Transgrid

HumeLink Environmental Impact Statement Summary

August 2023

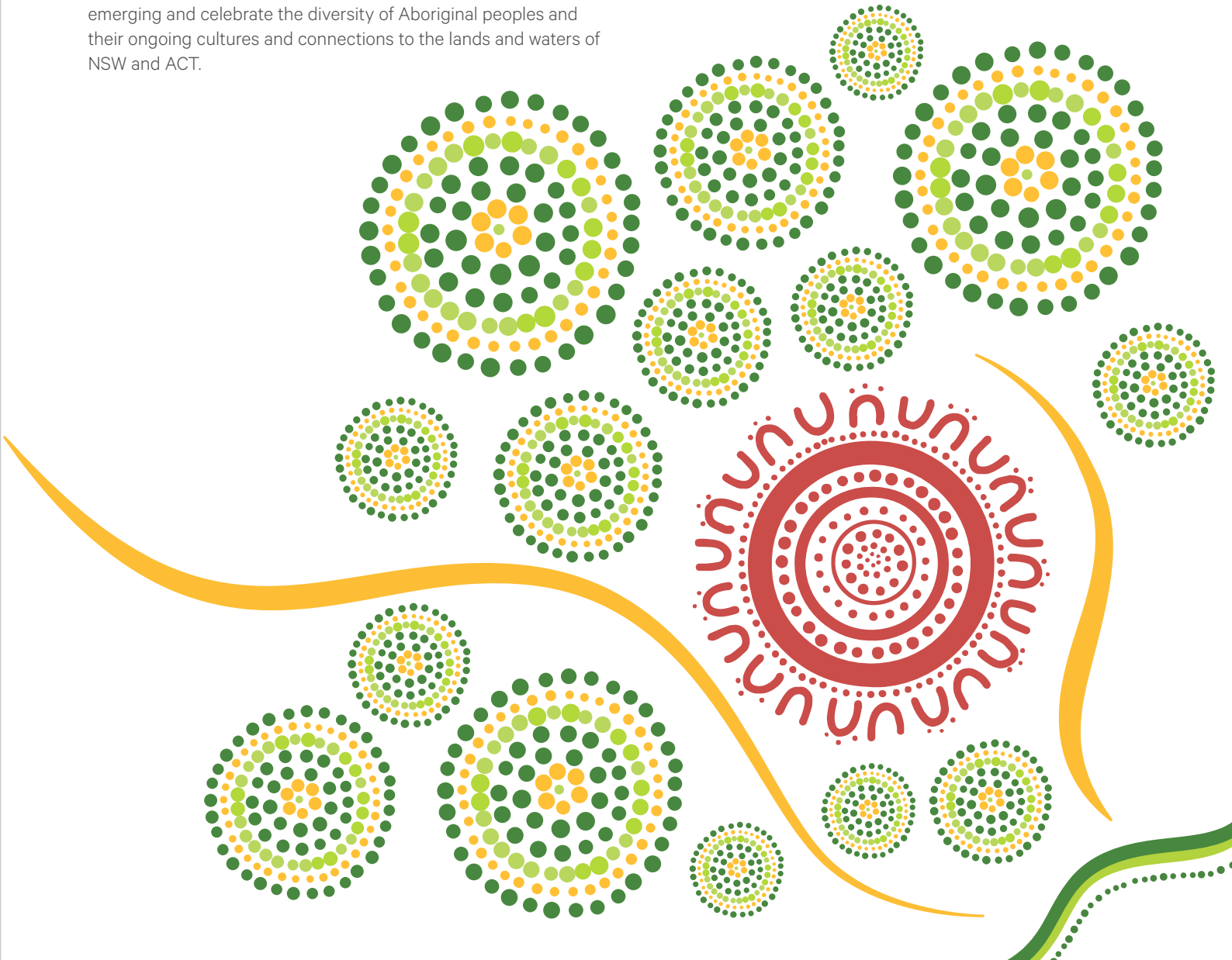
People. Power. Possibilities.

Contents

Acknowledgment of Country

In the spirit of reconciliation Transgrid acknowledges the Traditional Custodians of the lands where we work, the lands we travel through and the places in which we live.

We pay respects to the people and the Elders, past, present and emerging and celebrate the diversity of Aboriginal peoples and their ongoing cultures and connections to the lands and waters of NSW and ACT.



Preface

Transgrid

Preface

The Australian energy landscape is transitioning to a greater mix of low-emission renewable energy sources, such as wind and solar. To support this transition, meet our future energy demands and connect Australian communities and businesses to these lower cost energy sources, the national electricity grid needs to evolve. In response to this need, Transgrid is seeking regulatory and environmental planning approval for the construction and operation of about 360 kilometres of new 500 kilovolt (kV) high-voltage transmission lines and associated infrastructure between Wagga Wagga, Bannaby and Maragle. This project is collectively referred to as HumeLink.

The project has been declared as Critical State Significant Infrastructure (CSSI) and requires assessment by the NSW Department of Planning and Environment (DPE) under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The project has also been declared a "controlled action" under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and will be assessed by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the assessment bilateral agreement, which accredits certain NSW processes to reduce assessment duplication by the Commonwealth government. The approval authorities are the NSW Minister for Planning and the Commonwealth Minister for Environment and Water.

The planning approvals process for the project is summarised in Figure 1.

An Environmental Impact Statement (EIS) has been prepared in accordance with the Planning Secretary's Environmental Assessment Requirements (SEARs), the Supplementary SEARs, the requirements of the EP&A Act and EPBC Act, the Environmental Planning and Assessment Regulation 2021, and the *State Significant Infrastructure Guidelines*. The EIS details the project, its potential environmental, social and economic impacts and benefits, and how these impacts would be avoided, minimised and managed throughout construction and operation. Should the project be approved, it would be constructed and operated in accordance with the mitigation and management measures proposed in the EIS as well as the conditions of approval.

This document is a summary of the EIS and has been prepared to describe the findings of the EIS in an easy-to-read format.

Figure 2 provides an explanation of the levels of information provided on the project.

The EIS is available to download on the Department of Planning and Environment's website: https://pp.planningportal.nsw.gov.au/major-projects/projects/humelink.

Chapter 1 (Introduction) of the EIS provides further information on the context and content of the EIS.

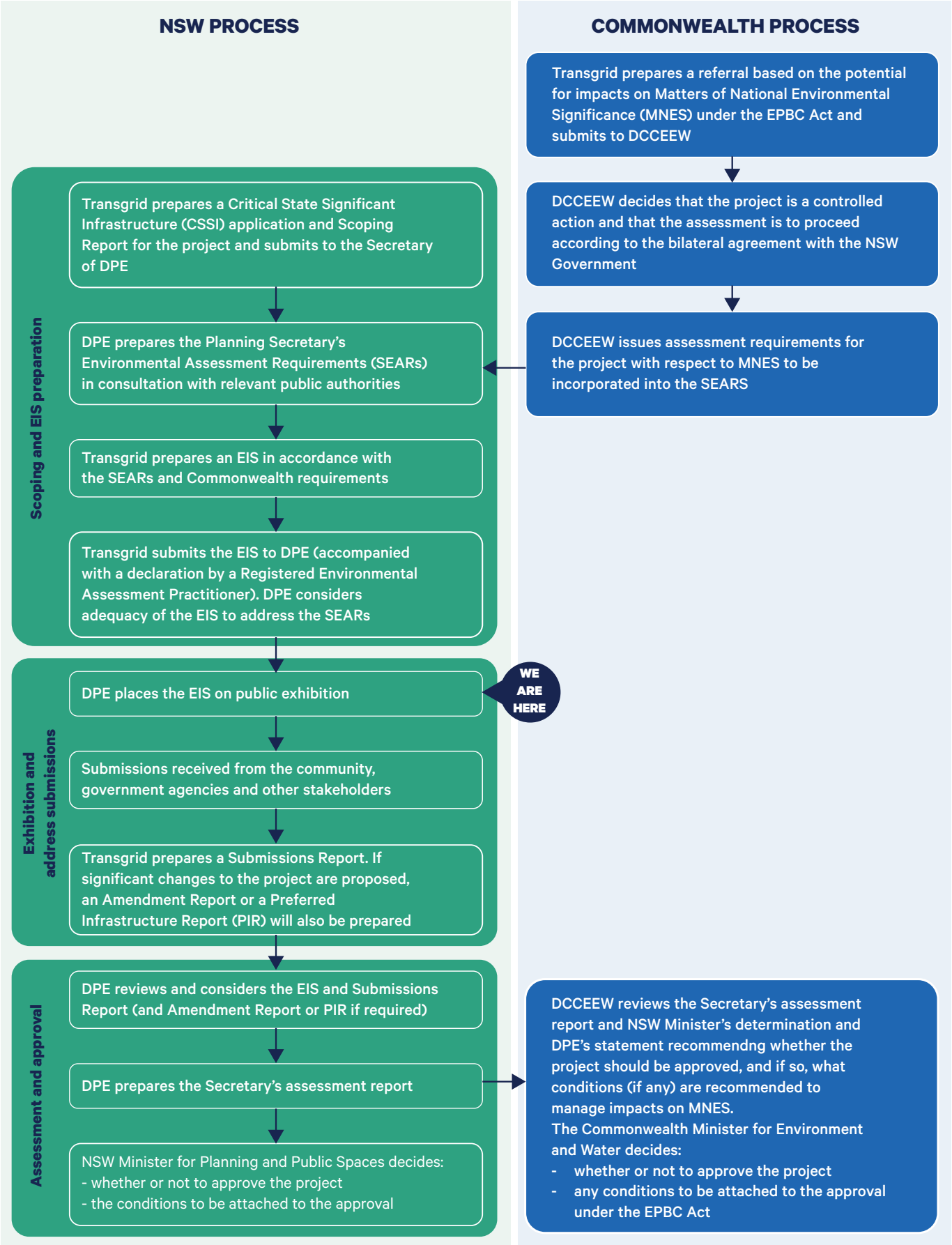


Figure 1 - Planning approvals process for the project

Guide to the

HumeLink Environmental Impact Statement (EIS)

Transgrid understands community members and stakeholders will be interested in different aspects of the EIS relating to their local area or individual circumstances.

This infographic explains the different types of information available and where this information can be found, and provides guidance on the content of each suite of resources.

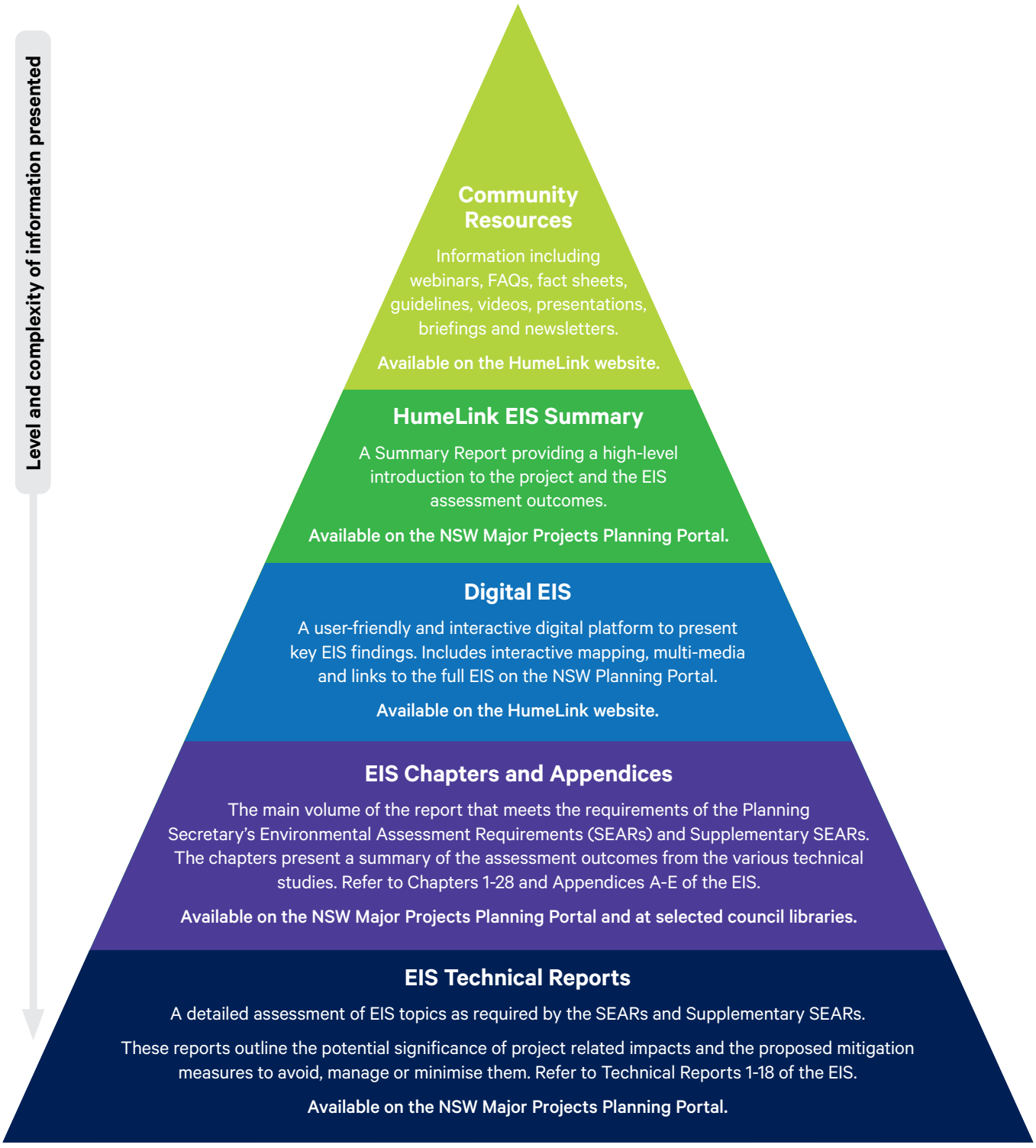


Figure 2 - Public information on the EIS

Description of the project

Transgrid

Who is Transgrid and what is HumeLink?

Transgrid operates and manages the high voltage electricity transmission network in NSW and the ACT, connecting generators, distributors, and major end users through 13,000 kilometres of existing high voltage transmission lines and 121 substations.

Transgrid's network forms the backbone of the National Electricity Market, enabling energy trading between Australia's three largest states along the east coast, and supporting the competitive wholesale electricity market, while leading the transition to a clean energy future.

Transgrid is proposing to increase the energy network capacity in southern NSW through the development of about 360 kilometres of new 500 kilovolt (kV) high-voltage transmission lines and associated infrastructure between Wagga Wagga, Bannaby and Maragle. This project is known as HumeLink. The project would be located across five Local Government Areas (LGAs) (refer to Figure 3).

