.5 Air quality

5.5.1 Existing environment

No air quality monitoring has been undertaken specifically for the proposal, however DPE operates a comprehensive air quality monitoring network comprising sites throughout the State, with particular focus on the main population centres of Sydney, the lower Hunter and the Illawarra.

Key air pollutants as identified under the National Environment Protection Measure for Ambient Air Quality include: carbon monoxide, nitrogen dioxide, lead, sulphur dioxide,

photochemical smog and fine particles. Photochemical smog (as ozone) and, to a lesser extent, fine particles remain significant issues in NSW.

Air pollution includes emission of odours, smoke, fuel or any other substances to the air. There are many substances in the air which may impair human health as well as the health of plants and animals or reduce visibility. Impacts from pollutants are governed by the intensity of pollutant discharges, type of discharges and the prevalent weather conditions.

The existing (background) air quality environment is highly influenced by the urban and commercial activities occurring in the vicinity of the proposal. Influences of existing air quality include emissions from transportation, major industry, commercial operations and domestic activities. There are no major industrial sources of air emissions in the vicinity of the proposal.

5.5.2 Potential impacts

Direct potential impacts from the proposal to the local air quality would be limited to dust and emissions from vehicles, plant and equipment generated during the construction and to a lesser extent the operational phases. Given the nature of the works, it is unlikely that there would be an odour impact.

Exhaust emissions are likely to include nitrogen oxides, carbon monoxide, sulphur oxides, hydrocarbons and total suspended particulates. All equipment would be fitted with approved exhaust systems and maintained to keep vehicle exhaust emissions within accepted standards.

Activities that may generate dust include wind erosion of exposed surfaces, movement of topsoil during excavations and disturbance of stockpiles, movement of vehicles and equipment over unsealed roads, trenching, boring, saw cutting, rock breaking and site preparation works.

During construction the work site would be transitory in nature with the excavation and backfilling works progressing down the length of the trench. During the operational phase if faults occur on the cables a small work site would be established to excavate, uncover and repair the fault.

Ausgrid's internal guidelines require an erosion and sediment control plan (ESCP) or soil and water management plan (SWMP) for construction works where soil disturbance is greater than 250 m². The ESCP must be produced in accordance with the 'Blue Book'¹³. The site would be inspected for compliance with the ESCP during the construction phase. During the operational phase works would comply with the erosion and sediment control measures detailed in section 2.2 of NS174C Environmental Handbook.

Impacts to air quality would be predominantly associated with construction activities. A number of mitigation measures (described in section 5.5.3) would be implemented to ensure the amount of dust and emissions generated is minimal and would not affect the surrounding environment.

5.5.3 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 5-11.

Table 5-11: Air quality mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
Comply with sections 2.1 Erosion and sediment control and 4.1 Air of NS174C Environmental Handbook		✓	
All workers to be made aware of the presence of sensitive receivers in the area and the need to avoid impacts.		✓	
Use water sprays to dampen (but not saturate) disturbed surfaces and stockpiles, at material transfer points and during construction and demolition.		✓	
Visually monitor dust levels during works. If dust is leaving site, causing a safety issue or complaints are received suspend works and consider mitigation options and/or substitute with an alternate process.		✓	
Use dust collection devices (such as vacuum) on construction and rock breaking equipment where available.		✓	
Minimise stockpiling on site. All spoil to be tipped into a truck or skip bin.		✓	
Position vehicles and equipment where the fumes will least affect receivers, where practicable.		✓	✓
Do not leave vehicles or equipment idling when they are not needed.		✓	✓

5.5.4 Conclusion

The proposal is not likely to significantly affect the environment in relation to air quality for reasons including:

- construction related impacts would be minor, localised and short-term,
- once in operation, the proposal would have no impact on air quality, and
- mitigation measures outlined in section 5.5.3 would readily manage potential impacts.

5.6 Hydrology

5.6.1 Existing environment

The proposal traverses two important waterways in the southern Sydney region including;

- Alexandria Canal, and
- Mill Stream

Alexandria Canal is a highly modified concrete lined waterway that flows south into the Cooks River before exiting into Botany Bay. Similarly, Mill Stream is formed via the

upstream catchments of Botany Dam's, The Australian Golf Club and further to the north, Centennial Park. Mill Stream too flows into Botany Bay.

The proposal would cross Alexandria Canal via the existing formed bridge- Campbell Road Bridge. Cables would utilise existing conduits already in place on the bridge.

The proposal would cross along the northern portion of Gardeners Road in proximity to The Australian Golf Club. This portion of the route would include a mix of open trenching and HDD techniques.

Two studies across the project area have identified the proposed route to traverse land that is classified as flood prone;

- Alexandria Canal Catchment Flood Study, and
- Cooks River Flood Study

These areas are largely restricted to the City of Sydney LGA but rather a function of the defined scope of the studies rather than the potential region impacted across the study area.

Based on the identified hydrological conditions, groundwater underlying the site is expected to flow in a southerly direction towards Botany Bay. The nature of the underlying geology and topography is expected to influence the movement of groundwater.

A Geotechnical Investigation has been completed for the project by *Alliance Geotechnical and Environmental Solutions* (Refer to Appendix D). Groundwater was encountered in three of the eight boreholes during the site investigations at depths where it is likely to be encountered during works:

- BH01 in Burrows Road, Alexandria at a depth of 0.9m
- BH02 in Campbell Road Bridge, Alexandria at a depth of 1.8m, and
- BH07 in Harcourt Parade, Rosebery at a depth of 0.9m

5.6.2 Potential impacts

Trenching work would cause surface disturbance to the route during the initial phases of construction, creating potential for erosion and sedimentation of waterways. During and after wet weather, dewatering may be required to allow work to continue. Onsite treatment of the water would be undertaken to remove sediment from the water. A dewatering plan would be developed as part of the Construction Environmental Management Plan.

At the conclusion of earthworks all exposed soil surfaces would be stabilised. This would ensure that there would be no long term erosion or sediment impact. Where possible this stabilisation would happen progressively during construction.

The proposal does not require an increase in hardstand areas or need to change topographic features, therefore local drainage flows or impacts to flood prone land would not be altered.

Groundwater

Groundwater is likely to be intercepted during excavation in proximity to those locations outlined in Section 5.6.1 above and likely during HDD works. The proximity of some of the lower lying levels would indicate that groundwater levels may fluctuate with tidal

levels. Where groundwater would be intercepted a dewatering licence under the *Water Act 1912* or *Water Management Act 2000* may be required. Such a licence would not be required during the operation of the proposal.

Perched groundwater caused by surface water seepage through sands may be expected to occur at the interfaces of alluvial soils and the highly weathered sandstone bedrock profile. Some seepage can also be expected along defects in the bedrock after adverse weather conditions and following periods of heavy rainfall. During construction, any surface water seepage would need to be appropriately managed, either being discharged on site or removed via tanker. Refer to Table 5-9: Hydrology quality mitigation measures below.

Water quality in the study area may be affected by spills of hydraulic oil and fuels from equipment or vehicles. Quantities of these products would be kept to a minimum and would be stored in a suitably bunded and covered area. Adequate storage and refuelling controls would be installed to mitigate impacts. Plant and equipment would also be maintained to minimise the potential for leakages.

Frac-Out Management Plan

Directional drilling requires a Frac-Out Management Plan (FOMP). Where the risks of a Frac-out are deemed high (environmentally sensitive area and/ or poor soil conditions), the FOMP may need to be prepared in consultation with technical experts and/or geotechnical engineers.

As a minimum, the FOMP would include measures to;

- monitor and control drilling fluid pressure,
- utilise inert biodegradable drilling fluids where practical to lower environmental risk,
- track the location of the drill head to target and respond to any potential frac outs immediately
- ensure incident response procedures (See Section 9 of NS174C) are effectively in place for the project and are relative to the risk(s) identified, and
- the exit of the drill head at the receive hole is planned and in a controlled environment where all drill fluids are contained, controlled and recovered from a designated work area.

The proposed works include the retirement of an existing fluid-filled 132kV underground cable between Alexandria and Kingsford, see Section 1.8.5. This will involve cutting, capping and making the cable safe; draining any free fluid from the cable and purging with nitrogen; and removal of any underground and aboveground fluid tanks.

A Fluid Filled Cable Decommissioning Plan will be required. This will assess the route for high risk (environment) locations and consider the need for additional works, such as installing additional drainage points. The Decommissioning Plan will detail the control measures required to be implemented during draining/purging to contain cable fluid.

5.6.3 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 5-12.

Table 5-12: Hydrology quality mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
Comply with sections 2.1 Erosion and sediment control, 2.3 Oil fuel and chemicals and 2.2 Water discharge of NS174C Environmental Handbook.		✓	
All workers to be made aware of the presence of sensitive areas and the need to avoid impacts.		✓	
Maintain sediment controls consistent with environmental conditions, especially during periods of rainfall.		✓	
Remove temporary erosion and sediment controls as the site is stabilised or rehabilitation is complete		✓	✓
All spoil to be tipped into a truck or skip bin. Any stockpiling on site is to be in consultation with Ausgrid.	✓	✓	
Contain slurry using a wet-vac.		✓	
During construction, any encountered groundwater would require additional testing to be undertaken, the development of a Water Quality Management Plan and advice sought on the need for a dewatering license.		✓	
During construction, any surface water seepage would need to be appropriately managed, either being discharged on site or removed via tanker. Refer to Ausgrid's NS174C for dewatering criteria.	✓	✓	
Prior to the commencement of any HDD work, develop a Frac-out Management Plan consistent with the complexity of the bore and sensitivity of the environment, refer to Section 5.6.2 for minimum requirements.		✓	
Store oil in a bund unless it is temporary storage in accordance with NS174C.		✓	✓
Ensure a spill kit is readily available and workers know how to use it.		✓	✓
Decommissioning of fluid filled cables and fluid tanks will be conducted in accordance with Fluid Filled Cable Decommissioning Plan and NS156. Ongoing management of decommissioned cables in accordance with Ausgrid Procedures.		✓	✓

5.6.4 Conclusion

The proposal is not likely to significantly affect the environment in relation to hydrology for reasons including:

- construction related impacts would be minor, localised and short-term,
- once in operation, the proposal would have no impact on hydrology,
- potential hydrology impacts would comply with the Blue Book, and
- mitigation measures outlined in section 5.6.3 would readily manage potential impacts.

