



8.0 Significant Impact Assessment

8.1 Relevant Guidance

In addition to the statutory requirements of the EPBC Act, the following guidance has been considered in assessing the significance of potential impacts to MNES associated with the Project area.

8.1.1 Significant Impact Guidelines

The Significant Impact Guidelines (DoE 2013) provide overarching guidance on determining whether an action is likely to have a significant impact on a matter protected under the EPBC Act. The Significant Impact Guidelines consider the concepts defined in **Table 8-1** when assessing the significance of impacts to MNES:

Table 8-1 Key Concepts in the Significant Impact Guidelines (DoE 2013)

Concept	Definition
Habitat critical to the survival of a species	Areas that are necessary: <ul style="list-style-type: none">• for activities such as breeding, roosting, foraging and dispersal;• for the long-term maintenance of the species;• to maintain genetic diversity and long-term evolutionary development; or• for the reintroduction of populations or recovery of the species. Such habitat may be identified in a recovery plan for a species and/or listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.
A population – this relates particularly to species listed as Endangered or Critically Endangered	A population is an occurrence of a species within a particular area, including but not limited to: <ul style="list-style-type: none">• a geographically distinct regional population, or collection of local populations; or• a population or collection of local populations that occurs within a particular bioregion.
An important population – this relates particularly to species listed as Vulnerable	An important population is one that is necessary for species' long-term survival and recovery. This may include populations identified in recovery plans and/or that are: <ul style="list-style-type: none">• key source populations for breeding or dispersal• populations that are necessary for maintaining genetic diversity; and/or• populations that are near the limit of the species range.



Concept	Definition
Important habitat for migratory species	This is defined as: <ul style="list-style-type: none">• habitat used by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of a population of the species; and/or• habitat that is of critical importance to the species at a particular life stage; and/or• habitat used by a migratory species which is at the limit of the species' range; and/or• habitat within an area where the species is declining.
An ecologically significant proportion of the population of a migratory species	Listed migratory species include a broad range of species with different life cycles and population sizes. An 'ecologically significant proportion' of a population varies with the species based on factors such as the species' population status, genetic distinctiveness and species-specific behaviour patterns (such as site fidelity). A population of a migratory species means the entire population or any geographically separate part of the population of any species, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries including Australia.

8.1.2 The Biodiversity Convention

The Convention on Biological Diversity was conceived as an output of the 1992 Rio Earth Summit and has three main objectives:

- The conservation of biological diversity;
- The sustainable use of the components of biological diversity; and
- The fair and equitable sharing of the benefits arising from the utilisation of genetic resources.

Signatories to the Biodiversity Convention are required to prepare and implement a National Biodiversity Strategy and Action Plan (NBSAP). *Australia's Biodiversity Conservation Strategy 2010-2030* (the Strategy) is Australia's NBSAP. This overarching biodiversity conservation framework outlines Australia's 10 national targets and how they align with the 20 Aichi Biodiversity Targets, and the national contribution to the achievement of each. **Table 8-2** summarises these targets and outlines how the Project will not be inconsistent with them.

Climate change and its consequent manifestations (e.g. higher temperatures, rising sea levels, melting of polar ice caps, desertification, ecosystem change, and more frequent and more intense natural disasters) is the major global threat to biodiversity, ecosystem services and ecological integrity. Two mechanisms through which Australia and most other countries of the world are seeking to achieve reductions in future greenhouse gas emissions and to lessen the impact of climate change are the Paris Climate Accord and the Glasgow Climate Pact. These agreements require systemic changes to many aspects of our lives, including how our electricity is generated, distributed and consumed.



Fundamental to this is the transition away from the reliance on fossil fuel energy sources, and the uptake of utility-scale renewable energy generators. Detailed studies across the Project area for 24 months have helped to inform the Project design. Notwithstanding the pricing of carbon, these alternative energy generators must be cost-competitive with the fossil fuel generators if they are to experience the uptake required across the world to set us on the path to decarbonisation. Of all the energy sources, wind and solar power have the lowest levelised cost of energy in Australia. The Project is now less than 50% of its original size, and avoids what the Project team determined to be “no-go” areas. The design also minimises impacts to the greatest practical extent for a project of this size, and should largely be considered a linear infrastructure project, with habitat removal and fragmentation being the two primary impacts associated with the Project.