When completed, HumeLink would achieve the objectives to:

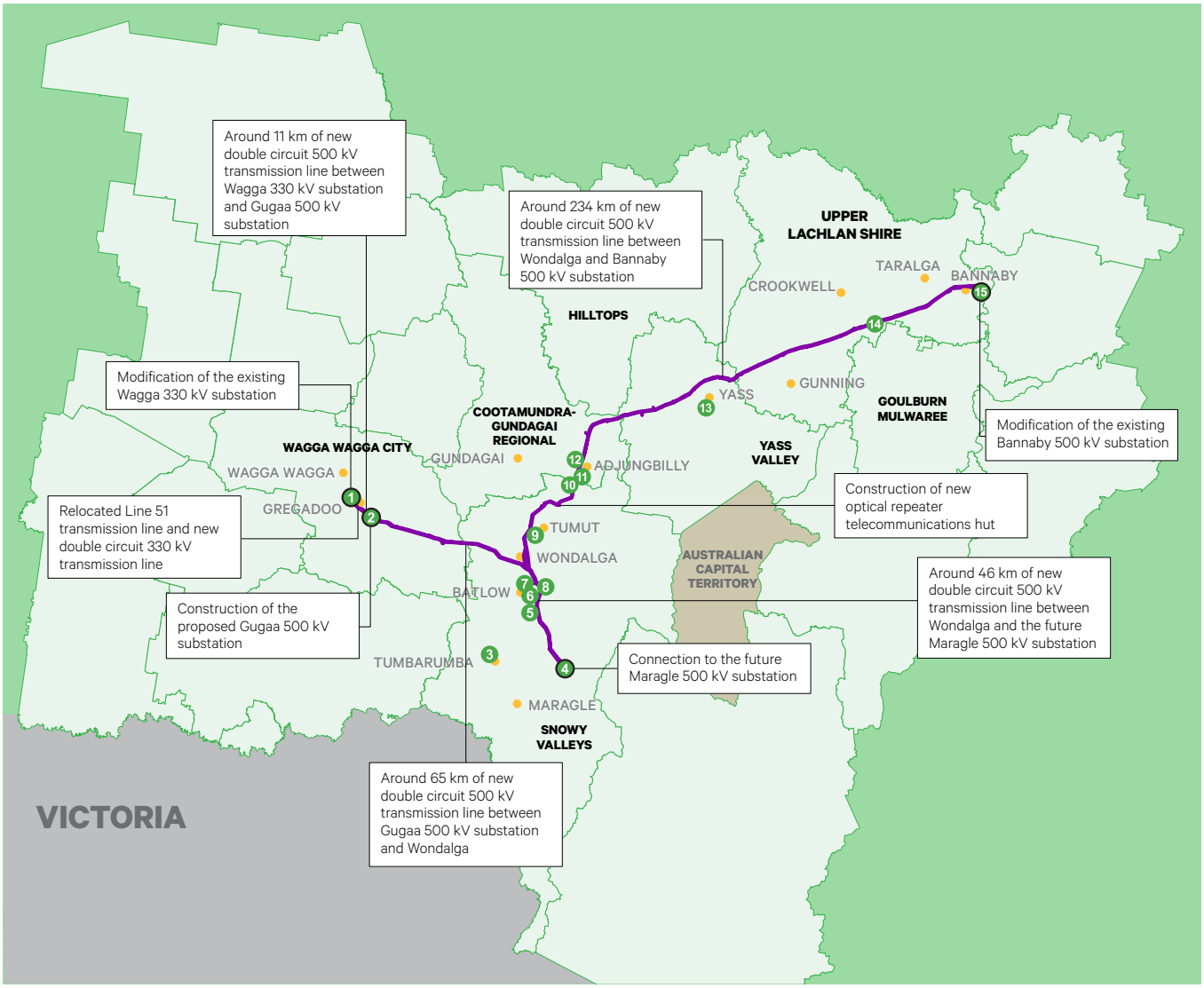
- increase the transfer capacity between southern NSW and major load centres within NSW (Sydney, Newcastle and Wollongong)
- reinforce stability and reliability in the network
- facilitate transition of the network to new generation sources.

Once operational, HumeLink would deliver a cheaper, more reliable and more sustainable grid and help to transition Australia to a low carbon future. This would be achieved by increasing the amount of renewable energy that could be delivered within the National Electricity Market, including by supporting the transfer of energy from existing and new renewable energy projects in the region. HumeLink would connect to other approved major projects including EnergyConnect (NSW – Eastern Section) and Snowy 2.0 - Transmission Connection Project.

Transgrid seeks approval for:

- construction and operation of around 360 kilometres of new double-circuit 500 kV transmission lines and associated infrastructure between Wagga Wagga, Bannaby and Maragle
- construction of a new 500/330 kV substation at Gregadoo (Gugaa 500 kV substation) approximately 11 kilometres south-east of the existing Wagga 330/132 kV substation (Wagga 330 kV substation)
- demolition and rebuild of a section of existing transmission line (around two kilometres in length) as a double-circuit 330 kV transmission line connecting into the Wagga 330 kV substation
- modification of the existing Wagga 330 kV substation and Bannaby 500/330 kV substation (Bannaby 500 kV substation) to accommodate the new transmission line connections
- connection of transmission lines to the future Maragle 500/330 kV substation (Maragle 500 kV substation, approved separately under the Snowy 2.0 Transmission Connection Project)
- provision of one optical repeater telecommunications hut and associated connections to existing local electrical infrastructure
- establishment of new and/or upgraded temporary and permanent access tracks/roads
- ancillary works required for construction of the project such as construction compounds, worker accommodation facilities, utility connections and/or relocations, brake and winch sites, and helipad/helicopter support facilities.

Chapter 1 (Introduction) of the EIS provides further information on Transgrid and HumeLink.



Project footprint Substation location

Construction ancillary facilities

1. Wagga 330 kV substation compound (C01)
2. Gregadoo Road compound (C06)
3. Tumbarumba accommodation facility (AC1)
4. Maragle 500 kV substation compound (C05)
5. Snubba Road compound (C16)
6. Bowmans Lane compound (C15)
7. Memorial Avenue compound (C14)
8. Snubba Road compound (C03)
9. Snowy Mountains Highway compound (C02)
0. Honeysuckle Road compound (C07)
11. Red Hill Road compound (C08)
12. Adjungbilly Road compound (09)
13. Yass substation compound (C10)
14. Woodhouselee Road compound (C11)
15. Bannaby 500 kV substation compound (C12)

Figure 3 - Key components of the project

Why is the project needed?

The Australian energy landscape and its supporting infrastructure requirements is transitioning. In NSW, existing coal-fired generators are being progressively retired and as a result, there is a pressing and urgent need for new sources of supply to meet existing and growing energy demand. New sources of energy generation will largely consist of renewable energy projects.

In response, the transmission infrastructure networks need to be expanded to connect renewable energy generation. Expansion is required as load centres are primarily located along the eastern, coastal regions of NSW where coal-fired generation is currently located. Areas of greatest potential for new renewables are distant from these existing load centres. While the existing network will continue to play an important role, it only has enough capacity to connect around five per cent of these potential new renewable energy projects according to the *NSW Transmission Infrastructure Strategy*.

HumeLink would be a key component of the energy transition. It would open up additional capacity for new generation, primarily renewable wind and solar generation in southern NSW, and improve wholesale market competition. HumeLink would therefore improve access to affordable electricity and lower electricity costs in the longer term.

The need for HumeLink is highlighted in the *2022 Integrated System Plan*, which identifies HumeLink as a key "actionable" project, to be "progressed urgently". HumeLink would support several other critical energy projects identified in this plan that are required to transition the National Electricity Market to lower cost and low-emission renewable energy sources. HumeLink would have a direct interface with the approved Snowy 2.0 – Transmission Connection project at the future Maragle 500 kV substation and with the approved Project EnergyConnect (NSW – Eastern Section) at the Wagga 330 kV substation. As stated in the *2019 Electricity Statement of Opportunities*, the full benefits of new renewable generation, including upgrades to the Snowy Hydro Scheme (Snowy 2.0) will not be realised without an associated increase in transmission capacity. HumeLink would provide this additional capacity.

Other key strategic factors driving the need for HumeLink are the need to:

- address climate change, and to meet the Commonwealth and State government commitments to reduce carbon emissions and greenhouse gases
- reinforce stability and reliability in the network
- facilitate development of new renewable energy generation in the candidate Wagga Wagga Renewable Energy Zone (REZ) and Tumut REZ and declared South West NSW REZ, which are identified in the 2022 Integrated System Plan.

Figure 4 shows the location of the project in relation to the candidate renewable energy zones and nearby projects.

The project is expected to deliver $491 million in net benefits to electricity customers. Other key benefits include:

- Reliable power: NSW households would have greater access to reliable and affordable electricity.
- Economic growth: HumeLink would unlock the full capacity of the expanded Snowy Hydro Scheme and enable greater sharing of energy across the eastern states.
- Cleaner, sustainable future: HumeLink would enable more renewable energy generation to enter the market, supporting Australia's emissions reduction targets.
- Jobs and opportunities: HumeLink would create more than 1,000 construction jobs.
- Economic growth: HumeLink would contribute to economic activity in regional NSW, generating major benefits for local communities along the route.

By increasing the amount of electricity that can be delivered to the National Electricity Market (NEM) and providing greater access to reliable and affordable electricity, the project would increase competition in wholesale energy, help lower and stabilise electricity prices and reduce volatility in the longer term. More reliable and affordable energy would in turn help to increased business productivity and lower living expenses.

The project also aims to support the strategic objectives of several other plans and strategies related to energy including:

- *Australia's Long Term Emissions Reduction Plan*
- *NSW Transmission Infrastructure Strategy*
- *NSW Electricity Strategy*
- *Electricity Infrastructure Roadmap*
- *Net Zero Plan Stage 1: 2020 – 2030.*

Chapter 2 (Strategic context and project need) of the EIS provides further information on why the project is needed.

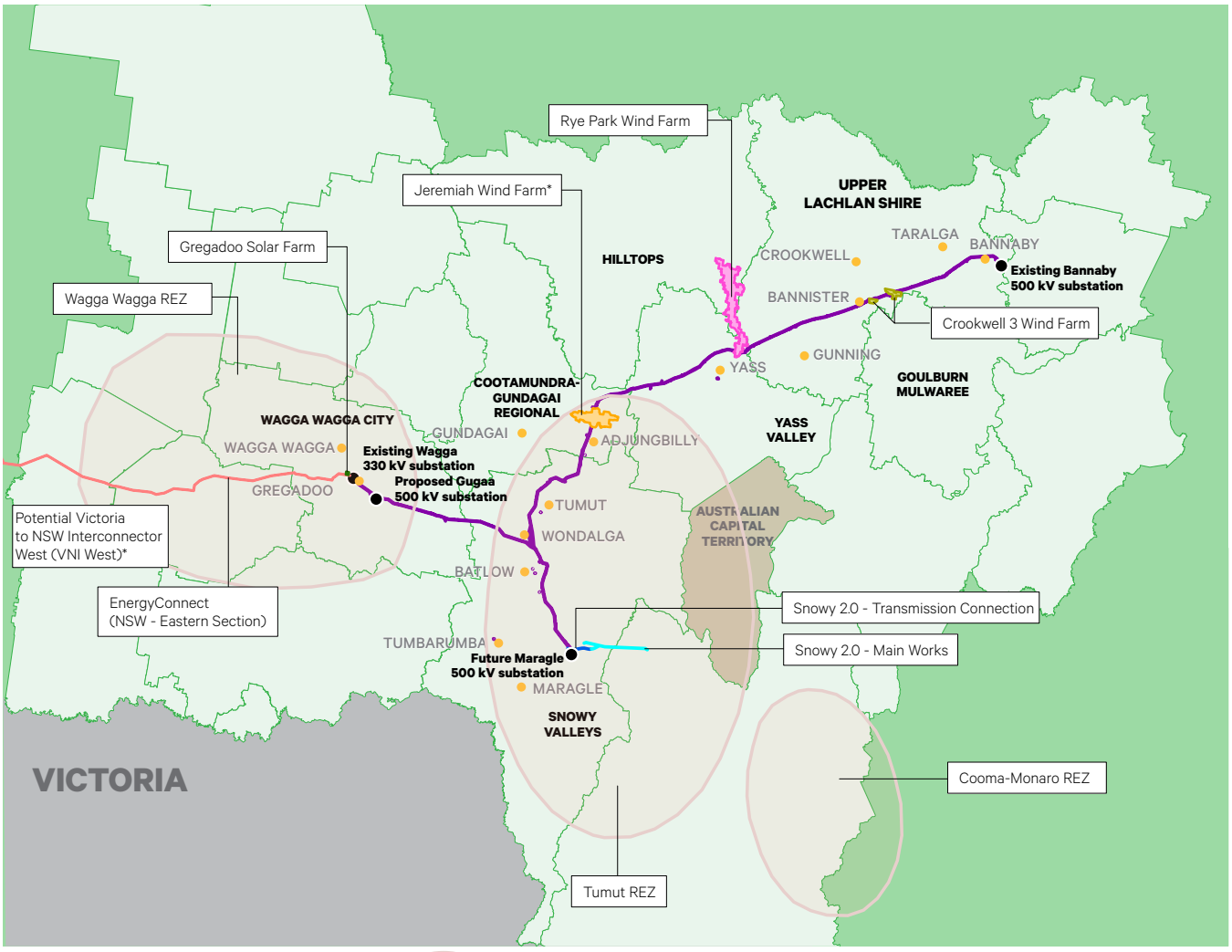


Figure 4 - Strategic location of the project

How was the project developed and what alternatives were considered?

The development of the project involved a robust regulatory assessment of strategic and technical options (the Regulatory Investment Test for Transmission (RIT-T) process), as well as a detailed route and corridor refinement process. Chapter 2 (Strategic context and project need) of the EIS provides further information on the project development processes. These processes involved engagement with landowners, communities and key stakeholders. A summary of these processes including the opportunities for public involvement is shown in Figure 5.