5.7 Geology and soil

5.7.1 Existing environment

The New South Wales Seamless Geology dataset, version 2.1 published by the Geological Survey of New South Wales indicates that the western extend of the site is underlain by Estuarine deposits which may contain fine- to medium-grained lithic-carbonate-quartz sand (marine-deposited), silt, clay, organic mud, peat, gravel, and shell material. The central to eastern extend of the site is underlain by Coastal deposits – dune facies characterised by marine-deposited and aeolian-reworked coastal sand dunes.

Preliminary site investigations included the drilling of twenty boreholes using a drilling rig. Each borehole was advanced from between 2m along standard excavation techniques to 10m below ground level in areas of proposed HDD work, refer to Section 1.8.3.

In general terms, uncontrolled filled underlain by sandy soils grading to sandy clays are likely to be encountered across the route entirety. A detailed summary of soil profiles encountered during preliminary investigations can be found in Appendix D.

Groundwater was only informally encountered at several of the boreholes at a depths of between 0.9m to 6.2m below ground level. It should be noted that groundwater conditions are subject to seasonal variations and major weather events (i.e. prolonged rainfall). Additional limited groundwater sampling was undertaken in BH01 in Burrows Road, Alexandria. Groundwater at this location is expected to be tidal. Refer to the Limited Groundwater Assessment in Appendix D.

Ausgrid's WebGIS Environment Layers indicate that the proposal is partially located in an area where Acid Sulphate Soils (ASS) are likely to occur. As such, the further assessment of ASS, PASS or sulfidic ore risk is considered warranted for sampling points BH01, BH02, BH05, BH06, BH07, BH11, BH12, BH13 and BH22 Potential impacts. Refer to the Preliminary Waste Classification in Appendix D

The construction of the proposal would cause some minor soil instability. There would be less than 250 m² of soil disturbed at any one time, which would be placed directly into trucks and removed from site. Therefore an ESCP has not been prepared.

Excavation through road pavement, fill, and sands are expected to be readily achievable using conventional earthwork equipment such as a tracked excavator with tiger-tooth bucket. The construction related vibrations are expected to be negligible. Generally, the peak particle velocity during any demolition, excavation, and construction should be limited to 5mm/s.

Groundwater was encountered during the site investigations in the HDD section across Southern Cross Drive and Bunnerong Road and adjacent to Alexandria Canal. Significant groundwater inflow may occur where the trench excavations intersect with granular fill material surrounding or at the surface of existing services. Groundwater encountered in such circumstances may be contaminated and require specialist treatment for disposal.

Additional limited groundwater sampling was undertaken in BH01 in Burrows Road, Alexandria. No sheen or odour were observed in the samples collected. However, there were exceedances for Copper and Petroleum Hydrocarbons. Whilst deemed acceptable for discharge as trade waste, additional advice would be required prior to

any off-site discharge to stormwater. Refer to the Limited Groundwater Assessment in Appendix D.

During the operational phase if faults occur on the cables a small worksite would be established to excavate, uncover and repair the fault. During operational phase work would comply with the erosion and sediment control measures detailed in NS 174C Environmental Handbook.

Construction access from Harcourt Parade to Southern Cross Drive Reserve may be required to facilitate HDD activities. Where this is the case, construction access and management would form part of the successful construction contractors CEMP and be subject to suitable reinstatement in consultation with Ausgrid, Council and/ or TfNSW.

5.7.2 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 5-13.

Table 5-13: Geology and soil mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
Comply with section 2.1 Erosion and sediment control of NS174C Environmental Handbook.		✓	
All workers to be made aware of the presence of sensitive areas and the need to avoid impacts.		✓	
Concerning Southern Cross Drive Reserve, design access tracks and undertake their maintenance in accordance with <i>Managing Urban Stormwater Volume 2C Unsealed Roads</i> and <i>Erosion and sediment control on unsealed roads – A field guide for erosion and sediment control maintenance practices</i> .	✓	✓	✓

5.7.3 Conclusion

The proposal is not likely to significantly affect the environment in relation to geology and soil for reasons including:

- the construction would be temporary, localised, short term and transitory
- reinstatement works would stabilise the proposed route once construction is complete
- once in operation, the proposal would have no more than a minor impact on geology and soil
- mitigation measures outlined in section 5.7.3 would readily manage potential impacts.

5.8 Contamination

5.8.1 Existing environment

A desktop assessment of the study area showed the land adjacent to work areas is predominately comprised of low to medium density residential as well as commercial

industrial. There are no registered contaminated sites within the study area likely to present significant risk of harm.

Potential sources of contamination of the study area are outlined below in Table 5-14 but may also include other petrol stations, dry cleaners, mechanics or manufacturing facilities which are present along the route. Online searches indicate potential for uncontrolled filling, former commercial / industrial sites adjacent to the proposed alignment.

The area is also mapped on Ausgrid's Web GIS EL as potentially containing Class 3 Acid Sulfate Soils from Burrow's Road to Gillespie Avenue, Alexandria. Class 3 soils are typically found from a depth of 1m in typically anoxic environments.

Table 5-14: Sites mapped as potentially contaminated in proximity to the proposal

Site	Address	Regulated
Burrows Road	Adjacent to Transgrid's bulk supply point	Not notified
Australian Refined Alloys	202-212 Euston Road, Alexandria	Not required
Mascot Developments	494-504 Gardeners Road, Alexandria	Not required
Sydney Water Corridor between Gardeners Road and Coward Street, Mascot	Adjacent to Ausgrid's existing Mascot zone substation at the corner of Gardeners Road and O'Riordan Street	Via a Construction Environmental Management Plan – Asbestos Capping Sydney Water bike corridor
Coles Express Service Station Kingsford	58 Gardeners Road, Kingsford	Not Required

There is the potential for the existing fluid-filled cables and pilot cables to have been treated with Organochlorine pesticides (OCPs). Soils around the existing fluid-filled cables may be contaminated with OCPs. There is very limited potential for exposure to the public from OCP contamination in soils, while the soils remain in-situ in the cable trench. This is mainly due to the higher concentrations of OCPs in soils being within the cable trench at depth, under a concrete protective slab and the majority of the cables being laid under roads. There may be minor localised areas where OCPs have mobilised in the soil if excavations for fault repairs have previously occurred on the cables. OCPs are strongly absorbed to soils, have very low solubilities in water and are unlikely to be leached from the undisturbed in-situ soil into groundwater.

There is no known contamination along the preferred cable. Given the nature of the project in relation to the surrounding environment, a Stage 2 Detailed Site Investigation was not required.

5.8.2 Potential impacts

Except for some recent works undertaken by Ausgrid in Burrow's Road which uncovered contamination, there is no evidence that other parts of the route are contaminated. However, those areas as identified in Table 5-14 above should be approached with caution. Indicators of contamination may be found at these locations or in general proximity to commercial industrial premises. The contractors CEMP should highlight these locations and provide a reminder for intrusive workers to be vigilant in their assessment of identified potential contamination consistent with NS174C at locations deemed to be high risk or where there is a known history of contamination.

Results from trial hole investigations would be used to ensure excavated spoil is appropriately classified and managed with respect to waste management requirements.

If asbestos is encountered in soil or old conduits or joint bays during construction, the works would cease, access restricted and the asbestos managed and disposed of in accordance with NS211 Working with Asbestos Products and DECC's Waste Classification Guidelines.

Similarly, if Acid Sulfate Soils are encountered, the work would need to be undertaken consistent with NS174C. Alternatively, prepare and comply with a site-specific ASS Management Plan (ASSMP). The ASSMP would be required for excavations in confirmed areas of ASS (this may require preliminary POCAS testing) which are;

- Disturbed at greater than 50m³ in any one instance,
- Discharging water in ASS, or
- Affecting the water table.

Any ASSMP would form part of the CEMP prepared prior to construction.

Soil quality may be affected by spills of hydraulic oil and fuels from equipment or vehicles. However, the extent would be localised and appropriate controls would minimise the potential for contamination to occur. Quantities of these products would be kept to a minimum and would be stored in a suitably bunded and covered area. Adequate storage and refuelling controls would be installed to mitigate impacts. Plant and equipment would also need to be maintained to minimise the potential for leakages. Any accidentally contaminated soil would be excavated, stockpiled, chemically classified for disposal and transported to an appropriately licensed waste facility.

The removal of sections of fluid-filled feeders and fluid tanks and the draining and capping of the sections of feeders left in situ would result in a positive impact on the environment from the proposal by reducing the risk of future leaks.

Soils around the existing fluid-filled feeders would be assumed to be contaminated with OCPs unless sampling proved otherwise. Sampling may be undertaken to determine the presence of OCPs. Any sampling would be undertaken from below the protective slabs. If soils are not contaminated with feeder fluid (or anything other than OCP) they would be replaced in the trench to original depths where possible. Otherwise they would be classified in accordance with the NSW DECC's Waste Classification Guidelines and disposed of to a licensed waste facility. Testing for OCPs would be undertaken on any sections of the fluid-filled feeders and pilot cables being removed and they would be handled and disposed of accordingly.

If unexpected contamination is identified during construction, the works would cease, access restricted and the Environmental Officer contacted to determine the nature and extent of the contamination.

5.8.3 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 5-15.