Table 8-2 Australia’s 10 National Targets for Biodiversity Conservation

Target	Project Response
By 2015, achieve a 25% increase in the number of Australians and public and private organisations who participate in biodiversity conservation activities.	The Project has encouraged public participation in the environmental assessment process, including inviting members of biodiversity conservation organisations to participate in field surveys, as outlined in Section 11.0 .
By 2015, achieve a 25% increase in employment and participation of Indigenous peoples in biodiversity conservation.	The Project has actively sought the views of Indigenous people (specifically, the Jirrbal People #4) in the development of the Project design, with a CHMA signed in October 2020 and ILUA planned for authorisation in Quarter 1 2022, as outlined in Section 11.6 . The ILUA provides for financial, training and employment opportunities for Indigenous peoples.
By 2015, achieve a doubling of the value of complementary markets for ecosystem services.	Renewable energy is fundamentally a provisioning (ecosystem) service, and the overall intent of the Project is to bring to market a commercially competitive, low-carbon alternative to fossil fuel energy.
By 2015, achieve a national increase of 600,000 km ² of native habitat managed primarily for biodiversity conservation across terrestrial, aquatic and marine environments.	With the incorporation of rehabilitation activities and environmental offsets, the Project has been designed to result in no net loss in biodiversity, including natural habitats.
By 2015, 1,000 km ² of fragmented landscapes and aquatic systems are being restored to improve ecological connectivity.	The Project is primarily a linear infrastructure project and therefore risks fragmenting the landscape. Design measures have been incorporated into the Project to reduce this risk, such as aligning access roads with existing tracks as far as practicable and rehabilitating up to 70 % of the area temporarily required for construction. Specific measures to maintain connectivity for fauna across the landscape include retaining canopy connectivity across clearing widths to the greatest extent possible (particularly at watercourse crossings), rehabilitating temporary construction areas sequentially as soon as possible on completion of construction, retaining stags with fauna hollows and using these in adjacent, undisturbed areas of vegetation, use of fauna



Target	Project Response
	crossing infrastructure such as rope bridges, ledges in culverts, etc.
By 2015, four collaborative continental-scale linkages are established and managed to improve ecological connectivity.	The establishment of collaborative, continental-scale linkages are beyond the scope of this Project. Nonetheless, the Queensland Department of Environment and Science's Connectivity Impact Assessment tool has determined that vegetation clearing associated with construction of the Project will not result in a significant impact on connectivity across the broader landscape.
By 2015, reduce by at least 10% the impacts of invasive species on threatened species and ecological communities in terrestrial, aquatic and marine environments.	Invasive species such as cane toads, feral cats, wild dogs and feral pigs are well established across the Project area. The Project will implement control procedures to limit the spread of these invasive species further and will aim to minimise the threats posed by invasive species within the Project area as far as reasonably practicable.
By 2015, nationally agreed science and knowledge priorities for biodiversity conservation are guiding research activities.	Project surveys have already contributed to an improved understanding of the distribution and habitat requirements of the EPBC Act-listed magnificent brood frog. The Project aims to continue supporting research into this poorly known species as part of its offset strategy.
By 2015, all jurisdictions will review relevant legislation, policies and programs to maximise alignment with Australia's Biodiversity Conservation Strategy.	The Project will not directly contribute to this target, nor will it be inconsistent with its intent.
By 2015, establish a national long-term biodiversity monitoring and reporting system.	The Project will implement a long-term monitoring and reporting program, including the Project area and any land-based environmental offset management areas. Adaptive management strategies will be implemented based on the outcomes of this monitoring program.

Overall, the Project is not inconsistent with Australia's obligations under the Biodiversity Convention.

8.1.3 The Apia Convention

The Convention on the Conservation of Nature in the South Pacific (the Apia Convention) commits signatories to taking action for the conservation, utilisation and development of natural resources of the South Pacific region through careful planning and management for the benefit of present and future generations.

In order to pursue the objective of the Convention the Parties:

- undertake to create protected areas to safeguard representative samples of natural ecosystems, superlative scenery, striking geological formations and regions and objects of aesthetic, historic, cultural or scientific value (art.2);



- commit to not alter national parks so as to reduce their area except after the fullest investigation; their resources are not to be subject to commercial exploitation; hunting and collection of species are to be prohibited and provision is to be made for visitors (art. 3);
- agree to maintain lists of indigenous fauna and flora in danger of extinction and to give such species as complete protection as possible (art. 5); and
- provision may be made as appropriate for customary use of areas and species in accordance with traditional cultural practices (art. 6).

For context, the APIA Convention was suspended with effect from 13 September 2006; however, it is still relevant to take Australia's previous obligations under the Convention into consideration.

Many of the commitments outlined in the Apia Convention are incorporated into and superseded by Australia's commitments under the Biodiversity Convention, see **Section 8.1.2**. Overall, the Project will have no direct impact on protected areas and has incorporated the design measures outlined in **Section 6.0** to minimise indirect impacts on neighbouring protected areas to the greatest possible extent. In addition, there is the potential for Project-related offsets to be incorporated into the protected area estate, which would actively promote the objectives of the Apia Convention. An Offset Management Strategy for the Project is provided in **Appendix O**.