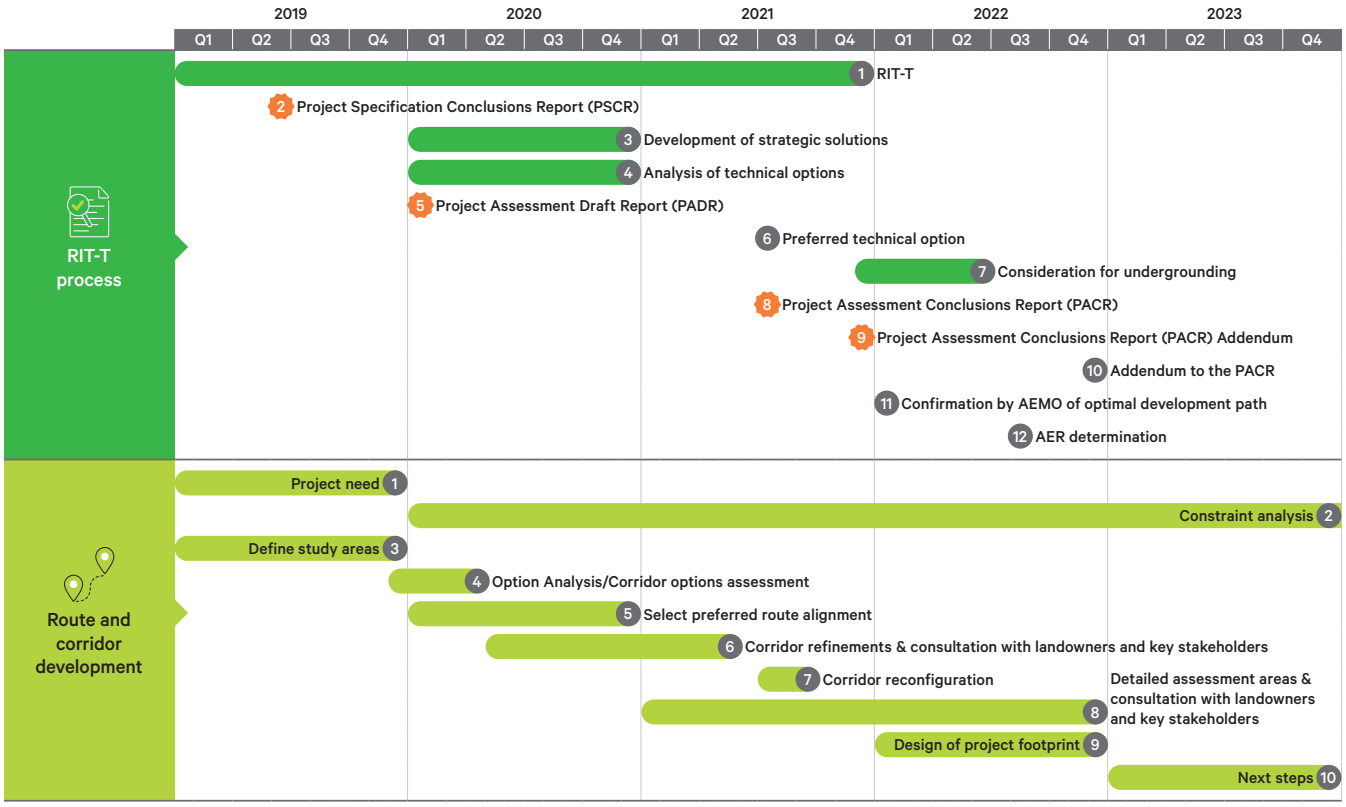
HumeLink has been independently reviewed and approved by the Australian Energy Regulator (AER) through the RIT-T process. The purpose of the RIT-T process is to consider all credible technical options to address the identified need for the transmission network (including non-network options) and select the option that maximises benefits to all those who produce, consume and transport electricity in the market. The RIT-T process for HumeLink was carried out between 2020 and 2022. The RIT-T process concluded that a new double-circuit 500 kV transmission line between Maragle and Bannaby via Wagga Wagga would provide the greatest net benefit of the options considered. The AER approved the requested funding for the first stage of HumeLink in August 2022.

The transmission line corridor identification and route refinement process began around late 2019 by carrying out a corridor options assessment based on mapping and analysis of high-level constraints. An initial study corridor that was between one and 5 kilometres wide was published in April 2020 and formed the basis for community and stakeholder engagement activities. From 2020 to 2022, several modifications and refinements were made to the initial study corridor as a result of consultation with landowners and stakeholders, site visits, design development and improved understanding of constraints through field studies and environmental assessment. Information on the key proposed changes was provided to the community during this process, including publishing of a community information fact sheet on several route refinement decisions in March 2022.

The project has been developed to avoid and minimise impacts where feasible and reasonable to do so and has been informed by stakeholder and community feedback in addition to other considerations. This included iterative refinement of the potential transmission line corridor as well as assessment of alternative locations for key project components including Gugaa 500 kV substation and ancillary facility locations such as construction compounds and worker accommodation facilities. The proposed transmission line corridor and locations for all key project components were selected on the basis of best meeting the project objectives and avoiding and minimising the impacts on communities and the environment.

In response to community feedback, an independent investigation was also carried out in consultation with an Undergrounding Feasibility Steering Committee to assess the viability of building HumeLink as an underground cable instead of overhead transmission lines. Based on the findings, Transgrid confirmed undergrounding HumeLink would not be consistent with the regulatory rules that require Transgrid to propose the most efficient option for consumers based on the capital cost of the solution, the ongoing operational costs, the market benefits, the expected reliability, and the costs associated with the impact on landowners, the community, and the environment.

Aspects of the project will continue to be refined as part of the detailed design and construction process, including the specific location, height and type of transmission line structures, location of access tracks/roads and confirmation of the required construction locations within the project footprint. Would be carried out with the objective of further avoiding and minimising potential impacts. The detailed design and construction stages would be informed by ongoing consultation with stakeholders, landowners and the community.



RIT-T process

1. **RIT-T (Jan 2019–Dec 2021):** Regulatory Investment Test-Transmission demonstrating Humelink's benefits to consumers.
2. **Project Specification Conclusions Report (PSCR) (Jun 2019):** Detailed the need to reinforce the transmission network in southern NSW to increase capacity to the state's demand centres and described options to meet the need, including technical characteristics that would be required of a non-network option.
3. **Development of strategic solutions (Jan–Dec 2020):** Testing and determining different strategic options.
4. **Analysis of technical options (Jan–Dec 2020):** Technical options assessed including optional transmission lines and scenarios for different voltages, to be included in Project Assessment Draft Report (PADR).
5. **Project Assessment Draft Report (PADR) (Jan 2020):** Quantitative analysis of the proposed options and expected market benefit across a range of scenarios and sensitivities, published as supporting documents.
6. **Preferred technical option (Jul 2021):** Best technical option/project solution published in the Project Assessment Conclusion Report (PACR). Best technical option has been announced as – *new transmission lines in a "loop" between Maragle, Bannaby and Wagga Wagga with construction and operation at 500 kV.*
7. **Consideration for undergrounding (Nov 2021–Jun 2022):** Research and analysis on the possibility and benefits of undergrounding.
8. **Project Assessment Conclusions Report (PACR) (Jul 2021):** Addressed PADR consultation responses and determined the final preferred option.
9. **Project Assessment Conclusions Report (PACR) Addendum (Dec 2021):** This addendum has been prepared in response to the AER's dispute determination and extends the analysis presented in the HumeLink PACR published in July 2021.
10. **Addendum to PACR (Dec 2022):** Providing more information on the best technical option/project solution.
11. **Confirmation by AEMO of optional development path (Jan 2022):** Confirmed that the proposed option and preferred cost is consistent with the optimal development path.
12. **AER determination (Aug 2022):** Confirmed that Transgrid may proceed to the next stage of the HumeLink project and is entitled to recover revenues from energy consumers to deliver the Stage 1 (Early Works).

Route and corridor development

1. **Project need (Jan–Dec 2019):** Transmission lines route and area of works.
2. **Constraint analysis (2020–ongoing):** Tier 1 – Avoid, Tier 2 – Avoid where possible, minimise impacts to Network requirements.
3. **Define study areas (Jan–Dec 2019):** Based on nodes and outcomes of high level constraint analysis.
4. **Option Analysis/Corridor options assessment (Nov 2019–Apr 2020):** Identified high level constraints through desktop analysis and community engagement processes. Generated list of route alignment options that connect between nodes and reflect ranking of Tier 1 and 2 constraints. Evaluated list of route alignment options and shortlisted alignment options.
5. **Select preferred route alignment (Jan–Dec 2020):** Divided project into sections based on common constraints and opportunities. Compared shortlisted alignment options based on constraints and opportunities. Selected preferred route alignment for each section.
6. **Corridor refinements & consultation with landowners and key stakeholders (May 2020–May 2021):** Refine the project footprint with the selected route alignment, prioritising consultation with landowners and key stakeholders through the corridor refinement process.
7. **Corridor reconfiguration (Jul–Sept 2019):** Further changes and modifications to the refined project footprint.
8. **Detailed assessment areas & consultation with landowners and key stakeholders (2021–2022):** In parallel with RIT-T process, to address strong community interests to potential route options and minimise environmental impacts in particularly sensitive areas, by undertaking consultation with landowners and key stakeholders.
9. **Design of project footprint (Jan–Dec 2022):** Design the final project footprint with sufficient flexibility for concept design.
10. **Next steps (Jan–Dec 2023):** Community and stakeholder engagement along preferred project footprint, considering alternative alignments and routes suggestions. Refine project footprint and easement alignment. Direct engagement with landowners in the area have resulted in the proposal of alternative route for consideration (Yaven Creek and Green Hills).

Figure 5 - Overview of transmission line options selection process

How have the community and stakeholders been involved?

Transgrid is committed to engaging with landowners, communities and other stakeholders throughout the project's life. Landowner, community and stakeholder engagement for HumeLink began in early 2020. Engagement has been carried out in line with the *HumeLink Engagement Strategy* the International Association of Public Participation's (IAP2) public participation spectrum and the requirements of the SEARs. The objectives of the engagement are to:

- work in partnership with local communities and businesses
- listen to feedback, understand community views, and consider how these can deliver a better project
- be accessible and provide engagement that works for communities and considers audiences
- deliver long-term social, economic, and environmental legacies for communities and regions
- build awareness of HumeLink's role in providing reliable, clean energy and affordable electricity to consumers
- build on Transgrid's positive reputation and social licence to operate.

Figure 6 summarises an overview of community consultation activities carried out for the project up to June 2023. Key topics raised and responded to during community consultation in the development of the project and EIS include:

- design and construction including transmission line structure locations, potential to underground transmission lines, alignment and route selection, electric and magnetic field (EMF) and vegetation clearance
- environment and heritage including impacts on visual amenity, biodiversity, Aboriginal heritage, local roads and tourism as well as biosecurity, bushfire and EMF risks
- project process including the consultation process, contractor requirements and regulatory frameworks
- property including compensation, landowner agreements and property valuations
- socio-economic including impacts on tourism, worker accommodation, local partnerships and opportunities for community benefits, and impacts to mental health.

The feedback received has been and will continue to be considered as the project progresses.

In 2021, Transgrid established three independently facilitated Community Consultative Groups (CCGs), which include a wide range of stakeholders including local government authorities, impacted landowners, and interested community members. The aim of the CCGs is to inform, seek input from key community representatives on issues, and work directly with stakeholders to address concerns as they are identified throughout all stages of the project. The three CCGs were combined into one larger combined CCG in March 2023 at the request of the participants.

Transgrid proactively sought landowner and community input on draft materials including easement option agreements, EIS factsheets and other engagement collateral.

Transgrid also implemented a targeted approach for landowner engagement. Each landowner within the project footprint was allocated a dedicated Place Manager and Land Access Officer who worked with them throughout early engagement, route refinement and continuing easement negotiations.

Consultation with Commonwealth and State government agencies and councils for the project during the development of the EIS has included workshops, meetings, emails, discussions and a site visit. This engagement has informed the preparation of the EIS. Additional targeted consultation has also been carried out to inform the preparation of EIS technical reports. This included consultation with Aboriginal communities in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* as well as consultation with relevant stakeholders to help identify agricultural, social and aviation impacts.

Transgrid will continue to provide opportunities for community and stakeholder engagement during the exhibition period including stakeholder briefings and community information sessions. This will facilitate further understanding of the project assessment process and what can be expected. Engagement with the community and stakeholders (including the CCGs) will continue throughout the assessment process and during the construction of HumeLink. In particular, consultation would continue with directly impacted landowners during the detailed design and construction of the project to develop individual Property Management Plans that address specific property requirements.

Chapter 6 (Engagement) of the EIS provides further information on how the community and stakeholders have been involved during development of the project.

HumeLink community consultation activities overview

March 2021 – June 2023

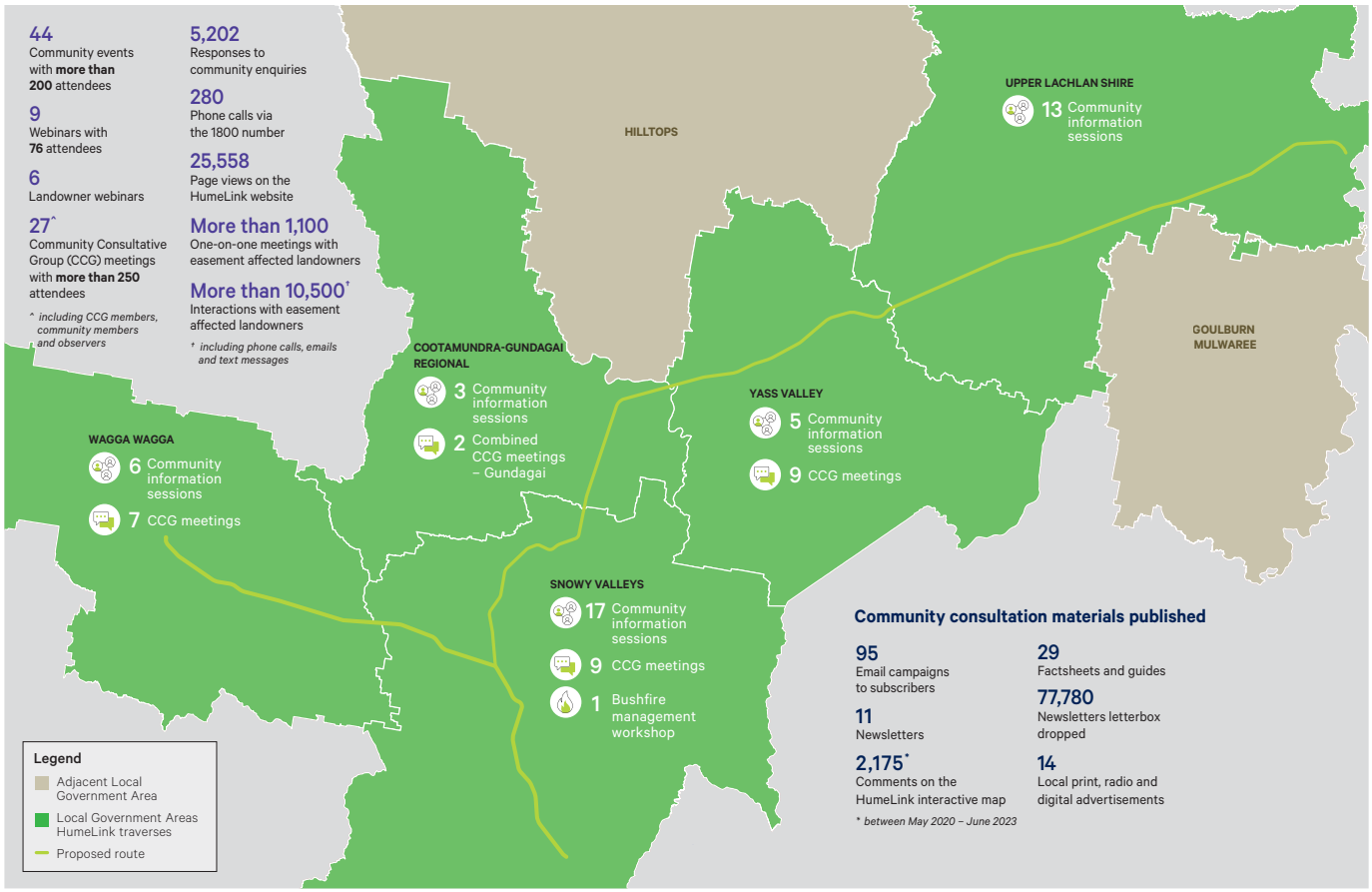


Figure 6 - Overview of community consultation activities to date

What are the key details of the project?

The project description is based on a concept design and indicative construction methodology, which would continue to be refined by the successful construction contractors. Chapter 3 (Project description – infrastructure and operation) and Chapter 4 (Project description – construction) of the EIS provide further details on the project.