Table 5-15: Contamination mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
Comply with section 5.1 Contamination of NS174C Environmental Handbook.	✓	✓	✓
The final trench design to facilitate cabling through Burrows Road is to remain shallow as possible whilst still maintaining Ausgrid's specification requirements.	✓	✓	
Intrusive workers to remain vigilant in their assessment of identified potential contamination consistent with NS174C at locations deemed to be high risk or where there is a known history of contamination. See also Appendix D.		✓	✓
Segregate suspected contaminated spoil from clean spoil to reduce disposal costs.		✓	
Undertake testing to determine the waste classification and subsequent storage, transport, tracking, licensing and disposal requirements.	✓	✓	
Provide a secure and bunded area for the storage of fuel, oil or chemicals. This area would be imperviously bunded with a capacity to contain not less than 110% of the volume of the largest container.		✓	
Temporarily store excavated known or suspected contaminated spoil in a covered, lined/ sealed skip or bulk storage bag or sealed container on-site for classification prior to disposal off site. Where there are site restrictions for on-site storage, store offsite. If storing more than 5 tonnes of spoil, use a licensed storage facility. There may also be a requirement for having a licence to transport the spoil (there are exemptions for Ausgrid staff).		✓	
If you think that you have found contamination, you must stop work immediately, restrict access and notify: <ul style="list-style-type: none"> • your supervisor, • Ausgrid's Environmental Services, and • your local safety advisor for WHS requirements. 		✓	
Bedding sands around the 132kV fluid filled cables may contain Scheduled Pesticides (Organochlorine Pesticides). Comply with NS 156 when working near or around underground cables.		✓	✓
Soil excavated from Ausgrid's 132kV fluid filled cable trenches must be contained in a plastic lined and covered secure bin to prevent water ingress or dust escape.		✓	✓
If the soil is not contaminated with cable fluid (or anything other than OCP) it can be replaced in the trench to original depths. Soil excavated from the below the protective slab must be reinstated below the protective slab.		✓	✓

Mitigation measures	Implementation of mitigation measures		
If soil from below the slab of existing 132kV cable trenches is not contaminated with anything other than OCP, reinstate it below the slab.		✓	✓
<p>If soils from below the slab of existing 132kV cable trenches is contaminated with substances other than OCP:</p> <ul style="list-style-type: none"> • do not reinstate the soil in the trench and assume the soil is hazardous waste until it is classified, • wear appropriate PPE, • transport using a licensed transporter to a premises licensed to store the contaminated soil, • arrange for classification of the soil, and • dispose of the soil offsite in accordance with the classification 		✓	✓
<p>When transporting soil where the concentration of Aldrin or Dieldrin in the soil is 5-mg/kg or greater, or the presence has not been ruled out, the following additional controls apply:</p> <ul style="list-style-type: none"> • The transport vehicle must carry personnel trained in containing spills of OCP contaminated spoil, and • Appropriate PPE, clean up material and equipment must be carried on the transport vehicle. 		✓	✓
Any person handling the waste is trained in handling Scheduled Chemicals and methods of containing Scheduled Chemical spills and wears Personal Protective Equipment (PPE).		✓	✓
All packages / storage containers are clearly labelled and maintained in good order.		✓	✓
Provide a secure, lockable and floored area for the storage of fuel, oil or chemicals. This area would be imperviously bunded with a capacity to contain not less than 110% of the volume of the largest container.		✓	
Prior to construction, nominate and sign post a plant refueling area.	✓	✓	
If asbestos is encountered in soil or old conduits or joint bays during construction, the works would cease, access restricted and the asbestos managed and disposed of in accordance with NS 211 Working with Asbestos Products and NSW EPA Waste Classification Guidelines 2014.		✓	✓
Where the soil contains contaminants such as cable fluid, spoil should be disposed off-site to a suitably licensed waste facility. The waste must be classified in accordance with the NSW EPA Waste Classification Guidelines. The sampling must include OCPs.		✓	✓

Mitigation measures	Implementation of mitigation measures		
An ASSMP (where confirmed to be required) would need to be prepared by a specialist (i.e. who has prior experience in developing an ASSMP in accordance with the Acid Sulfate Soils Assessment Guidelines 1998; ASSMAC).	✓	✓	

5.8.4 Conclusion

The proposal is not likely to significantly affect the environment in relation to contamination for reasons including:

- there is no known contamination along the route / on the site,
- the contamination would be managed in accordance with relevant DPE contamination guidelines, and
- mitigation measures outlined in section 5.8.3 would readily manage potential impacts.

5.9 Waste

5.9.1 Existing environment

The preferred route is currently unoccupied and as such there is no waste being generated.

5.9.2 Potential impacts

The proposal may generate various types of waste, some would be reused or recycled while others would require disposal. Most waste would be generated during the construction phase. Waste likely to require disposal includes:

- bitumen, concrete and asphalt as a result of removal of existing hard surfaces,
- excavated earth material that is unsuitable for re-use,
- waste oils, liquids and fuels from maintenance of construction plant and equipment,
- wastes from site compounds (including sewage waste, putrescible waste etc),
- building waste (packaging material, scrap metal, plastic wrapping, cardboard),
- excess building materials that can't be reused,
- vegetation from clearing activities,
- cable and conduit off-cuts,
- timber cable drums,
- timber pallets,
- redundant equipment, and
- other general construction waste.

All waste would be re-used where possible, otherwise managed in accordance with the *NSW Waste Classification Guidelines*.

Trenching, excavation and boring will generate waste spoil for disposal. Pre-classification in-situ has been undertaken for the route.

Preliminary Waste Classification was undertaken by *Alliance Geotechnical and Environmental Solutions* for the cable route (Refer to Appendix D). The investigation was undertaken to provide an indicative assessment of the cable route and comprised twenty-two waste classification samples, providing the following observations;

- Fill materials are predominately to have a General Solid Waste classification,
- Spoil at selected depths through BH06, BH09 and BH16, subject to further assessment and delineation may be considered Hazardous Waste,
- Similarly, fill materials at depth through BH17, subject to further assessment and delineation may be considered Restricted Solid Waste,
- Natural materials identified across the route, subject to further assessment and delineation may be classified as either Virgin Excavated Natural Material (VENM), General Solid Waste (recyclable), or General Solid Waste (non-putrescible), and
- Failing any further assessment, natural materials through BH01-BH07 should be classified as General Solid Waste (non-putrescible)/ Untreated Acid Sulfate Soils.

Asbestos containing materials (ACM) were found in soils during investigations within BH02 at the eastern side of Alexandria Canal where existing installed conduits would be utilised. Although not identified at other locations, the linear nature of the project means the presence of asbestos in soils along the proposed alignment cannot be precluded.

Any soil identified as virgin excavated natural material (VENM) or excavated natural material (ENM) would be reused where possible. Known reuse sites with the conditions of the planning approval to accept fill should be explored in discussions with Ausgrid. Any excess soil would be disposed of at an appropriately licensed facility or recycled through an appropriately licensed soil recycler.

Any soil suspected of being contaminated would be stored and sampled separately then disposed to an appropriately licensed waste facility (refer to section 5.9.3).

During operation of the proposal, waste generation would be minimal.

5.9.3 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 5-16.

Table 5-16: Waste mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
Comply with section 5.3 Waste management of NS174C Environmental Handbook.		✓	
Classify wastes to determine licensing, waste tracking and disposal requirements.		✓	
Segregate and label waste to improve recycling opportunities, avoid cross contamination and reduce disposal costs.		✓	

Mitigation measures	Implementation of mitigation measures		
Where possible, reuse or recycle or return to the supplier wastes including metal components, transformer oil, spoil and packaging.		✓	✓
Reuse VENM and ENM where options are available. Ensure that: <ul style="list-style-type: none"> • a valid waste classification certificate is available and • the reuse meets the conditions of the planning approval for that site. 		✓	
Where more than 50kg but less than 1 tonne of Scheduled Chemical Waste (SCW) is stored, ensure that: <ul style="list-style-type: none"> • there is a clearly defined storage area with conspicuous warning notices • the storage area is constructed to prevent discharge into the external environment. This can be satisfied by storing in a plastic lined and covered bin • an adequate supply of PPE, clean-up material and equipment must be available in a secure external location from the storage area. 		✓	
Where more than 1 tonne of SCW is stored: <ul style="list-style-type: none"> • a licence is required to store the waste. • comply with the conditions of the licence • perform monthly inspections for unauthorised entry or leakage and keep a log at the storage area containing details and reports of inspections. 		✓	
When transporting SCW with a concentration of more than 50mg/kg, personnel accompanying the vehicle must: <ul style="list-style-type: none"> • be trained in methods of containing spilled scheduled chemicals • be provided with adequate personal protective equipment, clean up material and equipment to deal with any spill • notify the EPA of any spill. 		✓	

Mitigation measures	Implementation of mitigation measures		
A transport licence or waste tracking is not required to transport oil (liquid or hazardous waste) in Ausgrid vehicles between Ausgrid locations (eg from the substation to a depot). A licence for storage of liquid or hazardous waste of greater than 5 tonnes is required. If these licensing thresholds are breached ensure storage is on a licensed Ausgrid depot. If liquid or hazardous waste will be transported by non-Ausgrid vehicles the appropriate licences must be in place. The waste oil must be disposed of to a facility licensed to accept Liquid and, or hazardous waste. Ausgrid employees must manage the waste oil in accordance with Ausgrid's waste licence and additional requirements outlined in EG 120 Waste Guidelines.		✓	
Ensure a spill kit is readily available and workers and know how to use it.		✓	

5.9.4 Conclusion

The proposal is not likely to significantly affect the environment in relation to waste for reasons including:

- all waste would be re-used or managed in accordance with the NSW Waste Classification Guidelines and
- mitigation measures outlined in section 5.9.3 would readily manage potential impacts.

5.10 Flora and fauna

5.10.1 Existing environment

The existing flora and fauna environment of the preferred route consists of streetscape plantings.

An Arboricultural Report was prepared by *Accurate Tree Assessment* to assess any potential impacts on trees in the vicinity of the project route and make any recommendations for amendments to the preliminary design to retain as many, if not all trees along the proposed route (see Appendix E).