Overall, the Project is not inconsistent with Australia's obligations under the Apia Convention.

8.1.4 CITES

Australia implements its obligations under the Convention on International Trade in Endangered Species of Flora and Fauna (CITES) through the EPBC Act, which aims to ensure that the international trade in wildlife does not threaten wild populations of flora and fauna. Domestic measures that are imposed to restrict trade in CITES listed species include tight restrictions on international imports and exports of species listed in Appendix II of the Convention, and the exclusion of some species from personal and household effects exemptions.

The Project does not relate to the trade in flora and fauna species, in whole or in part, and will not in any way be inconsistent with Australia's commitments under CITES.

8.1.5 International Treaties Relating to Migratory Birds

8.1.5.1 The Bonn Convention

Australia is signatory to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) which provides a global platform for the conservation and sustainable use of migratory animals and their habitats. Australia implements its obligations to the Bonn Convention through national legislation – the EPBC Act. The EPBC Act gives effect to Australia's obligations under the Convention through the protection of all migratory species listed under the Act.

The convention definition of migratory species is 'the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries'. This definition has been adopted in the EPBC Act

Migratory species threatened with extinction are listed on Appendix I of the Convention. CMS Parties strive towards strictly protecting these animals, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. Besides establishing obligations for each State joining the Convention, CMS promotes concerted action among the Range States of many of these species. Migratory species that need or would significantly benefit from international co-operation are listed in Appendix II of the Convention.



Of the MNES relevant to the Project that are listed as migratory species, all but fork-tailed swift and white-throated needletail are listed as AH2 under the Bonn Convention, which is to say that the species are a member of a family listed in Appendix II but are not individually listed at the species level. Fork-tailed swift and white-throated needletail are not listed under either Appendix I or II of the Bonn Convention.

The Project has been assessed as not having a significant residual impact on any migratory species as described in **Section 8.7** and the Project is not inconsistent with Australia's obligations under the Bonn Convention.

8.1.5.2 CAMBA

Australia has entered into a bilateral agreement with China that aims to achieve protection and conservation of migratory birds and their important habitats, protection from take or trade except under limited circumstances, the exchange of information, and building cooperative relationships – the China-Australia Migratory Bird Agreement (CAMBA). Australia implements its obligations to CAMBA through national legislation – the EPBC Act. The EPBC Act gives effect to Australia's obligations to pursuing conservation outcomes for migratory birds of this agreement through the protection of migratory bird species listed under the Act and under this agreement.

Of the MNES relevant to the Project that are listed as migratory species, the white-throated needletail is the only species listed under CAMBA. The Project has been assessed as not having a significant residual impact on white-throated needletail as described in **Section 8.5.5** and the Project is not inconsistent with Australia's obligations under the CAMBA.

8.1.5.3 JAMBA

Australia has entered into a bilateral agreement with Japan that aims to achieve protection and conservation of migratory birds and birds in danger of extinction and their environment – the Japan-Australia Migratory Bird Agreement (JAMBA). Australia implements its obligations to JAMBA through national legislation – the EPBC Act. The EPBC Act gives effect to Australia's obligations to pursuing conservation outcomes for migratory birds of this agreement through the protection of migratory bird species listed under the Act and under this agreement.

Of the MNES relevant to the Project that are listed as migratory species, the fork-tailed swift, Latham's snipe and white-throated needletail are listed under JAMBA. The Project has been assessed as not having a significant residual impact on these migratory species as described in **Section 8.7** and the Project is not inconsistent with Australia's obligations under the JAMBA.

8.1.5.4 ROKAMBA

Australia has entered into a bilateral agreement with the Republic of Korea that aims to achieve protection and conservation of migratory birds – the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA). Australia implements its obligations to ROKAMBA through national legislation – the EPBC Act. The EPBC Act gives effect to Australia's obligations to pursuing conservation outcomes for migratory birds of this agreement through the protection of migratory bird species listed under the Act and under this agreement.

Of the MNES relevant to the Project that are listed as migratory species, the fork-tailed swift, Latham's snipe and white-throated needletail are listed under JAMBA. The Project has been assessed as not having a significant residual impact on these migratory species as described in **Section 8.7** and the Project is not inconsistent with Australia's obligations under the ROKAMBA.



8.1.6 Recovery Plans and Threat Abatement Plans

The requirements of relevant Recovery Plans and Threat Abatement Plans are provided in **Table 8-3**, along with the Project's response to these requirements.