Project infrastructure

Transmission lines

The project includes the construction of new 500 kV transmission lines between the existing Wagga 330 kV substation, proposed Gugaa 500 kV substation, future Maragle 500 kV substation and existing Bannaby 500 kV substation. The transmission line section between the Wagga 330 kV substation and the proposed Gugaa 500 kV substation would operate at 330 kV under HumeLink. The 500 kV transmission lines would be supported on a series of free-standing steel lattice structures that would be generally spaced between 300 to 600 metres apart. The project also includes the demolition and rebuild of about two kilometres of an existing transmission line between the Wagga 330 kV substation and Ivydale Road, Gregadoo as a double-circuit 330 kV transmission line. The final transmission line structure types, number of transmission line structures, size, height and spacing, would be determined during detailed design. Indicative transmission line structures are shown in Figure 7.

The project would require new easements (ie a legal right of access) to be established for the 500 kV transmission lines, which are typically 70 metres wide. However, a number of locations may require wider easements of up to 110 metres wide for technical engineering reasons and up to 130 metres wide where the new transmission line would parallel the rebuilt 330 kV section of line.

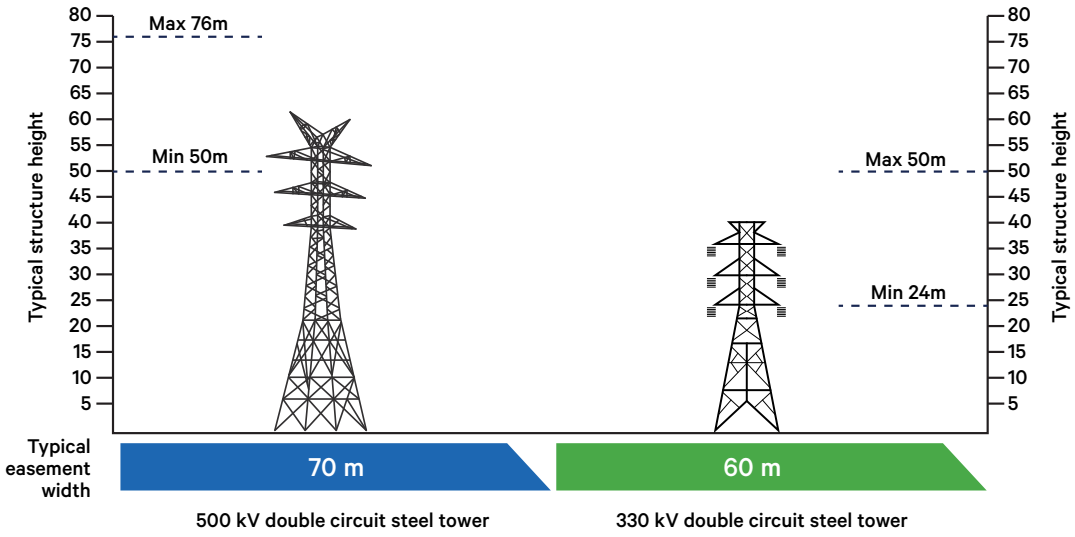


Figure 7 - Indicative transmission line structures

Substations

The proposed Gugaa 500 kV substation would be constructed at Gregadoo, about 11 kilometres south east of the Wagga 330 kV substation. The required infrastructure would occupy an area of about 22 hectares and would include new transformers and reactors, overhead electrical components, an auxiliary services building and associated facilities (eg for drainage).

The existing Bannaby 500 kV substation on Hanworth Road, Bannaby and the existing Wagga 330 kV substation on Ashfords Road, Gregadoo would be expanded and modified to accommodate the new 500 kV transmission lines. This would include a substation bench extension and modifications to existing electrical equipment, drainage, external fence, substation roads and other minor infrastructure.

The project would connect to the future Maragle 500 kV substation approved under the Snowy 2.0 Transmission Connection Project.

Ancillary infrastructure

One telecommunications hut would be required for the project to boost the signal in the optical fibre ground wire. The project also includes a connection of optical fibre ground wire between transmission line structures and the Rye Park Wind Farm substation.

Where possible, existing roads, tracks and other existing disturbed areas would be used to access the project. However, upgrades to existing access tracks or new access tracks and/or waterway crossings would be required where there is no suitable access.

Construction

Construction overview

The indicative timeframes for key construction activities are shown in Figure 8. In line with the *2022 Integrated System Plan*, the project is planned to be completed by mid-2026, ahead of the previous projected date of late-2026. Transgrid recognises the benefits of the transition to renewable energy for consumers and is committed to working with our delivery partners, landowners and key stakeholders to meet this timeline.

Construction at each transmission line structure would be intermittent. Figure 9 shows the indicative construction process for each transmission line structure.

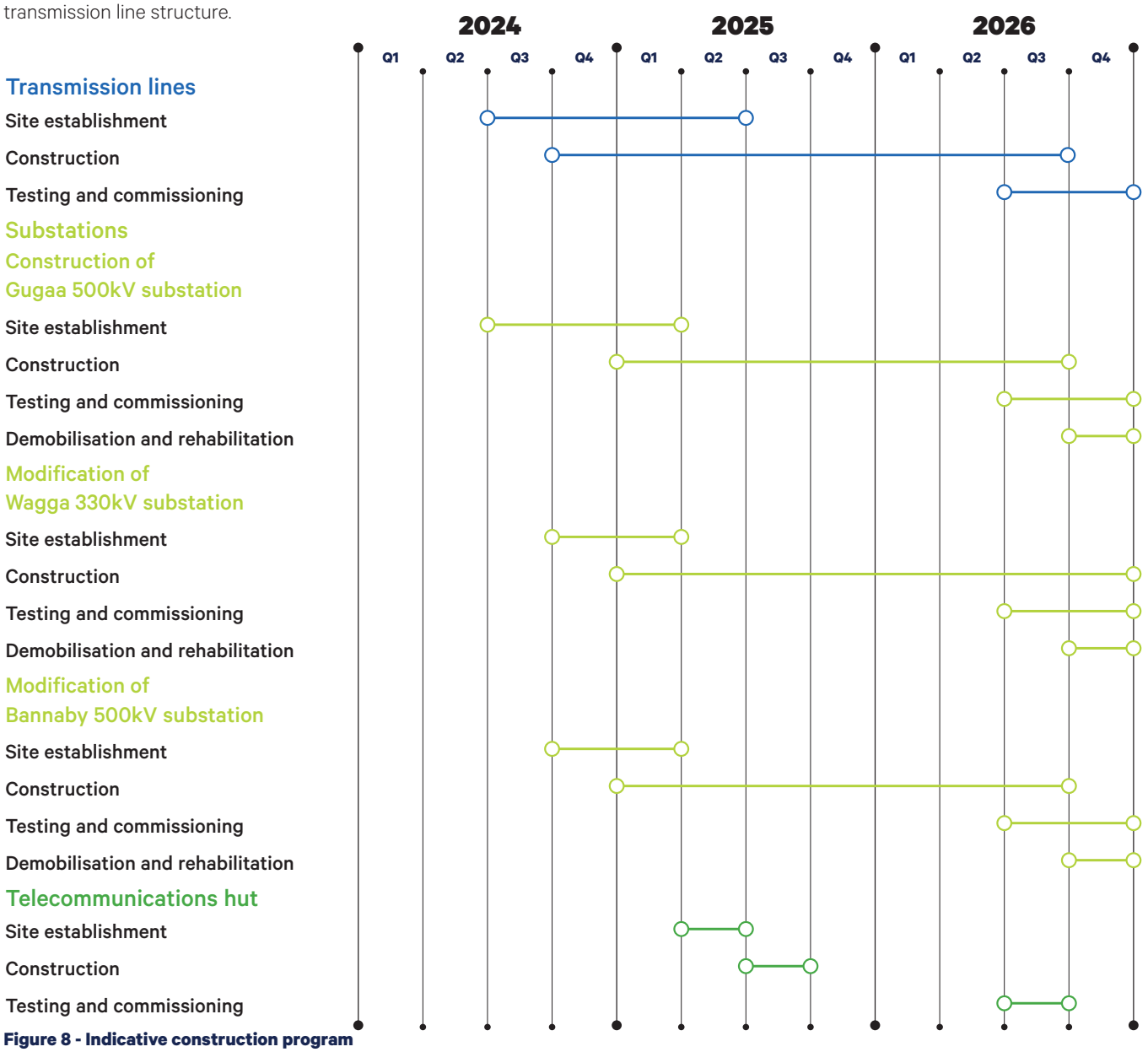


Figure 8 - Indicative construction program

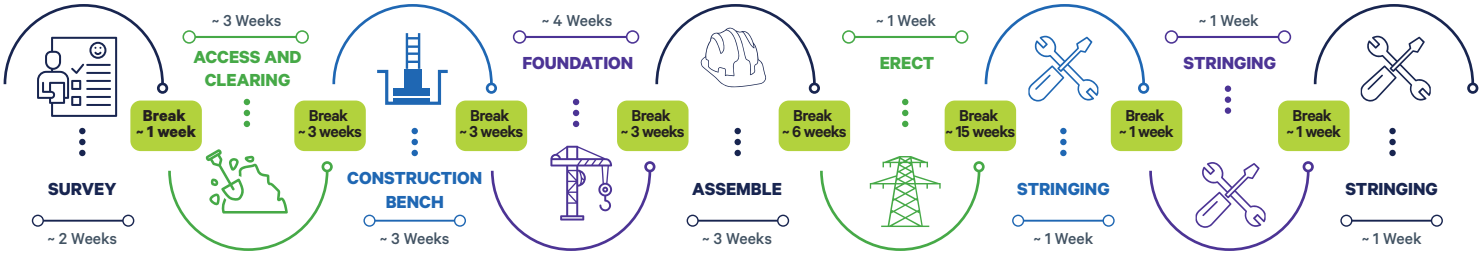


Figure 9 - Indicative duration and sequence of construction activities for transmission line structures

It is expected that construction activities would largely be undertaken during standard construction hours. However, there would be times when working outside of standard construction hours (refer to Figure 10) would be required. This would be managed through an out of hours work protocol.

Construction movements would comprise vehicles transporting equipment, materials and workers. More heavy vehicles would be required during the main work associated with the substations. Non-standard or oversized loads would also be required for the substation work (e.g. for transformers) and transportation of transmission line structure materials and conductors.

The construction worker numbers would vary depending on the stage of construction and activities. During peak construction, the project would employ up to 1,200 workers across multiple work fronts. However, the maximum number of construction workers at any one location would not be expected to exceed 200.

Construction facility locations

Construction compounds would be required to support staging and equipment laydown, concrete batching, temporary storage of materials, plant and equipment and worker parking. Fourteen potential construction compound locations have been identified (refer to Figure 3). However the specific use of each compound (if confirmed required) and their proposed boundaries/layout would be refined as the project design develops.

It has been assumed that existing accommodation facilities within towns near the project would provide temporary accommodation for most construction workers. To assist in managing demand for local accommodation requirements, an option for temporary worker accommodation at Tumbarumba for up to 200 construction workers has been assessed as part of the EIS. Construction worker accommodation would be developed in accordance with the Worker Accommodation Strategy for the project. The final worker accommodation requirements would be confirmed by the construction contractors.

Helicopters may be used to deliver materials/equipment and workers to construction areas particularly within high alpine regions. Helicopters may also be used for stringing of the transmission lines (to be determined during detailed design). To enable helicopters to operate safely and allow easy access to the site, helicopter landing pads (helipads) would be required. The helipad locations would be confirmed during detailed design by the construction contractors.

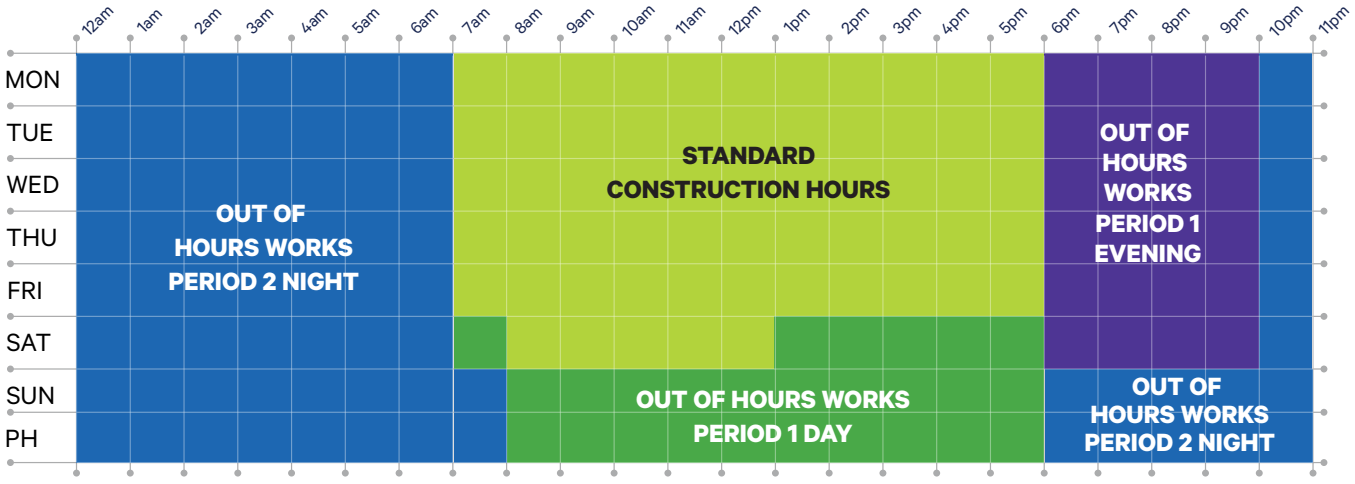


Figure 10 - Overview of construction hours as defined by the Interim Construction Noise Guideline

Operation and maintenance

HumeLink would be managed and operated consistent with Transgrid's existing high voltage transmission network in NSW and the ACT. Field staff and contractors would carry out inspections and maintenance of the substations and transmission lines over the design life of the project.

Likely activities would include:

- inspection (ground and/or aerial) and maintenance of electrical equipment
- inspection of buildings, asset protection zones and access roads/tracks
- vegetation clearing/trimming within the easement or of adjacent hazard trees
- fire detection system inspection and maintenance
- stormwater drainage systems maintenance.

Approach to assessment of impacts

The EIS represents a conservative assessment of project impacts in the following manner:

- The project footprint defined and assessed in the EIS is the area assumed to be directly affected by the construction and operation of the project. However, the project footprint has been developed to provide flexibility for future design refinement, which may further avoid and minimise potential impacts, while providing for a rigorous and robust impact assessment of the project. For example, the new transmission line easement would generally be 70 metres wide, while the project footprint is generally about 200 metres wide.
- In addition to the project footprint, various study areas have been defined for specific environmental aspects. These study areas are generally larger than the project footprint to help understand the context of the project and assess direct and indirect impacts.
- An indicative disturbance area has been defined within the project footprint to provide a more refined area for assessment of biodiversity impacts related to vegetation clearance.
- Where information is lacking or uncertain, a conservative approach has been adopted, such as assuming presence of threatened fauna or flora species or adopting predictive models.

This conservative approach is required because the EIS is based on a concept design and indicative construction methodology that will be subject to further refinement and development by the appointed construction contractors, including to continue avoiding, minimising and mitigating potential impacts.