A desktop assessment was undertaken for the study area. A review of DPE's Atlas of NSW Wildlife Database and the Commonwealth Department of Environment *Protected Matters Search Tool* to identify threatened species, populations, communities and migratory species likely to occur within the study area.

The review indicates one threatened faunal species has previously been recorded near (as identified within Ausgrid's Web GIS EL report, Appendix A) the proposed cable route at several locations, the *Grey-headed Flying-fox*. Classified as both Vulnerable under the BC Act and under the Commonwealth EPBC Act.

Ausgrid's Web GIS EL report has also identified a key fish habitat as being present within the study area. However, the site forms part of the Botany Dams system further

south of the project area. Given its location with respect to the work area(s), there are no potential impacts identified as a result of this proposal.

Fauna habitat adjacent to the site may include hollow-bearing trees, as well as ground habitat such as decaying logs, bush-rock and litter. Vegetation near the route has not been identified as comprising corridor value in the Randwick area.

5.10.2 Potential impacts

Three hundred and fifty-two (352) trees have been identified along the proposed route and potentially subject to encroachment from trenching works.

Potential impacts to flora and fauna from the proposal have largely been avoided through route selection. Vegetation pruning may be required in some sections of the proposed route to allow for the 132kV underground cable to be installed.

Based on the preliminary design with respect to each trees calculated Tree Protection and Structural Root Zone;

- Six (6) trees/groups are subject to major encroachment from the proposed works. These may be retained subject to further investigation during the set out for proposed works.
- Four (4) trees/groups are subject to encroachment of the Structural Root Zone and would require an alternative solution.

The group of ten (10) immature Eucalyptus species adjacent to the Gardners Road overpass would be required to be removed to accommodate the proposed send/receive pit for the Option 1 under boring of Southern Cross Drive, refer to Figure 1-3.

Notwithstanding the above removals, further consideration will be given during detailed design to align the route and maximise distance between the 132kV underground cable and the adjacent trees to maximise the potential for full retainment of all trees can be achieved.

Subject to additional arborist advice, vegetation management and removal may be required along select sections of the route. Those trees identified for removal do not form part of a threatened species, community or population. Further assessment of each tree along the route is outlined in the Arboricultural Report (Appendix E).

Mitigation measures will be implemented to ensure the structural integrity and health of all trees are not impacted as a result of this proposal. Where trees require removal, the process for Structural root zone encroachment and vegetation removal outlined below in this section would be complied with.

Noise impacts

While the construction phases of the proposal (along with its ancillary activities) may cause temporary disturbance to animals, the impacts from noise emissions are likely to be localised close to the proposal (up to 100 m) and are not likely to have a significant, long-term, impact on wildlife populations.

Fragmentation and connectivity

Habitat fragmentation through the clearing of vegetation can increase the isolation of remnant vegetation and create barriers to the movements of small and sedentary fauna such as ground dwelling mammals, reptiles, amphibians and small birds. Furthermore, habitat fragmentation can create barriers to the movement of pollinator vectors, such as insects, and thereby affecting the life cycle of both common and threatened flora.

Construction of the proposal in the existing cleared route would not result in additional fragmentation or any edge effects.

Structural root zone encroachment and vegetation removal

Ausgrid has been working closely with *Accurate Tree Assessment* to identify and assess the potential impacts for established street trees along the project route. Both Tree Protection Zones and Structural Root Zones of all trees were mapped against the route alignment, refer to Appendix A and E.

In order to retain as much vegetation as possible, further consideration has been given during the design phase to align the route and maximise distance between the 132kV underground cable and adjacent trees.

During the final design stage, in order to minimise the likely requirement for vegetation removal and encroachment, the contractor is required to consider the retainment of all trees against other competing objectives.

Ultimately, vegetation removal is approved as part of this REF provided the below due diligence process is followed;

Where the structural root zone requires encroachment:

- non-destructive works within the Tree Protection Zone must document the nature (size of roots) and extent (depth) of root material, providing a preliminary arborist assessment of the likelihood of safely passing the Structural Root Zone.
- Where it may be considered possible, prior to working within the Structural Root Zone of any tree, ground truthing via exploratory non-destructive means (hand-digging, hydro-vac), within the proposed alignment, at the approval and direction of a suitably qualified arborist will be required.

The investigation will;

- determine the presence or absence of any significant tree roots and ultimately whether encroachment of the individual trees Structural Root Zone to facilitate the proposal is possible.
- ensure each tree is investigated and assessed to the fullest extent possible so a suitable determination can be made as to whether an individual tree can be retained or ultimately needs to be removed.

Where an arborist determines a tree requires removal, the contractor will discuss civil alternatives and feasibility with the arborist. If there are no other feasible alternatives, the contractor is to inform Ausgrid of the removal requirement so a review can be undertaken with respect to additional environmental and community impact.

Prior to the removal of any trees, Ausgrid is to be satisfied the above due diligence process has been suitably followed.

Further assessment of each tree along the project route is outlined in the Arboricultural Report (Appendix E) and digitised [here](#).

5.10.3 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 5-17.

Table 5-17: Flora and fauna mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
Vegetation removal is permitted for those trees identified in Appendix E to facilitate HDD work across Southern Cross Drive.		✓	
Comply with section 6 Ecology of NS174C Environmental Handbook.		✓	
All workers to be made aware of the presence of sensitive (including the identified Tree Protection and Structural Root Zones provided for in Appendix E) areas and the need to avoid impacts.	✓	✓	
Digitised tree mapping is to form part of the contractors CEMP and referred to during works.	✓	✓	
Prior to construction, mark and fence off areas to avoid tree protection structural root zones (SRZTP) where works are in close proximity. Works should where possible be confined to the road surface and away from the footpath so that fencing is not required.		✓	
Where cables must be laid within the TPZ, minimise the extent impacted and for significant encroachments, underbore HDD/ directional drill at least 600 mm beneath the ground surface, or if excavating, hand dig or use an air knife.		✓	
Keep storage areas, stockpiles, vehicle parking, and access tracks clear of the TPZ. Works should where possible be confined to the road surface only.		✓	✓
Comply with the Tree Safety Management Plan when undertaking vegetation pruning/ removal and maintenance works. Minor branches can only be pruned in a very minor or inconsequential manner.			✓
Vegetation clearing and pruning to comply with NEG-OH21 Vegetation Safety Clearances / ISSC3 Guideline for Managing Vegetation Near Powerlines/Bushfire Risk Management Plan .			✓
Where works could inadvertently harm adjacent vegetation, implement measures to protect the TPZ and the vegetation.		✓	
Where trenching is planned within the SRZ or vegetation removal is considered required, the encroachment and removal process is to be followed as outlined in Section 5.10.2.	✓	✓	

Mitigation measures	Implementation of mitigation measures		
Contact local wildlife rescue organisations for the rescue or care of native wildlife (refer to section 10 of NS174C Environmental Handbook)		✓	
Keep to designated roads and access tracks. Restrict vehicle and plant movements to existing cleared areas.		✓	✓
No disturbance of bush rock, tree hollows, wetlands, mangroves, nests, aquatic or other sensitive habitats.		✓	
No storing equipment, parking vehicles or accessing the site through undisturbed areas.		✓	
Use non invasive species for landscaping or as determined by Council.		✓	
No importing mulch from other sites.		✓	
Provide an escape route for fauna if trenches or pits will be open extended periods (eg log or stick)		✓	✓
Vegetation to be retained must be identified and protected to prevent damage from workers and machinery and remain in place for the duration of construction work.		✓	
<p>A number of mitigation measures will be implemented to avoid impacts on the root systems of trees including;</p> <ol style="list-style-type: none"> 1. marking out of protection zones when works are in proximity, 2. utilising non-destructive means (hand-digging, hydro-vac) when within the TPZ 3. seeking arborist advice where roots greater than 40mm need to be severed within either encroachment zone 4. utilising the documented due diligence process whenever works are within the structural root zone and 5. considering horizontal directional drilling or other techniques to avoid the root systems of major trees. <p>Refer to attached Arborist report (Appendix E) for all mitigation measures.</p>	✓	✓	

5.10.4 Conclusion

The proposal is not likely to significantly affect the environment in relation to flora and fauna for reasons including:

- the proposal does not involve vegetation clearing,
- potential impacts to flora and fauna from the proposal have largely been avoided through route selection,
- the route is located within existing cleared areas which would minimise/ eliminate the number of trees requiring removal and disruption of habitat,
- Arborist investigations conclude that the proposal is unlikely to significantly impact upon any streetscape planting present along the route,

- no impacts are expected to any matters of NES and a referral to the Commonwealth Department of Environment is not required, and
- mitigation measures outlined in section 5.10.3 would readily manage potential impacts.

5.11 Bush fire

5.11.1 Existing environment

The proposal is not within land mapped as a bushfire category under Randwick Council or City of Sydney Council bush fire prone land maps. The site is in an urban setting surrounded by cleared land. The majority of the route traverses existing roads with vegetation located on either side of the road and the surrounding land does not contain large amounts of vegetation.

5.11.2 Potential impacts

The risk of causing a bush fire is primarily associated with construction and maintenance activities, not the inherent nature of the proposed infrastructure. The main risks constitute:

- undertaking various kinds of 'hot work' where naked flames are used, such as welding, use of blowtorches, angle-grinding and use of gas torches for shrinking heat shrink components, and
- use of machinery with the potential to generate sparks, such as jack hammers, rock saws, and angle grinders.

Ausgrid's guideline DG 33 Hot Work During Total Fire Bans restricts hot works during total fire bans and require risk assessments and precautions to be put in place to minimise the risk of causing a bush fire. These precautions would apply to construction and maintenance for the life of the proposal.

5.11.3 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 5-18.

Table 5-18: Bush fire mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
Comply with section 6.4 Total fire bans of NS174C Environmental Handbook.		✓	
During a total fire ban, no open fires or hot works are to be undertaken unless in accordance with an exemption granted by the NSW RFS.		✓	✓
Any hot works during a total fire ban must be in accordance with a Clause 6 Exemption. This includes grinding, welding, brazing, oxy-cutting, heat treatment or processes that generate heat or continuous streams of sparks. The Contractor or ASP must obtain their own exemption.		✓	✓

Mitigation measures	Implementation of mitigation measures		
Hot work activities to be clear of combustible matter by at least 3 metres. Keep adequate firefighting equipment immediately at hand.		✓	✓

5.11.4 Conclusion

The proposal is not likely to significantly affect the environment in relation to bush fire risk for reasons including:

- the proposal is not located within bush fire prone land,
- during a total fire ban, no open fires or hot works would be undertaken unless in accordance with an exemption granted by the NSW RFS,
- majority of the route traverses existing roads and the surrounding land does not contain large amounts of bushland, and
- mitigation measures outlined in section 5.11.3 would readily manage potential impacts.

5.12 Aboriginal heritage

5.12.1 Existing environment

The proposal is located in an area administered by both La Perouse and Metropolitan Local Aboriginal Land Councils (LALC).

The study area is developed land that has previously been disturbed. Previous disturbance has occurred over part of/the whole area as a result of construction of roads, trails and tracks, construction of buildings or structures, installation of utilities, clearing of vegetation and modification of the ground surface is clear and observable. Topsoil is not present and rock /clay subgrade is not visible.

With regard to landscape features, the study area is not located within 200 m of natural waters, within a sand dune system, on a ridge top, ridge line or headland; within 200 m below or above a cliff face; or within 20 m of or in a cave, rock shelter, or a cave mouth. In addition, there are no old growth trees in the vicinity of the site.

A desktop assessment of DPE's Aboriginal Heritage Information Management System (AHIMS) and the Commonwealth Department of Environment Protected Matters Search Tool revealed no Aboriginal sites/objects have previously been recorded in proximity to the proposal route.

5.12.2 Potential impacts

The proposal would not impact on any known Aboriginal object. The proposal does not involve clearing vegetation or disturbing the ground surface in areas previously undisturbed. There are no landscape features that indicate the presence of Aboriginal objects.

The location of registered artefacts is generally isolated to areas of potential developments and hence the result of investigations for development or rezoning applications. The presence of registered artefacts does not indicate the significance of sites in regional context, nor reflect the absence of artefacts in other locations. The

mapping of registered sites is often misleading and infers the absence of artefacts in other areas, when in fact it reflects an absence of detailed investigations.

Therefore, consideration of the potential for Aboriginal objects to be in the area of the proposal is required regardless of whether the database searches indicate known Aboriginal objects. Aboriginal objects are often associated with particular landscape features as a result of Aboriginal people's use of those features in their everyday lives and for traditional cultural activities. The proposal is not located near landscape features such as are rock shelters, sand dunes, waterways, waterholes, old growth trees and wetlands.

Notwithstanding, if potential heritage is identified during works, the works would cease, access restricted and the Environmental Management Representative (EMR) contacted to investigate, refer to Section 8.1.

Given the proposal would not impact on any known Aboriginal sites, is not located on undisturbed land, does not comprise any sensitive landscape features and visual inspection did not reveal any new objects, the probability of objects occurring in the area of the proposed activity is low and it was concluded that a more detailed investigation (and an AHIP application) was not required.

There are several locations within the Randwick City Council area deemed to have archaeological potential. However, a review of Council's database indicates there are no such sites present along the preferred route.

5.12.3 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 5-19.

Table 5-19: Aboriginal heritage mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
Comply with section 7.1 Aboriginal heritage of NS174C Environmental Handbook.		✓	
No impact to any rock outcrops		✓	

5.12.4 Conclusion

The proposal is not likely to significantly affect the environment in relation to Aboriginal heritage for reasons including:

- the proposal would not impact any known Aboriginal sites, is not located on undisturbed land, does not comprise any sensitive landscape features and a visual inspection did not reveal any new objects,
- there are no known Aboriginal objects along the route,
- the proposal would not impact any known Aboriginal sites, and
- mitigation measures outlined in section 5.12.3 would readily manage potential impacts.

5.13 Non-Aboriginal heritage

5.13.1 Existing environment

A desktop assessment was conducted using the Australian Heritage Database¹⁴, NSW State Heritage Inventory¹⁵ and relevant Local Environmental Plans. The results of these searches were that there are;

- no Commonwealth,
- one State (Alexandria Canal),
- one Sydney Water and Ausgrid S.170 item,
- one heritage conservation area, and
- several Local Heritage listed items

in the study area. Table 5-20 and provide a summary of these heritage items.

Table 5-20: Non-Aboriginal Heritage items

Location	Heritage listing	Details
53-55 Campbell St, Alexandria	Warehouse 'Rudders Bond Store'	A single-storey post-war warehouse. It has a regular rectangular plan, metal pitched roof, outward inclined metal walls at the upper section and sloped roofs at two shoulders. The front facing gable is glazed and the lower section comprises masonry walls with engaged piers.
Alexandria Canal	Alexandria Canal	Alexandria Canal is an adapted artificial waterway (formally known as Sheas Creek) which stretches 4.5 km from its southern point at Cooks River to the north near Huntley Street, Alexandria. Its banks are formed by pitching comprising sloping dry sandstone capped with a sandstone capping. It extends from approximately 0.5 metres below low water mark to approximately 1.5 metres above high water mark.
30 Birmingham Street, Alexandria	Former Sil-Ora Dental Products Factory	The building was constructed in 1945-1948 and extended in the 1950s for Sil-Ora Dental Products. It comprises a single storey building constructed of face brick walls, constructed in two sections, contained under sawtooth and gabled roofs. The irregular building form follows and marks the bend in Birmingham Street, reflecting the historic street and subdivision pattern and giving the building added prominence in the streetscape.

Location	Heritage listing	Details
33 Birmingham Street, Alexandria	Former H. G. Whittle & Sons Factory	The building was constructed as a factory, workshop and office in 1935 with 1942 additions for H G Whittle and Sons. The factory comprises a single-storey brick building contained under a skillion roof supported by triangle trusses. The front elevation is curved inwards, formed to fit the trapezoidal shape of the site on the bend of Birmingham Street.
27 Birmingham Street, Alexandria	Electricity Substation No. 375	The Birmingham Street substation is a simply designed unusual Art Deco styled single storey face brick structure with a central plant access door and a personnel door offset to one side. The main feature of the façade is the use of contrasting decorative stepped brickwork around the main entrance and across the building parapet.
15-25 Birmingham Street, Alexandria	Former warehouse 'Boltons Trading Co'	One and partially two-storey inter-war Georgian revival style warehouse featuring a face brick wall at the lower section and rendered finish at the upper level or the gable area. The facade facing Birmingham Street presents an entrance and an upper level at the middle and two gables at its two sides.
827 Botany Road, Rosebery	Gardeners Road Public School	Gardeners Road Public School was established in January 1883 when John Maloney opened the school in a temporary wooden school room designed to accommodate 200 pupils in 1 room. In 1880, the area around the junction of Gardeners and Botany Roads was settled by a scattered population of market gardeners, with huge tracks of vacant land and a few pockets of workers who were employed in the factories which had begun to be established in the district.
20 Harcourt Parade, Rosebery	Former Westinghouse Factory	The factory on this site was built in 1921 and extended in 1937 for Buzacott & Co's Rosebery Engine Works, which later became Westinghouse Rosebery. The large, mostly single-storey building occupies half the block of land with two long street frontages to Dunning Avenue and Mentmore Avenue and a shorter street frontage to Harcourt Parade.
30-40 Harcourt Parade, Rosebery	Industrial building 'Everready Australia'	Four storey inter-war functionalist style industrial building with strongly emphasised horizontal bands and multi-paned large windows between the bands. The building represents the design approach of well known architectural firm of Robertson and Marks for inter-war industrial buildings.

Location	Heritage listing	Details
24 Borrodale Rd, Kingsford	Edwardian timber cottage	Late Edwardian timber cottage, in excellent repair. More or less intact but for screen door, wire mesh fence and window screens. Hipped corrugated iron roof with front gable. Basic L-shaped plan. Bullnosed, hipped verandah roof. Feathered boarding. Simple verandah posts, on narrow brick piers. Carved brackets. Shingled hood over paired sash windows. Door has skylight. Half timbering on gable. One of few well preserved Edwardian timber cottages in the Municipality.
Between Gardeners and Bunnerong Roads	Botany Township Heritage Conservation Area	The Botany Township Heritage Conservation Area is a linear precinct focused on the alignment and properties adjoining Botany Road between Lord Street in the north to Hale and Hastings Streets in the south. It is characterised by its collection of very good and substantially intact civic and community buildings that formed the nucleus of the rapidly growing precinct once development was possible and was gradually infilled by shops.
At Cook Avenue crossing	Birds Gully SWC No.10	The Birds Gully stormwater drainage system is representative of a stormwater channel constructed predominantly by the PWD between 1930-1935 as part of the Unemployment Relief Program.

5.13.2 Potential impacts

The proposal is located generally within existing roadways and has been previously disturbed. Due to the previous disturbance and the proposal's location away from existing buildings, it is not expected that non-Aboriginal heritage would be found or impacted during construction.

Dilapidation reports would be prepared to determine the level of impact to all buildings that may potentially be impacted from construction activities such as pile driving / rock breaking.

Birds Gully SWC No.10

The proposal would traverse Birds Gully SWC No.10 in Cook Avenue, at the intersection of Solander Road and Colenso Crescent. Information on Sydney Water's heritage register indicates the system was extended through Astrolabe Park to the Botany Wetlands at Eastlakes Golf Course in 1970 by Botany Council. Downstream sections of Tonkin pipe were also replaced in Cook Avenue. The channel is located underground with no open channel sections present. It is constructed predominantly from concrete of which the cross section consists of 48% Box, 25% circular pipe and 15% Tonkin pipe.