Chapter 7 (Approach to assessment of impacts) of the EIS provides further details on how the project was assessed.

Project impacts

Transgrid

What are the potential project impacts?

The project has been developed following a robust and iterative process including detailed options analysis, engineering design, environmental assessment and engagement. Where feasible and reasonable, the project has aimed to avoid and minimise impacts. Where impacts are unavoidable, mitigation measures have been identified to reduce the likelihood, magnitude and consequences of any residual impacts. The following sections provide a summary of key potential positive or negative project impacts, which have been ordered consistent with the EIS structure. Chapters 8 to 25 of the EIS provide further information.

Biodiversity

Construction impacts and management

Biodiversity impacts have been minimised during development of the project through co-locating the transmission line route with existing areas of disturbance where possible and minimising native vegetation clearing. However, given the scale of the project, a number of biodiversity impacts were identified. Transgrid will continue to avoid and minimise impacts to biodiversity values during detailed design and further construction planning where practicable.

The project could potentially remove 670.21 hectares of native vegetation during construction based on the indicative disturbance area (refer to Table 1).

Table 1 - Interim Biogeographic Regionalisation for Australia (IBRA) regions and subregions and potential direct native vegetation impacts

IBRA region	IBRA subregion	Potential direct impact to native vegetation expected within indicative disturbance area (ha)
South-Eastern Highlands	Bondo - located from around Wondalga south to Batlow and around Adjungbilly	38.84
	Bungonia - located east of Taralga to the existing Bannaby 500 kV substation	34.17
	Crookwell - located between Bannister and Taralga	76.83
	Murrumbateman - located between Woolgarlo and Bannister	98.11
NSW South-Western Slopes	Inland Slopes - located from the existing Wagga 330 kV substation to east to Woolgarlo and east of Yass	245.29
Australian Alps	Snowy Mountains - located from Batlow south to the future Maragle 500 kV substation	176.97

This includes potential direct impacts on:

- five threatened ecological communities listed under the *Biodiversity Conservation Act 2016* (BC Act), two of which are also listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- 58 threatened flora species comprising:
  - 38 species listed under the BC Act and EPBC Act
  - 18 species listed under the BC Act
  - Two species listed under the EPBC Act
  - 11 critically endangered species under the BC Act and/or EPBC Act
- 33 threatened fauna species (12 bird, 11 mammal (including three bats), three reptile, five amphibian and two insect) comprising:
  - 18 species listed under the BC Act and the EPBC Act
  - 15 species listed under the BC Act
  - 13 critically endangered or endangered species under the BC Act and/or EPBC Act
- two endangered fauna populations listed under the BC Act.

Not all threatened flora and fauna species identified as impacted have been recorded within the project footprint. Fifty-five threatened flora species and 17 threatened fauna species have been assumed present due to the presence of suitable habitat within the project footprint and survey limitations.

The project also has the potential for indirect impacts including:

- impacts on adjacent habitat or vegetation from sedimentation and erosion and inadvertent clearing or movements
- reduced viability of adjacent habitat due to noise, dust, or light
- transport of weeds and pathogens from the site to adjacent vegetation
- reduced access to food and loss of shade or shelter from the modified vegetation, which may impact resident fauna species
- loss of breeding habitat such as large old growth trees, hollows, stick nests, drays and fallen timber
- trampling of threatened flora species
- removal and disturbance of rocks, including bush rock, which could impact habitat for small terrestrial fauna
- increase in pest animal populations and predation of native fauna.

Based on conservative assumptions and assumed presence for some species, the project could impact threatened ecological communities and species at risk of serious and irreversible impacts (SAII) as defined by the Biodiversity Conservation Regulation 2017. Four ecological communities, five flora species and three fauna species at risk of SAII were considered to have a moderate or higher likelihood of impact. Eighteen flora species and five fauna species at risk of SAII were conside`red to have limited potential to be impacted.

Based on the potential extent of biodiversity impacts and likelihood of presence, 34 EPBC Act listed communities and species were identified as likely to be significantly impacted or have potential for significant impacts. This comprised:

- one ecological community, four flora species, 14 fauna species and five migratory species with potential or likely significant impacts based on sufficient information being available to enable an informed decision
- one ecological community, six flora species, two fauna species and one migratory species with potential significant impacts based on a precautionary approach (eg where there is limited survey coverage).

Aquatic species and habitats may be impacted during construction as a result of:

- installation of waterway crossings for access tracks, which has potential to impact key fish habitat or threatened aquatic species
- construction activities directly impacting riparian vegetation or waterway banks
- construction activities impacting water quality from excess runoff, sedimentation, or accidental spills if inappropriately managed
- construction plant and machinery introducing aquatic pests and disease if inappropriately managed.

Construction of the project is unlikely to pose a significant risk to groundwater dependent ecosystems as:

- there are no groundwater dependent ecosystems close to substation locations
- transmission line structure construction would only require a relatively small area to be impacted at each location, which is unlikely to restrict groundwater or alter water quality.

With the implementation of mitigation measures, impacts on aquatic species and habitats are anticipated to be short-term and limited in extent. Significant impacts on threatened aquatic species and communities listed under the *Fisheries Management Act 1994* and EPBC Act are unlikely.

During detailed design and construction planning, potential biodiversity impacts would be avoided and/or minimised where practicable and in accordance with mitigation measures included the EIS. This would include minimising the indicative disturbance area and reducing vegetation clearance where practicable. A Biodiversity Management Plan would be prepared as part of the Construction Environmental Management Plan (CEMP), which would include a process for implementing, evaluating and reporting on mitigation measures for biodiversity impacts during construction. The Biodiversity Management Plan would be complemented by a Connectivity Strategy, Soil and Water Management Plan and Erosion and Sediment Control Plan to further manage potential impacts. In addition, biodiversity surveys will be undertaken in areas that were not previously accessible and where impacts have been conservatively assessed.

Residual biodiversity impacts would be offset in accordance with Biodiversity Assessment Method (BAM) calculations for both ecosystem and species credits and through implementation of the Biodiversity Offset Strategy for the project. The strategy proposes a combination of offset options, including establishing Biodiversity Stewardship Site(s), the purchase and retirement of existing biodiversity credits and/or making a payment into the Biodiversity Conservation Fund.

Operational impacts and management

Potential direct impacts to native vegetation and threatened species habitat during operation could occur through ongoing vegetation management to maintain vegetation clearances and asset protection zones (for safety reasons and to reduce risk of bushfire). These direct impacts have been included in the clearing estimates for construction (refer to Table 1).

Some indirect impacts may also occur during operation associated with:

- reduced viability of remaining habitat due to new forest edges and fragmented vegetation
- changed bushfire risk to surrounding vegetation and EMF exposure to native fauna, however these risks would largely be avoided through design and management practices
- fauna collision, entanglement or electrocution with transmission lines.

Potential impacts during operation to BC Act and/or EPBC Act listed ecological communities and species including those at risk of SAII are related to the increased fragmentation and/or loss of habitat connectivity. The project may alter connectivity or increase fragmentation of the remaining areas of White Box-Yellow Box-Blakely's Red Gum Grassy Box Woodland and Derived Native Grassland and Tableland Basalt Forest threatened ecological communities. This potential impact would be managed through preparing and implementing a Connectivity Strategy, which would identify the connectivity corridors required for fauna movement.

Potential impacts to aquatic species and habitats during operation would generally be limited to changes to waterways from waterway crossings and water quality impacts from sedimentation or accidental spills. However, given habitat for threatened aquatic species within the project footprint is generally in poor condition and mitigation measures would be implemented, impacts to aquatic species and habitats would be limited. Operation of the project is unlikely to pose a significant risk to groundwater dependent ecosystems.

Aboriginal heritage

Construction impacts and management

Ninety Aboriginal heritage sites and potential archaeological deposits are located within the project footprint. These include 79 stone artefact sites (artefact scatters and isolated finds), eight potential archaeological deposits and three modified trees. These sites have potential to be directly impacted by permanent infrastructure or indirectly through construction activities for the project. The sites to be impacted and the extent of impact would be confirmed during detailed design, which would consider opportunities to avoid or minimise impacts on the identified sites. It is likely the final directly impacted area would be much smaller than the project footprint assessed. Where impacts cannot be avoided, surface artefacts and subsurface deposits would be salvaged as a measure to mitigate harm.

Potential Aboriginal heritage impacts would be managed during construction by implementing a Heritage Management Plan as part of the CEMP. This plan would be developed in consultation with RAPs and would include measures to identify, protect and/or manage heritage items/sites, procedures for unexpected finds, heritage monitoring and compliance management and induction requirements for construction workers. Consultation with Aboriginal stakeholders will continue until the completion of construction of the project.

Operational impacts and management

Access track, easement and transmission line structure maintenance activities during operation could result in impacts to Aboriginal heritage. However, the likelihood of these impacts are expected to be low to negligible with standard mitigation measures.

Non-Aboriginal heritage

Construction impacts and management

Three heritage sites locally listed on the Wagga Wagga Local Environmental Plan 2010 and two places from the Register of the National Estate were identified to have curtilages partially within the project footprint. It is unlikely the project would impact the significance of these items because the historic items themselves are outside the project footprint, between 180 to 900 metres away.

Through the refinement of the transmission line corridor, the project has been developed to avoid direct impacts to the Snowy Mountain Scheme and the Australian Alps National Parks and Reserves, both listed on the National Heritage List. There is potential for indirect visual impacts from the project as a result of vegetation clearance and proximity of transmission line structures because their boundaries are approximately 80 metres from the project footprint. However, the indirect visual impact is expected to have a negligible impact on the heritage significance of these places.

One State listed heritage item, 20 locally listed heritage items and three Register of National Estate listed items were identified within the non-Aboriginal heritage study area (within one kilometre of the project footprint) but not within the project footprint. Impacts are expected to be negligible.

Operational impacts and management

Maintenance activities during operation of the project would not disturb additional areas compared to those assessed during construction. As such, no additional disturbance to non-Aboriginal heritage is expected to occur during operation.

Land use and property

Construction impacts and management

Construction of the project would require the acquisition and/or temporary leasing of land. Any leased and/or licensed land not required for permanent infrastructure elements would be rehabilitated in consultation with the relevant landowners.

Most of the land within the project footprint is used for agriculture and primary production, which includes grazing, forestry and cropping.

Potential impacts on agricultural land uses during construction would include:

- temporary removal of land from agricultural production
- temporary movement restrictions and disruption to agricultural activities such as aerial agricultural operations, cultivation, crop establishment and husbandry operations
- biosecurity risks from potential spread of weeds, pests, diseases associated with vehicle and worker movements resulting in impacts to productivity, additional costs for control and lower quality of agricultural outputs
- inadvertent impacts to crops and pastures or farm infrastructure
- disturbance to sheep and cattle caused by noise and vehicle movements.

Construction of the project would result in some forestry land being temporarily removed from production, including to establish and use up to five proposed construction compounds. This would result in a minor productivity impact on the forest industry due to the cost and delays associated with replanting new growth. All temporary work areas within State forests and privately owned plantations have been selected in consultation with Forestry Corporation of NSW and private landowners, as relevant.

Transgrid has and will continue to undertake extensive consultation with easement affected landowners to establish necessary property arrangements. Direct impacts on property and existing land uses would be managed in accordance with property management plans developed during the easement acquisition process in consultation with easement affected landowners. These property management plans would include specific measures to minimise disruption to agricultural activities as well as access and biosecurity protocols that are required to be complied with to address landowner concerns.

Operational impacts and management

The project would require permanent adjustments to property to facilitate operation. This would involve establishing new transmission line and access track easements, landowner agreements and property acquisition for the proposed Gugaa 500 kV substation and telecommunications hut. Nine dwellings are located within the project footprint. However, based on the current concept design, only one dwelling is likely to require demolition or relocation. The final extent of property acquisition or creation of easements would be refined and confirmed during detailed design in consultation with landowners.

The establishment of easements would restrict some agricultural, forestry and other activities within the easement and provide rights for Transgrid to access, operate and maintain the transmission line infrastructure. Permitted activities within easements would depend on the nature or scale of the activity, as well as proximity to the transmission line and structures as described in Transgrid's *Easement Guidelines - Living and Working with Electricity Transmission Lines 2022*.

The land within transmission line easements, and immediately next to proposed infrastructure could continue to be used for some agricultural activities such as grazing. However, permanent transmission line infrastructure would result in some restrictions on agricultural operations such as aerial agriculture operations, grain loading/unloading activities, drone use, maintenance of fruit tree orchards and crop spraying close to the new transmission line. Overall, the impact of the project on agricultural production would be minimal during operation due to the small area affected relative to total size of agricultural enterprises within the surrounding LGAs. The final location of permanent infrastructure would influence the amount of land permanently affected and the associated impacts on agricultural practices.

Under the NSW Government's Strategic Benefit Payments Scheme, private landowners would receive compensation for each kilometre of new transmission infrastructure hosted on their land in addition to the compensation under the *Land Acquisition (Just Terms Compensation) Act 1991*. This compensation may be beneficial to the identified landowners by offsetting costs associated with the project (such as the relocation of dwellings or equipment to a different section of their properties).

Operation of the project would result in some production native forestry land and plantation forestry land being permanently removed due to the transmission line easement. Based on the indicative concept design, this area of land is likely to be comprise about 348 hectares of State forest land and 4 hectares of privately owned plantation forest. However, the exact area to be impacted would be confirmed during detailed design. Transgrid would continue to consult with Forestry Corporation of NSW and other plantation landowners to determine opportunities to minimise or replace land used for forestry to reduce the loss of land available for timber supply and/or determine suitable compensation for the loss of productive forestry land.

Economic

Construction impacts and management

Design and construction of the project would require substantial capital investment, which would support employment in the regional and national economies. The indicative design and construction cost was sourced from the Project Assessment Conclusions Report and is estimated at $3.27 billion[1]. This would generate economic activity in the construction and professional, scientific and technical services industries.

Additional economic activity generated in the LGAs surrounding the project footprint is also expected from workers spending at local businesses and retailers, including accommodation, food, groceries and services, and the generation of local employment opportunities for skilled workers.

Operational impacts and management

The project would generally have a beneficial economic outcome. According to the *2022 Integrated System Plan*, the project is estimated to contribute about $1.3 billion in net market benefits. By increasing the amount of electricity that can be delivered to the National Electricity Market and providing greater access to reliable and affordable electricity, the project would increase competition in wholesale energy and help lower and stabilise electricity prices and reduce volatility in the longer term. This may help increase business productivity and lower living expenses.

Direct adverse residual impacts would largely at a local level in cases where permanent land adjustments are required. These impacts would be managed through landowner agreements.

1 The cost of HumeLink in the Project Assessment Conclusions Report was based on real 2021 dollars. This cost is being revised to reflect 2023 real prices and will take into consideration cost increases in construction, building, material, skilled labour costs and global supply factors.

Social

Construction impacts and management

Construction of the project would have positive social benefits that have been rated as 'high' or above associated with:

- the creation of new jobs, providing local communities with access to employment and new skills, including for Aboriginal and Torres Strait Islander people
- support for local businesses through increased expenditure and tourism from temporary workers in the social locality
- increased tourism from temporary workers and their visitors (eg families may visit for a weekend).