A review of historical drawings provided by Sydney Water identify the above-mentioned extension to be downstream of the anticipated traverse for this project proposal, see Appendix A. Section drawings of the original outlet pipe immediately south (and

downstream) of the proposal at Cook Avenue prior to the extension confirms the stormwater channel to be four feet five inches below road level. Factoring the thickness of the channel wall and wall header, this is approximately at 1m depth.

Whilst it is reasonable to expect the channel to be deeper (upstream) at the proposal location, it may only be marginal. As such, additional non-destructive exploratory excavation is recommended at the proposal location to best inform civil work methodologies and conduit configuration so there is no more than minimal impact to the stormwater channel during construction.

5.13.3 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 5-21.

Table 5-21: Non-Aboriginal heritage mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
Comply with section 6.2 Non-Aboriginal heritage of NS174C Environmental Handbook.		✓	
Non-destructive exploratory excavation (slit trench field book recordings) is to be carried out in Cook Avenue, at the intersection of Solander Road and Colenso Crescent to better define the location of Birds Gully SWC No.10. Once defined, civil works to facilitate the proposal would be undertaken to ensure no more than minimal impact to the stormwater channel during construction.	✓	✓	
All workers to be made aware of sensitive areas and the need to avoid impacts.		✓	
No physical alterations to heritage items		✓	
No impacts to potential heritage items eg sandstone gutters, sandstone walls		✓	
No excavations within an archaeological area.		✓	
All works to cease if potential heritage is discovered. Access should be restricted and Supervisor notified to ensure regulator is contacted. Ausgrid employees should contact Ausgrid Environmental Services on 9394 6659.		✓	
Barricades or equivalent to be used to prevent damage to the heritage item and the location of the item should be highlighted to all construction personnel as part of the site induction.		✓	
Undertake a dilapidation survey of the heritage listed building prior to the commencement of works if deemed to be at risk of impact.		✓	

5.13.4 Conclusion

The proposal is not likely to significantly affect the environment in relation to non-Aboriginal heritage for reasons including:

- there are no known non-Aboriginal items along the route / on the site
- the proposal would not affect known non-Aboriginal heritage items

- [add conclusions/reasons from specialist report]
- mitigation measures outlined in section 5.13.3 would readily manage potential impacts.

5.14 Visual and aesthetics

5.14.1 Existing environment

The existing visual environment of the preferred route consists of:

- urban, commercial, parkland or other open space,
- undulating terrain but little contrast, ruggedness and ridgelines,
- streetscape plantings,
- little / no view of water,
- high level of existing development (spread out buildings or medium to high density),
- traditional building character, and
- existing infrastructure in the area.

Figure 5-1 shows an example of the preferred route and existing visual environment. The photographs show land use adjacent to the proposal.



Figure 5-1: Existing visual environment at select locations along the preferred route (From top, left to Right; Gardeners Road, Alexandria, Birmingham Street, Harcourt Parade (West), Harcourt Parade (East), Borrodale Road)

5.14.2 Potential impacts

Potential visual impact may be determined through visual sensitivity of the site and the magnitude of changes. The site has a low visual sensitivity.

Short term visual impact

The construction phase of the proposal would have a visual impact on local views due to the presence of plant and equipment and exposed soil. The impact would vary throughout construction, with the earthworks stage likely to be most visually prominent. As construction impacts would be short term and the adjoining stakeholders would be consulted about the works, the overall impact during construction is not expected to be significant. Disturbed areas would be reinstated as soon as practicable to further ameliorate short term visual impact.

Long term visual impact

Once constructed, the proposal would not restrict access to recreational space, commercial development, residential development or schools. The proposal would require minimal maintenance, reducing the need for plant and equipment to access the site. Maintenance work would form part of Ausgrid's existing maintenance program.

5.14.3 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 5-22.

Table 5-22: Visual mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
Consult with affected stakeholders about the proposal.	✓	✓	
The cables would be installed underground within existing roadways.	✓		
Reinstate the roadways post works to a suitable condition.		✓	

5.14.4 Conclusion

The proposal is not likely to significantly affect the environment in relation to visual and aesthetic value for reasons including:

- the cables would be installed underground,
- the preferred route would be generally located within the pre-disturbed areas, such as existing roadways, and
- mitigation measures outlined in section 5.14.3 would readily manage potential impacts.

5.15 Traffic and access

5.15.1 Existing environment

The proposal would generally be within existing roads and accessed accordingly. There are several TfNSW classified roads located in vicinity of the preferred route.

The main features of the transport network in the area of the proposal include;

- Gardeners Road,
- O’Riordan Street,
- Botany Road,
- Southern Cross Drive, and
- Bunnerong Road

Transport in the region is heavily reliant on the road network for private vehicle usage and public transport in the form of buses and commercial vehicles. Any impacts on the road network in the region are quickly amplified with the high volumes of traffic which utilise the road network daily.

Traffic on the above-mentioned roads is very heavy during peak times and remains busy at off peak periods.

Overall, traffic surrounding the preferred route is dominated by residential vehicle movements and a low to moderate number of pedestrians.

5.15.2 Potential impacts

The proposal involves crossing several classified roads and working within Gardeners Road from Bourke through to Ellis Avenue. The TfNSW would be consulted, and necessary approvals gained prior to construction in each instance.

During construction, up to six vehicles would be required at any one location on the route at any one time. Vehicles associated with the proposal would mainly include light vehicles and one to two heavier vehicles such as trucks and excavators. Heavy vehicles along the route are expected to cause some minor disruption to local roads. Construction would also result in temporary changes to traffic arrangements in local roads. Portions of some roads would need to be blocked and access may change or be reduced to some buildings for short periods of time.

Where major road disruption would occur, a traffic management plan (TMP) would be prepared in accordance with the TfNSW Manual *Traffic Control at Work Sites*¹⁶ and would be implemented during construction. The TMP would also include allocated areas for staff parking.

A traffic guidance scheme (TGS) which shows the traffic control arrangements for the preferred site would be prepared in accordance with Australian Standard 1742.3. The TGS consists of a diagram showing temporary signs and devices arranged to warn traffic and guide it around, past or if necessary through the work areas.

During operation, the route would only be visited by vehicles on an intermittent basis for general maintenance purposes.

Measures would be employed to minimise traffic disruption. The construction would be undertaken by those experienced in such activities along traffic routes. Any disruption, however, cannot be fully avoided, but can be minimised through timing the work to avoid peak traffic flows.

There would be some localised disruption to the community around the immediate work site (delivery of construction equipment and materials) in terms of a reduction in pedestrian access and disruption to vehicular traffic and parking during construction works. Any inconvenience to pedestrians during construction or maintenance would be minimised by ensuring that there is an alternative route. Additionally, residents, public authorities and commercial organisations would be notified via a letterbox drop of upcoming works.

5.15.3 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 5-23.

Table 5-23: Traffic and access mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
Where works are proposed on a classified road, consent is required under section 138(1) of the Roads Act 1993. To apply for a section 138 consent, write to TfNSW for classified state roads or the relevant local council for classified regional roads to request approval, providing a description of the work and including a plan showing the extent of the works. An ROL must be obtained from TfNSW if working on a classified Road, a total road closure or within 100m of traffic lights.		✓	
All potentially affected residents and businesses are to be provided with 48 hours' notice of any access changes to properties. Where residents and businesses are directly affected by the work (eg their access will be restricted), one week's notice must be given.		✓	
Reinstate roads post works in consultation with council/TfNSW.		✓	

5.15.4 Conclusion

The proposal is not likely to significantly affect the environment in relation to traffic and access for reasons including:

- the construction period is temporary, localised and short term,
- all works affecting the local area would be undertaken in accordance with a TMP or TGS,
- given the small number of vehicles expected to be used during construction, it is unlikely to result in increased traffic in the area,
- once in operation, the proposal would have minimal impact on the local traffic, and
- mitigation measures outlined in section 5.15.3 would readily manage potential impact.

5.16 Social and economic

5.16.1 Existing environment

The preferred cable route is located within the suburbs of Alexandria, Rosebery, Daceyville and Kingsford across Sydney, Randwick and Bayside LGA's. The land adjacent to the preferred route is predominately comprised of low to medium density residential dwellings, portions of which are under the care and control of the Department of Communities and Justice – Housing.

5.16.2 Potential impact

The proposal would increase the reliability of electrical supply, resulting in a positive impact on the community.

By reducing the probability of power shortages and failure, the proposal is reducing the associated economic risks, including damages and productivity losses resulting from short term interruption of commercial activities.

Construction projects such as this proposal create opportunities for suppliers, contractors and consultants which creates flow on benefits for local communities. Discretionary spending by civil contractors during the construction period would benefit the local region.

Short term impacts on the community during the construction phase of the proposal include increased traffic intensity, altered traffic conditions, maintaining access to properties and noise. During the consultative process, as detailed in section 2, the community expressed concern over the social consequences resulting from the selection of a route that passed through the community. These concerns included, stress and anxiety in relation to the potential health effects related to EMF and aesthetics as a result of the possible visual impact of the proposal. The issues associated with EMF, noise, visual aesthetics, vegetative impacts and traffic have been assessed in detail in this REF.

Due to the small scale of the works, the socio-economic impacts of the proposal would be considered to be localised.

5.16.3 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 5-24.

Table 5-24: Social and economic mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
EMF, noise, visual and traffic mitigation measures (sections 5.3.3, 0, 5.14.3 and 5.15.3 would reduce potential impacts on the surrounding community.	✓	✓	✓

5.16.4 Conclusion

The proposal is not likely to significantly affect the environment in relation to social or economic impacts for reasons including:

- construction related impacts would be minor, localised and short-term,

- once in operation, the small scale of the works means any the socio-economic impacts of the proposal would be localised,
- a more reliable electricity supply reduces associated economic risks such as damages and productivity losses resulting from short term interruption of commercial activities, and
- mitigation measures outlined in section 5.16.3 would readily manage potential impacts.

5.17 Cumulative impact

5.17.1 Existing environment

Cumulative impacts may be experienced due to the interaction of elements within the proposal, or with other existing or proposed developments within the locality. Where possible, the cumulative impact associated with the proposal has been incorporated into the assessments within this REF.

Ausgrid projects typically have related projects and flow on activities due to the interconnected nature of the network (refer to section 1.4). Other Ausgrid activities with potentially cumulative impacts include:

Known material cumulative impacts associated with these related projects are addressed in section 5.17.

Other non-Ausgrid activities with potentially cumulative impacts include:

- other utility activities within the project area, and
- residential and commercial developments and redevelopments within the project area.

5.17.2 Potential impact

The potential impact due to the interaction of elements within the proposal, or with other existing or proposed developments within the locality is summarised in Table 5-25.

Table 5-25: Summary of cumulative impacts

Potential impact	Other activities with cumulative impacts	Contribution to overall impact	REF section
Noise	Construction noise listed in section 5.4.2.	Council was consulted in relation to other development in the area. Council submissions have been given due consideration (see section 2.2). Noise impacts during the construction phase would be localised, short term and staged along the separate sections of the proposal.	5.4

Potential impact	Other activities with cumulative impacts	Contribution to overall impact	REF section
EMF	Existing 132 kV, 33 kV, 11 kV and 415 V power lines. Existing 132 kV, 33 kV, 11 kV substations.	The specialist EMF assessment considered the cumulative impact of the operation of the substation to be minor. Council was consulted in relation to other development in the area. Council submissions have been given due consideration (see section 2.2).	5.3
Traffic	Traffic listed in section 5.15.2	Council was consulted in relation to other development in the area. Council submissions have been given due consideration (see section 2). The TMP and / or TGS would consider the cumulative impact of construction traffic movements.	5.15
Flora and fauna	Flora and fauna impacts listed in section 5.10.2.	The flora and fauna assessment considered the cumulative impact of the construction and operation of the substation to be minor. Council was consulted in relation to other development in the area. Council submissions have been given due consideration (see section 2).	5.10
Visual	Visual impacts listed in section 5.14	Council was consulted in relation to other development in the area. Council submissions have been given due consideration (see section 2). Activities listed in section 5.14.2 would not materially alter the outcome of the visual assessment in 5.14.2.	5.14
Resources	Materials as listed in section 1.8.10 are required for the proposal.	These materials are not currently in short supply, and it is not anticipated that the proposal would substantially increase the demand on these resources. The proposal would not have a major impact on the demand on resources.	5.9

5.17.3 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 5-26.

Table 5-26: Cumulative impacts mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
Notify Ausgrid's Community Relations section prior to commencing construction works in specific sections along the project route to ensure due consideration is given to consulting the local community.		✓	

5.17.4 Conclusion

The proposal is not likely to have significant cumulative impacts for reasons including:

- the localised extent of potential impacts during construction and operational phases, and
- mitigation measures outlined in section 5.17.3 would readily manage potential impacts.

6 Consideration of environmental factors

6.1 Clause 171 factors

In accordance with clause 171 of the EP&A Regulations, the following factors were considered for the proposal.

Table 6-1: Consideration of clause 171 factors

Clause 171 factors	REF section giving consideration to the factors
Impact on a community	2 Consultation, 5.1 Land use, 5.3 Electric and magnetic fields, 5.4 Noise and vibration, 5.14 Visual and aesthetics, 5.15 Traffic and access and 5.16 Social and economic
Transformation of a locality	5 Environmental assessment
Impact on the ecosystem of the locality	5.9.1 Flora and fauna, 5.10.1 Bush fire and 6.3.3 Biodiversity
Reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality	5 Environmental assessment
Effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations	5 Environmental assessment
Impact on the habitat of protected fauna	5.9.1 Flora and fauna
Endangering any species of animal, plant or other form of life, whether living on land, in water or in the air	5.9.1 Flora and fauna
Long-term effects on the environment	5 Environmental assessment
Degradation of the quality of the environment	5.7 Geology and soil
Risk to the safety of the environment	5.8 Contamination and 6.3.1 Precautionary principle
Reduction in the range of beneficial uses of the environment	5.1 Land use
Pollution of the environment	5.6 Hydrology and 5.8 Contamination
Environmental problems associated with the disposal of waste	5.9 Waste
Increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply	1.8.13 Resources and equipment and 6.3.4 Improved valuation of resources

Clause 171 factors	REF section giving consideration to the factors
Cumulative environmental effect with other existing or likely future activities	5.17 Cumulative impact
Impact on coastal processes and coastal hazards, including those under projected climate change conditions	5.2 Climate Change

6.2 Matters of national environmental significance

In accordance with the EPBC Act, the following matters of NES were considered for the proposal.¹⁷

Table 6-2: Consideration of Matters of NES

Matters of NES	Comment	Likely impact
World Heritage Properties	No world heritage properties would be potentially affected by the proposal	Nil
National Heritage Places	No national heritage places would be potentially affected by the proposal	Nil
Wetlands of International Importance	No wetlands of international importance would be potentially affected by the proposal	Nil
Commonwealth listed Threatened Species and Ecological Communities	No threatened species, populations or ecological communities listed within Commonwealth (or State) legislation would be potentially affected by the proposal	Nil
Commonwealth listed Migratory Species	No migratory species would be potentially affected by the	Nil
Nuclear Action	The proposal would not result in any nuclear action nor would it require any nuclear action to be undertaken.	Nil
Commonwealth Marine Areas	No Commonwealth marine areas would be potentially affected by the proposal	Nil
Great Barrier Reef Marine Park	The Great Barrier Reef Marine Park would not be affected by the proposal as it is not located within Ausgrid's network area.	Nil

Matters of NES	Comment	Likely impact
Water resources in relation to coal seam gas development and large coal mining development	Water resources would not be affected by the proposal as it does not involve coal seam gas or coal mining development.	Nil

6.3 Ecologically sustainable development

The proposal has been assessed against the following four principles of ESD as listed in the *Protection of the Environment Administration Act 1991* (NSW) adopted by s. 4(1) of the EP&A Act.

6.3.1 Precautionary principle

The precautionary principles (s. 6 (2) (a)) states that:

'If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.'

For the precautionary principle to be applicable two pre-conditions must be satisfied; "first it is not necessary that serious or irreversible environmental damage has actually occurred – it is the threat of such damage that is required. Secondly, the environmental damage threatened must attain the threshold of being serious or irreversible" .¹⁸

When the precautionary principle applies, measures taken must be proportionate to the level of threat. In assessing the level of threat and determining a proportional response, Ausgrid is guided by the relevant regulators and health authorities who are charged with the responsibility for providing such advice.

Potential health effects associated with EMF are discussion in section 5.3.

A range of specialist environmental investigations, including geotechnical, arbor and EMF have been undertaken during the preparation of this REF to ensure that the potential environmental impacts are understood with a degree of certainty. The design for the proposal has evolved to avoid environmental impacts where practical and mitigation measures have been recommended to minimise adverse impacts.

The proposal is therefore considered to be consistent with the precautionary principle.

6.3.2 Inter-generational equity

The principle of inter-generational equity (s. 6 (2) (b)) states that:

'The present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.'

The key objective of the proposal is to improve electricity supply and reliability, catering for future demand for the benefit of future generations. The proposal would not result in any impacts that are likely to impact on the health, diversity or productivity of the environment for future generations.

Potential health effects associated with EMF are discussed in section 5.3.

The proposal is considered to be consistent with the principle of inter-generational equity.

6.3.3 Biodiversity

The principle of biological diversity and ecological integrity (s. 6 (2) (c)) states that:

'Conservation of biological diversity and ecological integrity should be a fundamental consideration.'

A flora and fauna desktop assessment was undertaken to give due consideration to the proposal's potential impact on the biological diversity and ecological integrity of the study area.

The proposal is consistent with the principle of biological diversity.

6.3.4 Improved valuation of resources

The principle of improved valuation of environmental resources (s. 6 (2) (d)) states that:

'Environmental factors should be included in the valuation of assets and services.'

This principle explains that those who generate pollution and waste should bear the cost of containment, avoidance and abatement; the users of goods and services should pay prices based on the full life cycle of costs; and environmental goals should be pursued in the most cost effective way.

All costs associated with the containment, avoidance and abatement of pollution have been factored into the design of this proposal and Ausgrid's operations generally.

The proposal is considered to be consistent with the principle of improved valuation of environmental resources.

7 Summary of impacts

A number of potential environmental impacts from the proposal have been avoided or reduced during the design development and options assessment. The proposal as described in this REF best meets the project objectives but would still result in some impacts on traffic and access and other issues associated with construction activities, such as noise.

Mitigation measures as detailed in this REF would avoid or minimise these expected impacts. On balance the proposal is considered justified.

On this basis, it is concluded that the proposal and adopted mitigation measures will result in an overall minor environmental impact.

8 Environmental management plan

8.1 Construction environmental management plan

A construction environmental management plan (CEMP) outlines the environmental objectives of a proposal, the environmental construction mitigation measures to be implemented, the timing of implementation, responsibilities for implementation and management, and a review process to determine the effectiveness of the strategies.

Once the construction methodology is known, the principal construction would be responsible for developing a CEMP that addresses the scope of works to be undertaken, including site specific, measurable and achievable actions to the CEMP and the preparation of any appropriate work methods or sub plans.

The CEMP documents all the procedures and processes necessary to ensure that all personnel comply with:

- legislative requirements and relevant non-statutory policies,
- specific environmental construction mitigation measures described in section 5 of this REF,
- requirements outlined in any relevant approvals, permits or licences, and
- NS174C Environmental Handbook.