Construction of the project is considered likely to have some negative social impacts that have been rated as 'high' or above in significance following implementation of mitigation measures including:

- impacts to the visual landscape and scenic quality, where construction activities would temporarily disrupt the views and amenity for dwellings near the project footprint and affect people's enjoyment of their local areas and sense of pride
- impacts to landowners through property impacts, including dwellings that may require removal within the project footprint (nine dwellings are located within the project footprint, however based on the current concept design, only one dwelling is likely to require demolition or relocation)
- stress and uncertainty arising from property acquisitions, creation of easements and leases, which may affect how landowners use their properties and go about their day-to-day activities.

These negative social impacts would be managed through the mitigation measures proposed to address landscape and visual as well as land use and property impacts. This may involve consultation with affected landowners, community and stakeholders where relevant.

Operational impacts and management

HumeLink would provide increased opportunities for investment through Transgrid's community support initiatives, which would have a positive social impact in the surrounding communities. However, potential negative social impacts that have been rated as 'high' in significance following mitigation relevant to operation of the project would be associated with concern related to ongoing visual impacts from the new transmission line structures. These impacts would be relatively localised to the landowners within and next to the project footprint. The visual impact may contribute to a sense of loss when viewed by local residents who may have formed an attachment to particular views within the landscape. However, for the dwellings identified to have potential for a moderate to high visual impact (discussed in the section below), opportunities for visual screening would be investigated in consultation with the affected landowner to minimise impacts.

Landscape character and visual

The assessment of visual impacts was based on an indicative concept design within the project footprint rather than specific transmission line structure locations. This conservative approach allows opportunities for future micro-siting of project infrastructure to further avoid and minimise visual impacts.

Construction impacts and management

Construction activities could impact views and landscape character from temporary plant and equipment visible throughout the project footprint, establishment of construction compounds and access tracks/roads and vegetation removal.

The project footprint has been divided into eight landscape character zones for the purpose of assessing impacts on the landscape. Each landscape character zone reflects different geology, topography, vegetation, waterways, built form patterns and land use. The Great Dividing Range foothills, Undulating rural hills and ridges and Upland forest landscape character zones are expected to experience moderate impacts on the landscape from day time construction. The Forested hills, Upland forest and Rural highland and deep valley landscape character zones are also expected to experience moderate landscape impacts during the night-time from lighting required to support construction activities and the Tumbarumba accommodation facility. Night-time impacts would be minimised through the design of lighting at work sites to minimise light spill.

Twenty-eight public viewpoints were selected for assessment, which were considered representative of the range of views to the project. Some viewpoints and views from the area near Bago State Forest south of Tumut are expected to experience moderate day time visual impacts from construction of the project.

Operational impacts and management

Approaches to avoid and minimise permanent impacts on landscape character and visual impacts have been considered in the refinement of the project footprint. This included considerations such as paralleling existing transmission lines and locating the transmission line corridor away from towns, where practicable.

However, during operation, the new permanent infrastructure elements (including the new transmission lines, proposed Gugaa 500 kV substation and modification to the Wagga 330 kV and Bannaby 500 kV substations) would be visible from some viewpoints. In particular, there would be higher impacts where the landscape is more open, the transmission line changes direction and the project extends across broad valleys and hills where there are no existing transmission line structures in view.

The Great Dividing Range foothills, Upland forest and Undulating rural hills and ridges landscape character zones are expected to experience moderate landscape impacts during operation. Five public viewpoints are expected to experience moderate day time visual impacts from operation of the project. Figure 11 shows a photomontage for the view south from Snowy Mountains Highway that demonstrates an example of a moderate visual impact. All other landscape character zones and public viewpoints assessed would experience impacts below moderate.

The assessment identified 180 dwellings, either located in the project footprint or generally within 500 metres of the project footprint that may experience visual impacts. Of these, 17 dwellings would have a high visual impact, 27 dwellings would have a high-moderate visual impact and 36 dwellings would have a moderate visual impact. Where there is a potential view to the project from the primary view of a residential dwelling, resulting in a moderate-high or high visual impact, visual screening and any other potential mitigation measures would be considered in consultation with landowners with an aim to reduce the visual impact of the project.

Where technically practicable, transmission line structures would be micro-sited during detailed design away from sensitive viewpoints, to blend into the landscape or so intervening landforms or vegetation would block views to minimise the visual impact of the project.

Figure 11 - Photomontage showing a moderate visual impact expected at a view south from Snowy Mountains Highway

Noise and vibration

Construction impacts and management

Construction of the project would generate temporary noise and vibration from plant and equipment use and movements. The assessment conservatively assumed all components of transmission line construction could occur at any location within the project footprint, several items of equipment would be in use at the same time, construction workers would travel in the night-time, and the land is flat. In reality, construction noise levels would often be much lower than predicted.

Exceedances of the relevant noise criteria are predicted at up to 398 residential receivers and two churches during earthwork and clearing for transmission line construction during the day-time. This is predicted to be the noisiest transmission line construction scenario. Noise levels are not expected to exceed the criteria during this scenario for dwellings greater than 1,250 metres from the project footprint. Only 14 of these residential receivers are predicted to be highly affected by noise. However, this construction activity is only expected to take one to five days per transmission line structure. During out-of-hours work for transmission line construction up to seven residential receivers are predicted to experience clearly audible noise impacts, three of which may experience sleep disturbance. However, impacts are only expected when work is occurring at the closest transmission line structure.

The main noise-generating activity associated with construction or modification of substations is associated with earthwork and vegetation clearance which may result in:

- moderately intrusive day-time noise impacts at the closest receiver to the Wagga 330 kV substation
- clearly audible day-time noise impacts at an additional nine receivers near the Wagga 330 kV substation and the two closest receivers to the proposed Gugaa 500 kV substation.

Subjective classification	Exceedance of noise management level	
	Day-time	Out of hours
Negligible	No exceedance	No exceedance
Noticeable	-	1 to 5 dB
Clearly Audible	1 to 10 dB	6 to 15 dB
Moderately Intrusive	11 to 20 dB	16 to 25 dB
Highly Intrusive	>20 dB	>25 dB

Table 2 - Categories of noise level exceedances

Clearly audible worst-case noise impacts are predicted during out of-hours work at the receiver closest to the proposed Gugaa 500 kV substation and five receivers closest to the Wagga 330 kV substation. Sleep disturbance impacts are also predicted at the residential receiver closest to the Wagga 330 kV substation. This work is expected to take one month to complete at each substation.

Site establishment is the main noise-generating activity associated with construction compounds and the Tumbarumba accommodation facility. Site establishment would take between three to four weeks at each location. During this activity, highly intrusive day time noise impacts are predicted for up to 10 residential receivers close to the Memorial Avenue and Bowmans Lane compounds and/or Tumbarumba accommodation facility. During operation of the Tumbarumba accommodation facility moderately intrusive night time noise impacts are also predicted at one residential receiver and potential sleep disturbance is predicted at up to five residential receivers. However, the proposed boundaries and use of these temporary facilities would be refined as the project develops, which may minimise potential noise impacts.

Should vibration intensive equipment be required, the construction methodology for the project would be reviewed to avoid or minimise the potential for vibration impacts at nearby receivers. This would include considering minimum working distances to avoid cosmetic damage and human response related vibration impacts. Depending on geotechnical conditions to be identified by the construction contractor, blasting may be also required as part of the project construction. The potential noise and vibration impacts from blasting (if required) would be managed through a Blast Management Plan.

A Noise and Vibration Management Plan will be prepared to manage and mitigate all potential temporary noise and vibration impacts from construction of the project. Where noise criteria is likely to be exceeded, practical measures such as barriers, alternate construction methods and scheduling of activities would be investigated to minimise noise impacts.

Operational impacts and management

The new transmission lines may generate audible noise during operation, in particular during certain weather conditions, such as light rain or mist. Most sensitive receivers potentially impacted by operational noise from the project transmission lines are scattered rural residences. During the worst-case light rain scenario, 62 of the receivers closest to the project footprint are predicted to experience noise levels from the new 500 kV transmission lines that would potentially exceed the most stringent night time criteria (ie noise levels greater than 35 dBA). In sections where existing high voltage lines run parallel to the project, cumulative noise levels are expected to be marginally greater, with 65 receivers predicted to potentially exceed the criteria. However, the assessment conservatively assumed the new transmission line easement may be anywhere within the project footprint. As such, the number of impacted receivers is expected to be less than predicted in the assessment when the final transmission line route and easement is defined within the project footprint. Where operational noise from the project is predicted to exceed the relevant noise criteria, feasible and reasonable mitigation measures will be considered for affected receivers.

The proposed Gugaa 500 kV substation would include new noise-generating plant and equipment including transformers and reactors. However, with mitigation measures (such as consideration of transformer barriers and appropriate selection of equipment), noise levels from the proposed Gugaa 500 kV substation would comply with the relevant criteria.

Soils, contamination and geology

Construction impacts and management

Construction activities such as excavation, vegetation clearing and vehicle movement on unsealed surfaces would cause soil disturbance. Management measures would be implemented to minimise the impact on downstream water quality from these activities.

Disturbance of soil where contaminants are present has the potential to expose contaminants and impact on human health and water quality. These potential impacts would be managed through standard mitigation measures including additional investigations within areas identified as moderate or higher contamination risk.

Where unexpected contamination is encountered during ground-disturbing activities, this would be managed in accordance with an Unexpected Contaminants Finds Protocol.

Construction activities in regions with medium or high probability of naturally occurring asbestos, as well as at locations where other asbestos material may be encountered (such as demolition of older farming buildings and structures), would be guided by a site specific Asbestos Management Plan. The Asbestos Management Plan would include specific protocols for separation, handling, monitoring, validation and clearance of asbestos.

The CEMP, its associated Soil and Water Management Plan and the Asbestos Management Plan would provide measures to manage and minimise impacts that may occur during construction.

Operational impacts and management

During operation, there would be minimal exposed topsoil and therefore generally little risk of soil erosion and transport of sediment into nearby waterways. Changes to the soil profile, increased hardstand areas and ongoing vegetation removal within the transmission line easement could impact long-term salinity. However, any impacts would be minor. If not appropriately managed, the storage and use of chemicals during operation and maintenance of the project has the potential to cause localised contamination arising from vehicle accidents, leaks and spills. This risk would be managed in accordance with Transgrid's existing environmental policies and framework.

Surface water and groundwater

Construction impacts and management

About 564 megalitres of water would be required for construction to support dust suppression, concrete batching and worker facilities. Most of this water could be non-potable. The total volume of water required for construction is very small compared to the total volume of water allocated under the water sharing plans in the project footprint. As such, the impact on water availability would be negligible.

Surface water quality impacts during construction could result from disturbance and mobilisation of soil (including soil with elevated levels of contaminants, nutrients and salinity) or other pollutants from vegetation clearing, excavation, movement and/or material storage. Accidental chemical and fuel spills may also occur when using and maintaining equipment and machinery. The potential impact significance (without mitigation) is highly dependent on the level of ground disturbance, soil erosion risk, proximity of work to waterways and the type of waterway potentially impacted. Activities (such as vegetation clearing and earthworks) within 50 to 200 metres of a waterway have the greatest potential to result in high impacts to water quality. However, with mitigation measures, water quality impacts from construction activities are anticipated to be short-term and limited in extent at sensitive receiving environments.

Other potential impacts on surface water and groundwater without mitigation include:

- temporary changes to flow paths, channel shape and flow conditions from installation of waterway crossings for vehicle and equipment access across smaller-order ephemeral streams, which have potential impacts ranging from low to high depending on location
- risk of changes to the bank stability and flow of Killarney Creek (a tributary of Gilmore Creek) during establishment of Snowy Mountains Highway compound next to this waterway, which has potential for a moderate impact on the waterway
- localised changes to groundwater levels where dewatering of excavated areas is required (such as during substation construction) or there are changes to infiltration/groundwater recharge from soil compaction and removal of vegetation, which could have moderate impacts at substations
- risk of mobilising contamination into groundwater if blasting is required in contaminated sediment, which could have low to moderate impacts depending on location.

During construction of the project, a range of measures would be specified in the Soil and Water Management Plan prepared as part of the CEMP.

Operational impacts and management

Surface water quality impacts that have the potential to occur during operation of the project, if appropriate mitigation is not implemented, are associated with:

- soil erosion and sedimentation from vegetation removal and movements during maintenance activities
- accidental spills during use of equipment and vehicles
- materials not properly disposed of by workers
- an increase in stormwater runoff, particularly at the modified Bannaby 500 kV substation from the additional bench area.

Similar to construction, the potential impact significance (without mitigation) is highly dependent on the location of the work or permanent infrastructure to waterways and the type of waterway potentially impacted. Scour protection would be included in the design for any infrastructure (eg waterway crossings) that has potential to impact waterways. With the use of mitigation measures, the project is expected to have an overall neutral impact on water quality during operation.

During operation, potential impacts on groundwater would be associated with the new deep piles for the transmission line structures, new substation bench area and accidental spills during maintenance activities. However, any impacts on groundwater would be localised and considered negligible to low in significance.

Hydrology and flooding

Construction impacts and management

Construction activities of the project have the potential for localised and minor impacts on local flood behaviour, in particular through:

- excavation for substation and transmission line structure foundations and new/upgraded access tracks
- stockpiling of material and modification of existing surface levels (eg filling) during establishment and use of construction compounds and the Tumbarumba accommodation facility.

Any potential impacts would be managed through incorporation of appropriate drainage, scour protection and site layout considerations during detailed design.

Flooding also has potential to impact construction activities, particularly if these activities are undertaken in flood-prone areas. Temporary stockpiles and equipment have the potential to be washed away in a flood event, particularly those located near waterways and drainage lines. Excavations have the potential to fill with flood water, requiring dewatering and resulting in unstable embankments. These risks would be managed through appropriately designed construction compound layouts and the CEMP, which would outline practices to mitigate site-specific risks from flooding.

Operational impacts and management

The flood modelling undertaken as part of the EIS revealed areas of the project footprint that would be at risk from major and minor flooding impacts, including the intersection of the project footprint with Tywong Creek, O'Briens Creek, Kyeamba Creek, Tarcutta/Umbango Creek, Plain Creek, Tumut River/Gocup Creek and Jerrawa Creek. If the transmission line structures are located within these areas, the transmission line structure base may be impacted by flooding. However, based on the form and height of the transmission line structures (up to 76 metres), flooding is unlikely to impact the operation of the transmission lines.

The proposed Gugaa 500 kV substation at Gregadoo would be about 850 metres west of O'Briens Creek which discharges to Kyeamba Creek. The flood investigation indicated that during the 1% AEP scenario, the proposed Gugaa 500 kV substation site would obstruct existing overland flow from the south. As a result, increases in flood levels would likely occur along the south western boundary of the site if unmitigated. The Bannaby 500 kV substation modification would divert overland flows and increase the localised risk of flood water ponding on the existing substation infrastructure and access road. These potential flood impacts and any associated flood risk to operations at the substations would be managed through appropriate design of the substation benches and drainage infrastructure, such as channels and culverts, during detailed design.

Access tracks that cross or are near waterways are likely to be impacted in flooding conditions and would require regular maintenance. It is anticipated that access tracks for the transmission lines would not be used during heavy rain or flood events. The design of access tracks would consider the required elevations and suitable cross drainage to minimise any potential adverse flood impacts.