The CEMP would typically:

- establish environmental goals and objectives,
- detail the conditions of approval,
- list actions, timing and responsibilities for implementation that arise from the construction mitigation measures recommended in this REF,
- detail statutory requirements,
- provide a framework for reporting on relevant matters on an ongoing basis,
- detail training requirements for personnel in environmental awareness and best practice environmental management system,
- detail emergency procedures, including contact names and corrective actions,
- detail process surveillance and auditing procedures,
- list complaint handling procedures, and
- detail quality assurance procedures.

The CEMP would be submitted to Ausgrid to be reviewed by an Environmental Officer prior to the commencement of any site works for an adequacy review to determine that the CEMP effectively addresses the scope of works to be undertaken, addresses the objectives described above and generally meets the requirements outlined in the *Guideline for the Preparation of Environmental Management Plans*.¹⁹

No works covered by this REF would be permitted to commence until a suitable CEMP is prepared and reviewed as adequate by Ausgrid.

It is also noted that the CEMP would be a working document and would be amended and continually improved over time. This would occur when there is a change in scope,

during the review process or when processes or strategies are found to be inadequate to mitigate potential environmental harm.

If an activity falls outside the scope of the REF (as defined by section 1.6) or if the mitigation measures outlined in section 5 cannot be implemented, then an additional approval would be required. The activity is not permitted to continue without an appropriate environmental assessment under the EP&A Act.

8.1.1 Implementation

The principal construction contractor would be responsible for implementing these controls during construction.

All personnel working on the proposal must be aware of their environmental obligations, responsibilities and have received the necessary training to meet the environmental obligations associated with their duties, as specified in the CEMP. Site induction training would be undertaken for all personnel to highlight sensitive work areas, explain the requirements of the CEMP, outline an individual's responsibilities and inform all personnel of emergency response procedures. Documented evidence of such training would be available before commencing work on-site.

Prior to works commencing:

- emergency procedures would be displayed in a prominent position within the site working area,
- a person would be allocated for the dissemination of general information on the site operations. A contact person and contact numbers would be identified for receiving comments or complaints from the community, and
- a register for complaints would be established and maintained for the full duration of the work. The register would record details of complaints, complainant contact information and action taken to address complaints.

Auditing of the construction would be undertaken in accordance with the relevant international and Australian standards²⁰ to establish whether the Contractor is conducting activities in accordance with their current CEMP and whether the CEMP is an effective tool to control adverse environmental impacts. Recommendations regarding improvements to the CEMP must be incorporated as soon as practicable.

An Environmental Officer (Environmental Management Representative; EMR) would be appointed to the proposal. The Environmental Officer has the authority to stop works if it is deemed necessary to mitigate potential environmental harm.

8.1.2 Compliance

The contractor is required to have an auditing and inspection schedule. Ausgrid may undertake audits to ensure the CEMP is being implemented appropriately.

At the conclusion of the construction phase of the proposal, the Contractor must record how and whether the conditions and measures in the REF and CEMP were observed. The documentation must be sufficient to enable a reasonable person who reads the documentation to understand, without reference to any extrinsic material, whether the conditions and measures in question were observed, and the nature of and reasons for any non-compliance.

8.2 Operation environmental management plan

An operation environmental management plan (OEMP) is sometimes required to minimise the potential environmental impacts from operational and maintenance activities conducted as a result of the proposal.

Ausgrid network standards, operating procedures and environmental guidelines will be sufficient to fulfil the requirements of an OEMP for this proposal.

8.3 Environmental mitigation measures

Mitigation measures for all phases of the proposal are summarised in Table 8-1: Implementation mitigation measures.

Table 8-1: Implementation mitigation measures

Mitigation measures	Implementation of mitigation measures		
	Design	Construction	Operation
Prepare CEMP.	✓	✓	
Review CEMP for adequacy by Ausgrid		✓	
At the conclusion of the construction phase of the proposal, the Contractor must record how and whether the conditions and measures in the REF and CEMP were observed.		✓	✓

Additionally, through the outcomes of the auditing process, Ausgrid will also generally implement as part of its broader processes any learnings which are identified through the auditing process in order to ensure its continuous improvement for future proposals.

9 Certification

The Alexandria to Kingsford Project REF assesses the potential impacts of the proposal to construct and operate an underground 132kV underground cable from Transgrid's Beaconsfield Bulk supply point to Ausgrid's Kingsford Substation.

Ausgrid is a statutory State Owned Corporation and is a determining authority as defined in the EP&A Act. The proposal satisfies the definition of an activity under the EP&A Act, and as such, Ausgrid as a proponent and determining authority, must assess and consider the environmental impacts of the proposal before determining whether to proceed.

This REF examines and takes into account to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposed activities outlined in the section 1.6. This REF fulfils the requirements of section 5.5 of the EP&A Act and section 171 of the EP&A Regulation, which sets out environmental factors to be considered in making the assessment.

On the basis of this REF, it is concluded that the proposal:

- is not likely to significantly affect the environment (including critical habitat) or threatened species, populations or ecological communities, or their habitats
- is not on land that is part of critical habitat
- is not likely to have a significant impact on matters of NES, or a significant impact on the environment (for actions on Commonwealth land) or a significant impact on the environment on Commonwealth land (for actions outside Commonwealth land).

In making these conclusions, consideration of environmental significance was made with regard to section 171 of the EP&A Regulations and the *Code of Practice for Authorised Network Operators*¹.

REF preparer:

I certify that I have prepared the contents of this REF and, to the best of my knowledge, it is in accordance with the Code approved under section 198 of the Environmental Planning and Assessment Regulation 2021, and the information it contains is neither false nor misleading.

Signature:



Name: Daniel Halton

Title: Environmental Officer

Company: Ausgrid

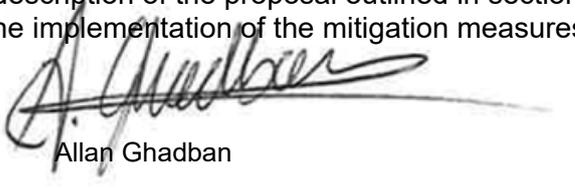
Date: 4th April 2023

REF reviewer:

I certify that I have reviewed the contents of this REF and, to the best of my knowledge, it is in accordance with the Code approved under section 198 of the Environmental Planning and Assessment Regulation 2021, and the information it contains is neither false nor misleading.

Signature: **Name:** James Hart**Title:** Environmental Manager**Company:** Ausgrid**Date:** 4th April 2023**Project manager acceptance:**

I accept the description of the proposal outlined in section 1.6 as true and accurate and I commit to the implementation of the mitigation measures outlined in section 5.

Signature: **Name:** Allan Ghadban**Title:** Project Manager**Company:** Ausgrid**Date:** 4th April 2023

Appendix A Drawings and plans

Appendix B Consultation Documentation

Appendix C Magnetic Fields Report

Appendix D Geotechnical Investigation and Waste Classification

Appendix E Arboricultural Investigation

References

- ¹ NSW Department of Planning and Environment, NSW Code of Practice for Authorised Network Operators, 2015
<www.planning.nsw.gov.au/~media/6D8F1CFFB2CE459FA25D084AA4A11A5B.ashx>
- ² The World Resource Institute and World Business Council for Sustainable Development, Greenhouse Gas Protocol – Corporate Accounting and Reporting Standard (GHG Protocol), 2004.
- ³ International Standards Organisation (ISO), ISO 14064-1:2006 Standard for Greenhouse Gases – Part 1: Specification with guidance at the organisation level for quantification and reporting of greenhouse gasses and removals, 2006.
- ⁴ Holper et al, Infrastructure and Climate Change Risk Assessment for Victoria, 2007.
- ⁵ Greenhouse Gas Abatement Scheme <www.greenhousegas.nsw.gov.au>
- ⁶ ARPANSA, Extremely low frequency electric and magnetic fields <www.arpansa.gov.au>
- ⁷ WHO What are electromagnetic fields? www.who.int
- ⁸ 2010 International Commission on Non Ionizing Radiation Protection, Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz - 100 kHz). Health Physics 99(6):818-836
- ⁹ ARPANSA, Extremely low frequency electric and magnetic fields <www.arpansa.gov.au>
- ¹⁰ Gibbs, Sir Harry (1991). Inquiry into community needs and high voltage transmission line development. Report to the NSW Minister for Minerals and Energy. Sydney, NSW: Department of Minerals and Energy, February 1991
- ¹¹ Peach H.G., Bonwick W.J. and Wyse T. (1992). Report of the Panel on Electromagnetic Fields and Health to the Victorian Government (Peach Panel Report). Melbourne, Victoria: September, 1992. 2 volumes: Report; Appendices
- ¹² DECCW, Interim Construction Noise Guideline (ICNG), 2009.
- ¹³ Landcom, *Managing Urban Stormwater: Soils and Construction*, 4th edition, 2004.
- ¹⁴ Commonwealth Department of Environment, *Australian Heritage Database*, Canberra, viewed [date month 2011](#), <www.environment.gov.au/cgi-bin/ahdb/search.pl>
- ¹⁵ NSW Heritage Branch, *State Heritage Inventory*, viewed [date month 2011](#), <www.heritage.nsw.gov.au/07_subnav_01.cfm>
- ¹⁶ Roads & Traffic Authority (RTA), *Traffic Control at Worksites, Version 4*, NSW 2010
- ¹⁷ Commonwealth Department of Environment, *Protected Matters Search Tool*, viewed Aug 2022, <www.deh.gov.au/erin/ert/epbc/index.html>
- ¹⁸ Telstra Corporation Limited v Hornsby Shire Council [2006] NSWLEC 133, Preston CJ at 129

¹⁹ Department of Infrastructure, Planning and Natural Resources (DIPNR), *Guideline for the Preparation of Environmental Management Plans*, 2004,
<www.planning.nsw.gov.au/rdaguidelines/documents/emp_guideline_publication_october.pdf>

²⁰ ISO, *ISO 14001:2015 Environmental management systems - Requirements with guidance for use*, 2004.