Hazards and risks

Construction impacts and management

Table 3 provides a summary of the hazards and risks that have potential to occur during construction.

Table 3 - Consideration of hazards and risks during construction

Consideration	Potential impact and management
Bushfires	During construction, there is potential for bushfires to impact construction activities as well as potential for bushfires to be started by construction activities (eg hot works) accidentally igniting nearby vegetation. The risk of bushfires is highest near heavily vegetated areas within Category 1 Bush Fire Prone Land, unmanaged grassland and near stockpiles of removed vegetation. A Bush Fire Emergency Management and Evacuation Plan would include mitigation measures for construction activities, which is expected to adequately manage the bushfire risk.
Aviation safety	Use of cranes and construction of transmission line structures may encroach into the obstacle limitation surface for the Wagga Wagga Airport and cause temporary disruptions to existing aerial activities. Aviation safety risks would be managed through consultation with relevant stakeholders and further construction planning in detailed design.
Interaction with utilities	There is potential existing utilities may need to be relocated or protected during construction, which would need to be appropriately managed. Consultation with utility providers with existing assets within the project footprint has commenced and would continue during detailed design and construction of the project to mitigate the risk of unplanned / unexpected disturbance of utilities.
Dangerous goods and hazardous materials	Dangerous goods and hazardous materials also have potential to cause risks associated with worker health or environmental contamination if inappropriately stored, handled and transported. These risks would be appropriately managed through procedures specified in the CEMP.
Emergency egress and evacuation routes	Emergency egress and evacuation routes could be temporarily impacted during stringing of the transmission line over roads. However, consultation would be carried out with emergency service providers and landowners to provide alternative emergency access and evacuation routes during construction.

Operational impacts and management

Table 4 provides a summary of the hazards and risks that have potential to occur during operation.

Table 4 - Consideration of hazards and risks during operation

Consideration	Potential impact and management
Electric and magnetic field (EMF)	EMF exists wherever electricity is generated, transmitted or distributed in transmission lines or cables, or used in electrical appliances. Transgrid has designed the project to comply with the relevant guideline levels. Overall, it is unlikely there would be any prolonged human exposure to EMF from the project or any notable adverse effects on animals or plants.
Bushfire	During operation, potential bushfire ignition sources (if not appropriately managed) are associated with hot works during maintenance, substation and transmission line equipment or services failure, vehicles, accidental ignitions and storage or use of hazardous materials. Transgrid has a vegetation management program to manage bushfire risks with established standards and procedures and monitoring frameworks. Within the proposed transmission line easements, vegetation clearance widths would be consistently applied in accordance with relevant standards. Managing safe clearances from transmission line infrastructure reduces the potential for a fire to start, thereby maintaining public safety, assets, environmental values, and electricity supply. Other strategies to manage overall bushfire risk include: • consideration of bushfire attack level mapping and access routes in design • adoption of asset protection zones and transmission line clearances • emergency preparedness and response procedures.
Aviation safety	Some transmission line structures near Gregadoo East Road and Angels Lane have potential to infringe on the obstacle limitation surface of the Wagga Wagga Airport. The potential to avoid and/or minimise this impact would be considered further during detailed design in consultation with relevant stakeholders. The project could also result in a major impact on the operation of up to four aircraft landing areas within three nautical miles (5.6 kilometres) of the project footprint located in the Snowy Valleys and Yass Valley LGAs. The impact may result in the aircraft landing areas being unusable or the need for a significant modification to enable aviation operations to continue. However, a sufficient number of alternative aircraft landing areas are located in the area surrounding the project footprint. The transmission lines and their structures may result in risks to aerial applications of fertilisers and pesticides, aerial baiting in National Parks and Wildlife Services land and emergency services operations. However, the inclusion of the transmission line on aeronautical charts and briefings prior to such flights would minimise these risks and would be consistent with current standard practices for low-level flights near large transmission lines.

Traffic and transport

Construction impacts and management

During construction, there is potential for temporary traffic impacts associated with the movement of construction vehicles. Heavy vehicle traffic would be distributed across work sites for the delivery or disposal of construction material. Light vehicle traffic would originate from the proposed worker accommodation facility and towns close to the project footprint and would be distributed to active work sites for transmission line construction, construction compounds and substations. Roads next to substation work sites and construction compounds are expected to experience higher volumes of high vehicle traffic due to their use for longer durations than other work sites for transmission line construction. The additional construction traffic would result in a noticeable increase in traffic on access roads (particularly on local roads and existing access tracks) due to low existing levels of traffic and the regional rural setting across the project footprint. However, with regards to road capacity, all roads would operate in reasonably free flow conditions and the road network is expected to perform similar to existing conditions.

Other potential impacts on traffic and transport during construction are related to:

- **Road condition** - Impacts on road condition most likely to occur on unsealed roads used to access construction compounds including Snubba Road, Livingstone Gully Road, Honeysuckle Road and Red Hill Road. Potential impacts to road condition would be managed through dilapidation surveys and road condition assessments. Any damage caused by the project would be rectified in consultation with the relevant road authority.
- **Road access and safety** - Road improvement work and several new or upgraded access tracks would be required to provide safe access to the work sites during construction. Any new connections to the road network would be designed in accordance with relevant Austroads guides and in consultation with the relevant road authority.
- **Road closures during stringing over public roads** - National, state and regional roads crossed by the proposed transmission line include Hume Highway, Snowy Mountains Highway, Gocup Road, Batlow Road, Tumbarumba Road, Burrinjuck Road, Rye Park Road, Grabben Gullen Road, Crookwell Road/ Goulburn Road and Taralga Road. Stringing of the proposed transmission line over roads would require temporary, full or partial road closures. The anticipated impacts of road closures would be temporary and largely relate to an increase in travel time and distance due to reduction in road capacity, speed restriction or detours. Where possible, road closures would be planned outside the traffic peak to minimise impacts. Any road closures would be confirmed during detailed design in consultation with the relevant roads authority and subject to the requirements of any road occupancy licence and/or other required approvals under the *Roads Act 1993*.
- **Transportation of oversize-overmass components** - Two haul routes have been identified to transport oversize-overmass components from the Port of Newcastle to the existing Bannaby 500 kV and proposed Gugaa 500 kV substations. Transport of this equipment would be undertaken in accordance with applicable approvals and requirements from the relevant road authorities.
- **Stringing of the transmission line over railways** - The project footprint is crossed by the Main Southern Railway Line approximately seven kilometres north west of Yass. Stringing activities at this location would be undertaken during planned rail possessions so no disruptions to rail services or operations are anticipated.

Any impacts on traffic and transport during construction would be managed through implementation of a Traffic and Transport Management Plan, which would form part of the CEMP. This would be developed in consultation with councils, relevant rail authorities and Transport for NSW.

Operational impacts and management

Based on the proposed operation and maintenance activities and their frequencies, the traffic generated for these activities would be insignificant. As such, operation of the project would have negligible impact on road network performance and road condition.

Air quality

Construction impacts and management

During construction, dust emissions can be caused by construction activities and movement of vehicles. The risk assessment indicated there was a medium to high risk of adverse dust impacts from construction of the transmission line without implementation of mitigation measures. However, the risk assessment approach is conservative as the major source of dust would occur only where the structures are installed and the impact would be short term. There are likely to be many locations within the project footprint where minimal (if any) dust-generating activities would occur and/or there are no sensitive receivers that could experience any adverse effects.

During construction or modification of the substations, and establishment and use of the construction compounds and Tumbarumba accommodation facility, there is predicted to be a negligible to low risk of adverse dust deposition and human health impacts occurring at sensitive receivers.

It is expected that with the implementation of mitigation measures (such as water sprays for dust suppression, covering stockpiles and minimising exposed areas of soil), residual dust impacts would be managed so there was negligible risk of adverse air quality effects at the sensitive receivers.

Operational impacts and management

During operation of the project, dust and gaseous emissions from maintenance activities and vehicle use are anticipated to be negligible and any impacts on the nearby sensitive receptors are anticipated to be short-term, minor and localised.

Climate change and greenhouse gases

Construction impacts and management

Construction of the project is likely to experience recent changes in climate that have already been observed including:

- an increase in the number of days with extreme high temperatures (above 35 degrees Celsius), which may cause heat stress to construction workers
- worsening bushfire conditions, which may cause disruptions or health and safety risks
- excessive and intense rainfall events which might cause flooding, and may limit access to work sites and result in construction delays.

These potential climate change risks would be considered during construction planning and mitigation measures required to manage the risks would be implemented.

Greenhouse gas (GHG) emissions from construction would be associated with use of diesel, unleaded fuel, oils and greases, electricity consumption and the energy embodied in construction materials. The main source of GHG emissions would be diesel consumption, which accounts for 86 per cent of the total emissions. Overall, the impact of project construction on the NSW and national GHG emissions is estimated to be negligible, representing less than 0.1 per cent of NSW's annual emissions.

Operational impacts and management

HumeLink would increase the amount of renewable energy that can be delivered across the national electricity grid, helping to transition Australia to a low carbon future.

The project has a design life of 50 years, which can be extended to more than 70 years for some components. As such, the project is likely to be exposed to a number of climate change risks, including those related to increased temperatures, bushfire and flooding, which could damage the transmission line and reduce their transmission capacity. Climate change is also anticipated to impact materials such as concrete and steel. These risks would be considered further during detailed design so the project is resilient in the long-term.

The main source of emissions associated with the ongoing operation of the project are Scope 2 emissions related to unavoidable transmission losses. For the Scope 1 emissions, the main source is associated with leakage of sulfur hexafluoride (SF_6), due to its potency as a GHG. The impact of project operation on NSW and national GHG emission loads is estimated to be negligible, with the annual emission estimate representing less than 0.1 per cent of NSW's annual emissions. However, GHG emissions from the project would be offset to some extent by its role in enabling the introduction of new renewable energy generation in the region, which would support Australia's emissions reduction targets.

Waste

Construction impacts and management

Construction waste would include general solid waste (putrescible and non-putrescible), special waste (including non-friable asbestos contaminated waste), hazardous waste or restricted solid waste and liquid waste. Waste would be generated from clearing and removing vegetation, earthwork activities, workers and excess construction material. The types, quantities and classifications of waste generated by the project would vary and be confirmed during construction. Management of construction waste would be specified in the Waste Management Plan prepared as part of the CEMP.

The project would adopt waste management strategies in accordance with the waste management hierarchy and avoidance and management of impacts. Where a NSW EPA Resource Recovery Order exists for a specific waste type, the opportunity to reuse waste would be considered such as use of green waste and spoil for rehabilitation and landscaping. Where material cannot be reused on site, it would be classified in accordance with the NSW EPA *Waste Classification Guidelines* prior to off-site disposal. Suitably licensed waste contractors would be used for the collection and transport of waste for off site processing and/or disposal to an appropriately licensed facility.

Operational impacts and management

Waste during operation is expected to be minimal and would be managed in accordance with Transgrid's existing Environmental Management System and processes. Maintenance would generate waste electrical components and oil as well as green waste from vegetation maintenance. Substation operation would generate small amounts of waste from workers including wastewater. This would likely include general solid waste (non-putrescible), hazardous waste or restricted waste, green waste and liquid waste. All waste for offsite disposal would be collected by an authorised contractor and taken to an appropriately licensed waste facility.

Sustainability

Transgrid is committed to leading the nation's transition to a clean energy future, including through corporate-level sustainability goals and priorities through to project-specific contractor requirements and individual project sustainability ratings. Figure 13 provides Transgrid's sustainability goals and priorities.

A project-specific sustainability strategy has been developed for HumeLink, which outlines preliminary sustainability objectives for the project aligned with eight sustainability themes. The HumeLink sustainability strategy will continue to evolve in parallel to the planning and approvals process. Identified sustainability initiatives and targets would be further refined and relevant requirements would be included in the contract documents for detailed design, construction and operation. This approach would encourage industry to develop innovative value-for-money sustainability solutions. Following this process, the contractors would confirm the targeted Infrastructure Sustainability Council rating for the project.

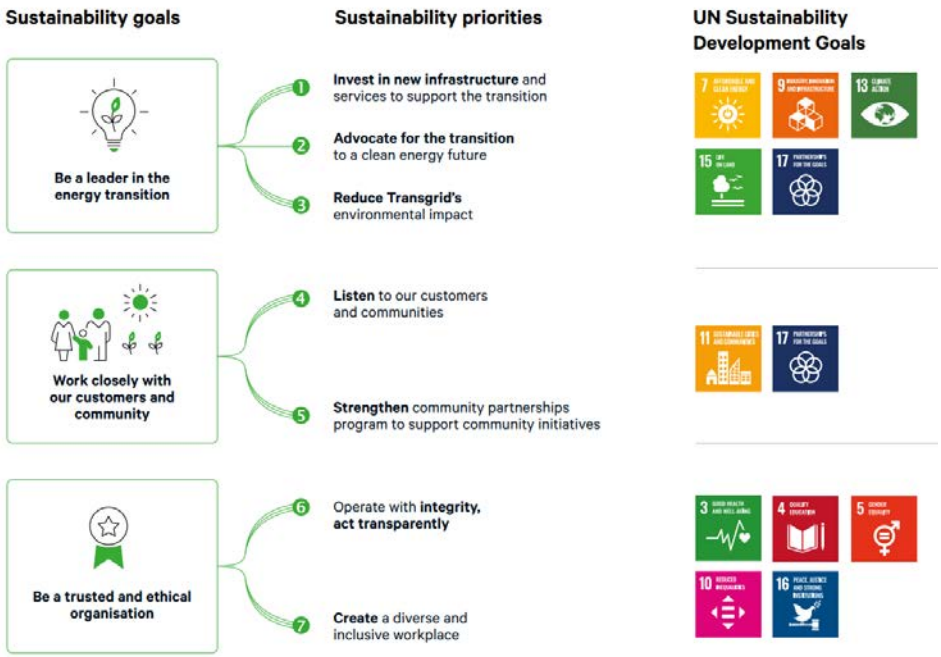


Figure 13 - Sustainability goals and priorities (Transgrid, 2021)

Cumulative

Cumulative impacts describe the impacts of the project together with the impacts of other relevant projects within an identified area. Figure 14 shows the relevant projects that were considered and identifies a summary of the potential negative cumulative impacts during construction and operation. Potential positive cumulative benefits from the project and other relevant projects were identified and generally apply across the region. These include social and economic benefits in relation to improved livelihoods, local employment opportunities, wage expenditure and increased economic activity.

The key matters identified as potentially negatively affected by cumulative impacts include biodiversity, Aboriginal heritage, land use and property, economic, social, landscape character and visual amenity, noise and vibration, traffic, transport and access and air quality.

There is also the potential for combined cumulative impacts to occur within the Wagga Wagga City LGA. The potential combined cumulative impacts would be due to the construction and operation of HumeLink and other relevant projects such as EnergyConnect (NSW – Eastern Section), Gregadoo Solar Farm, Inland Rail – Albury to Illabo (subject to approval) and the potential Victoria to NSW Interconnector West project. The potential combined cumulative impacts would be positive and negative.

Broader positive cumulative benefits from HumeLink and other energy projects include the transition of the NEM to diverse renewable and distributed energy generation. HumeLink is expected to deliver $491 million in net benefits to electricity customers (Transgrid, 2021b), contributing to the overall $28 billion in net market benefits that the network investments would deliver for the NEM's consumers (AEMO, 2022).

Through the implementation of mitigation measures included in the EIS, and implementation of equivalent mitigation measures as part of the delivery of the other relevant projects, cumulative impacts are expected to be minimised and appropriately managed.

Figure 14 - Potential cumulative impacts identified

Environmental management

Transgrid

How will environmental impacts be managed?

The approach to environmental management for the project would be consistent with:

- the objective of avoiding and minimising impacts throughout all stages of the project
- the relevant conditions of approval for the project (if approved)
- mitigation measures and management plans proposed in the EIS or as otherwise updated
- Transgrid and the construction contractors' Environmental Management System (EMS).

Figure 15 illustrates the overall environmental management approach for the project.

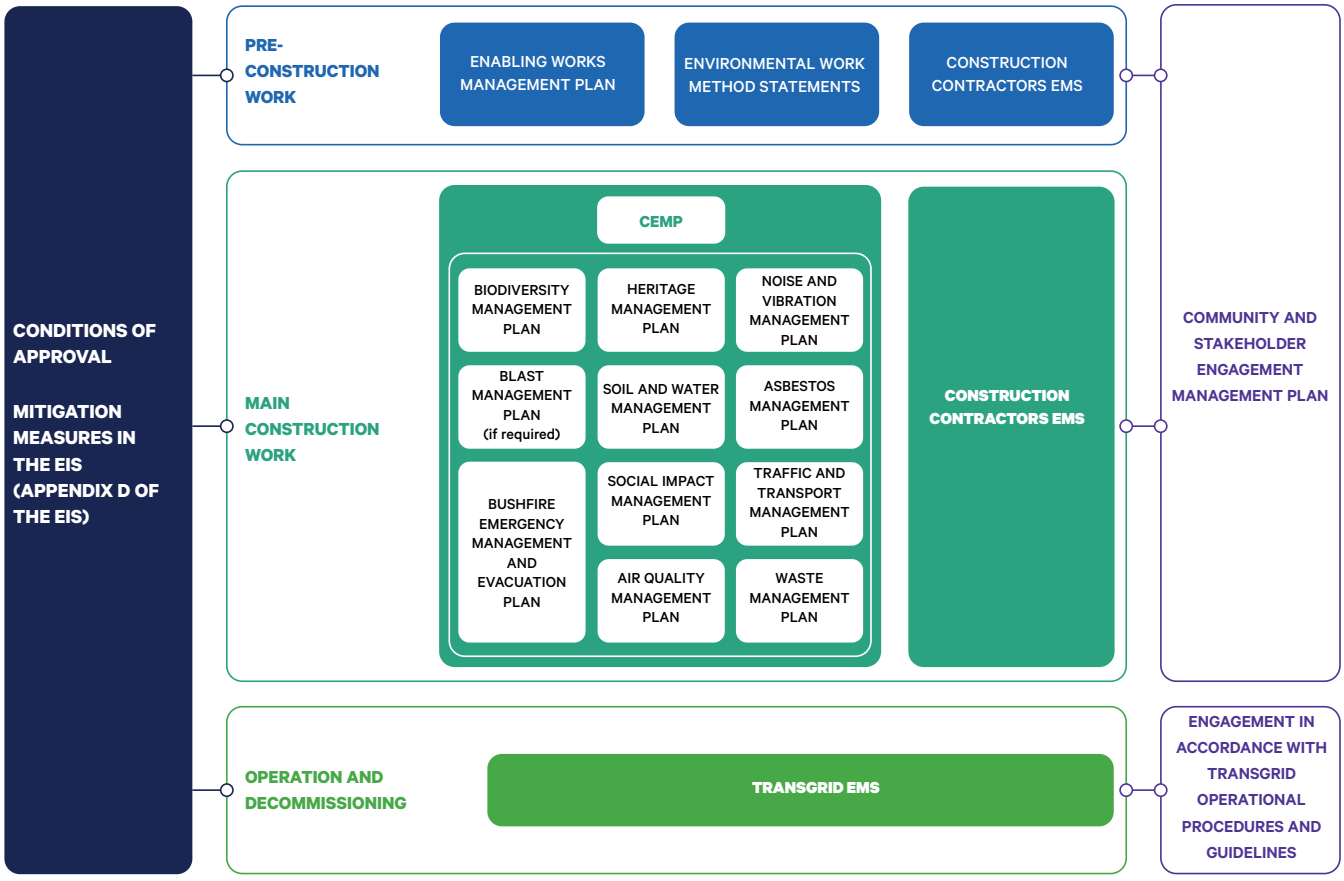


Figure 15 - Overall environmental management approach for the project

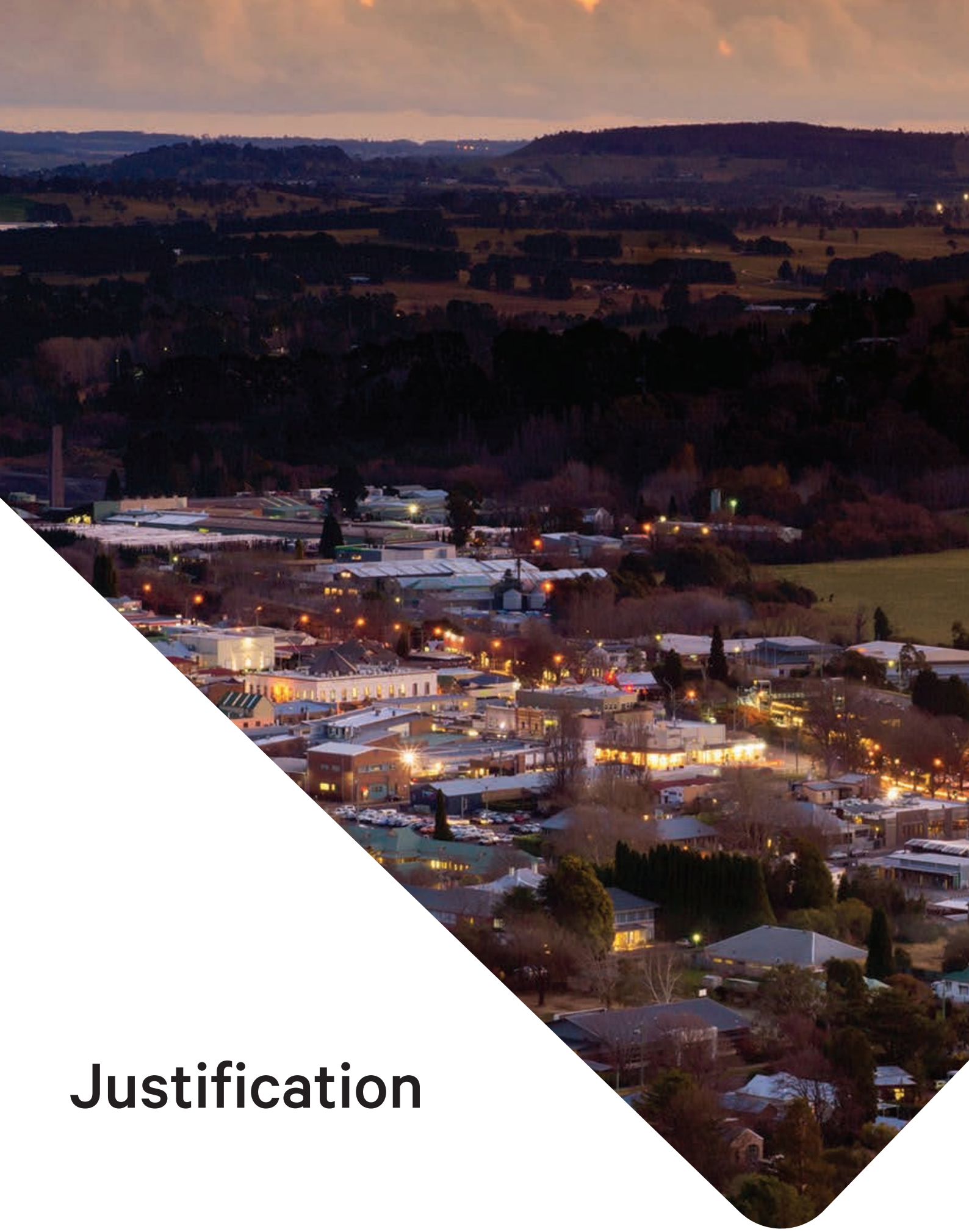
Pre-construction work would comprise either:

- pre-construction enabling work (eg establishment of construction facilities, access tracks and utility adjustments), which would be managed by an Enabling Works Management Plan
- pre-construction minor impact work, which are activities with low potential for environmental and community impacts that would be carried out in accordance with the construction contractors EMS and Environmental Work Method Statements.

Main construction work would occur in accordance with an approved Construction Environmental Management Plan (CEMP). The CEMP would be adaptive and establish processes to evaluate and monitor the effectiveness of the environmental management measures implemented. The CEMP would be supported by several sub-plans that provide more detail on the management of a certain environmental aspect. An overarching Community and Stakeholder Engagement Management Plan would be implemented to guide community and stakeholder engagement during construction of the project.

The operation of the project would be managed through Transgrid's EMS (which includes an Environmental Assessment Framework, environmental checklists and Environmental Handbook) and/or as otherwise outlined in the EIS or conditions of approval for the project.

Chapter 26 (Environmental management) of the EIS provides further information on the approach.



Justification

Transgrid

What is the justification for the project?

The project is considered a critical component in delivering long term benefits to the National Electricity Market and would support its transition to a greater mix of low-emission renewable energy sources in accordance with the *2022 Integrated System Plan*.

HumeLink would deliver a cheaper, more reliable and more sustainable grid by increasing the amount of renewable energy that can be delivered across the national electricity grid. The Australian Energy Market Operator (AEMO 2022) has identified HumeLink as a key "actionable" transmission project to be "progressed urgently".

Not proceeding with HumeLink:

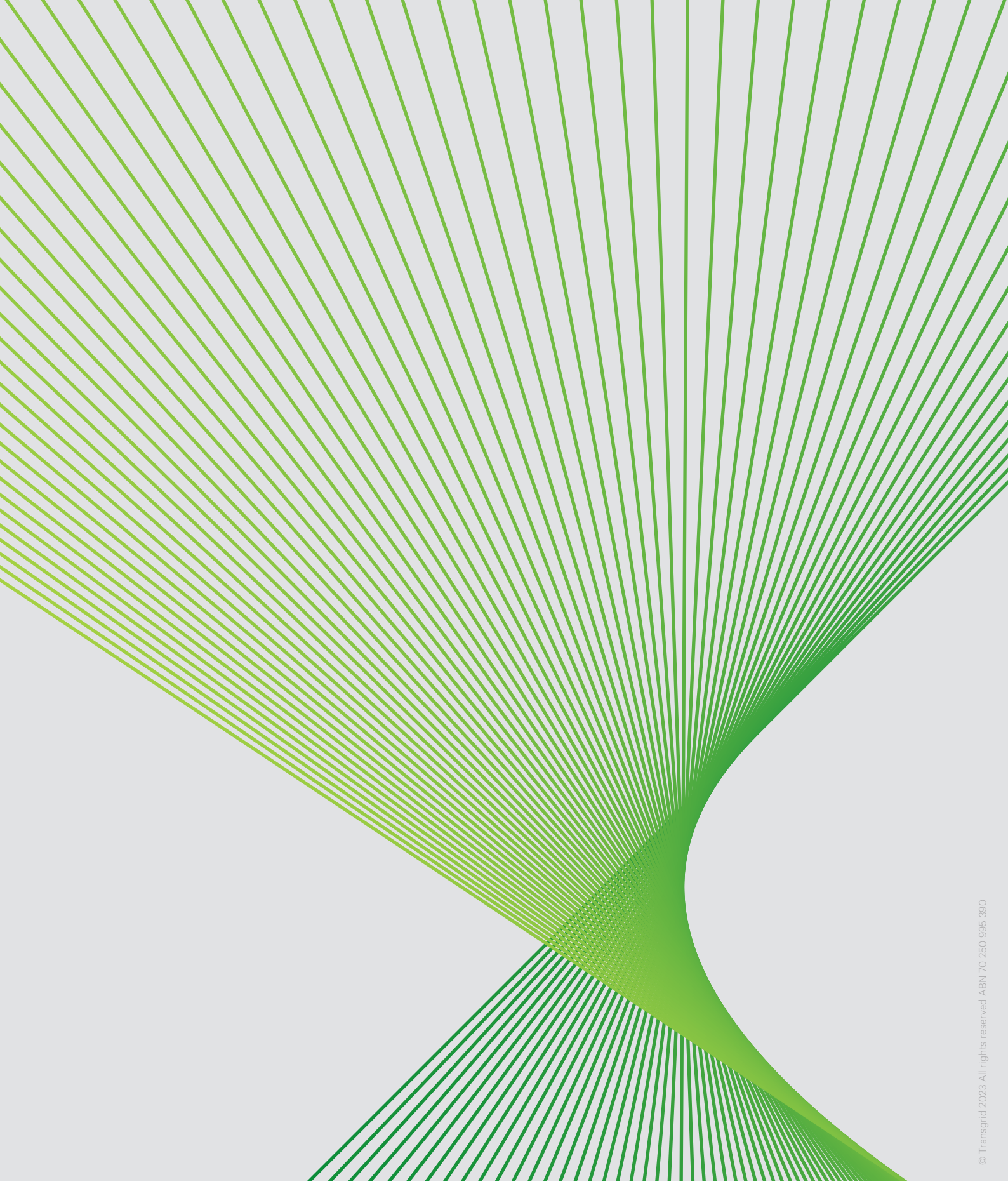
- means the expected benefits as described above, would not be realised
- would make Australia's shift towards greater renewable energy provision more difficult, impacting on Australia's ability to meet the global needs for reducing its carbon emissions
- would discourage investment in energy generation and storage within the declared South West NSW REZ as well as the candidate Wagga Wagga REZ and Tumut REZ
- would hinder the adoption of new renewable technologies in the future, required to support the delivery of commitments and policies at a State, Commonwealth and international level.

The project has been designed to avoid and minimise impacts, and to respond to the issues raised by the community and stakeholders. The finalisation of the design and construction methodology for the project would be further developed by the construction contractors with the objective of further avoiding and minimising potential impacts on the environment and local community.

The project has been assessed with regard to biophysical, social and economic considerations, and considered the principles of ecologically sustainable development. Detailed research, field investigation and modelling (where required) has been completed to inform technical studies to ensure a level of certainty has been achieved and to establish a good understanding of the existing environment. The key residual impacts unable to be avoided are associated with:

- biodiversity from vegetation clearance within the proposed easement during construction and operation
- landscape character and visual amenity from new large-scale transmission infrastructure that would be visible from public and private viewpoints
- land use and property, including restrictions for some agricultural and forestry land uses in the new transmission line easement
- Aboriginal heritage from ground disturbance during construction.

However, the potential residual impacts are considered manageable and/or would be offset. On balance, the strategic need and benefits of the project outweigh the mitigated project impacts. Therefore, the project is justified and would be in the public interest.



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