Table 8-3 Relevant Recovery Plans and Threat Abatement Plans

Recovery Plan or Threat Abatement Plan	Background to the Issue	Objectives of the Plan	Project Response
<p>Red Goshawk Recovery Plan (NSW)</p>	<p>The red goshawk is listed as 'Vulnerable' under the EPBC Act and 'Endangered' under the NC Act.</p> <p>The main cause of the decline of the red goshawk in eastern Queensland is reported as widespread clearance of native forests and woodlands for agriculture. Other threats to the species include fragmentation and degradation of habitat, direct disturbance and/or loss of nesting sites and changes in prey availability.</p> <p>Red goshawks occur in areas of high biodiversity and have large territories (Debus and Czechura 1988b, Aumann and Baker-Gabb 1991, Czechura 1997, 2001). Areas red goshawks are known to frequent possess intact forest or woodland, permanent water, and areas where large and diverse bird populations occur (Aumann and Baker-Gabb 1991, Czechura 2001). Hence, the conservation of any area for red goshawk will have a substantial biodiversity benefit for a wide range of woodland and forest animals and plants.</p>	<p>The overall objective of the Red Goshawk Recovery Plan is to maintain populations of the species across their range and implement measures to promote recovery of the species from key threats including habitat loss and fragmentation. Measures to achieve this are, specifically:</p> <ul style="list-style-type: none"> • Identify and map important habitat red goshawk habitat by sourcing information from existing databases to inform targeted field surveys; • Protect and manage important habitat areas by providing information to government and non-government agencies; • Increase knowledge about the red goshawk's productive success and its survival through monitoring activities; • Identify important populations; and • Increase community awareness about the red goshawk and the conservation of the species. 	<p>Ecological assessments of the Project area were completed between October 2020 and January 2022. Surveys were designed and completed in accordance with State and Federal guidelines including seasonality requirements, effort and methods to target potentially occurring MNES. Field surveys were informed by the results of desktop analyses.</p> <p>Completed surveys are described in Section 4.6.3.3.</p> <p>No red goshawks have been observed within the Project area; nevertheless, the Project area provides potential nesting and foraging habitat for the species.</p> <p>Large areas of potential nesting and foraging habitat for red goshawk will be retained throughout the Project area.</p> <p>The Project design has sought to avoid and minimise clearing within the riparian locations and areas of larger trees which are more likely to be suitable for nesting. If practical during construction, micrositing of access tracks will seek to avoid large nesting trees.</p> <p>Project infrastructure including laydown areas, construction compounds and</p>



Recovery Plan or Threat Abatement Plan	Background to the Issue	Objectives of the Plan	Project Response
			<p>substation have been sited in cleared areas where practicable to avoid clearing of potential habitat.</p> <p>Clearing of red goshawk habitat will occur sequentially and in accordance with an approved Species Management Program. Impacts to potential nesting habitat are generally restricted to access track and overhead transmission line crossings of riparian environments; the turbines and hardstands are located primarily on elevated ridgelines where there is less suitable habitat for the species. Refer to Section 8.5.3.</p>
Southern Recovery Plan	<p>Cassowary</p> <p>The southern cassowary is listed as 'Endangered' under the EPBC Act and NC Act.</p> <p>The Wet Tropics cassowary population is impacted upon by eight main threats. The main cause of the decline of the cassowary population is habitat loss from clearing, with much of the remaining habitat fragmented with ongoing degradation, roads and traffic, dog attacks, hand feeding, diseases and natural catastrophic events such as cyclones.</p> <p>The cassowary is a major disperser of rainforest plant seeds and the only long</p>	<p>The overall objective of the recovery plan is to secure the long-term protection of cassowary populations through improved planning mechanisms supported by robust monitoring, threat abatement and community engagement programmes.</p> <p>Actions to achieve this include:</p> <ul style="list-style-type: none"> • Identify and protect essential cassowary habitat and landscape corridors; • Institute a more coordinated and stronger planning response to 	<p>Ecological assessments of the Project area were completed between October 2020 and January 2022. Surveys were designed and completed in accordance with State and Federal guidelines including seasonality requirements, effort and methods to target potentially occurring MNES. Field surveys were informed by the results of desktop analyses.</p> <p>Completed surveys are described in Section 4.6.4.3.</p> <p>The Project has been designed to avoid all critical habitat for this species.</p>



Recovery Plan or Threat Abatement Plan	Background to the Issue	Objectives of the Plan	Project Response
	<p>distance disperser of some species with large fleshy fruits. Because it is essential to forest ecology and habitats of diverse species, the cassowary is a “keystone” species (i.e. one whose conservation is crucial to other species and ecosystems).</p>	<p>development issues in cassowary habitat;</p> <ul style="list-style-type: none"> • Implement strategies to protect cassowary populations by minimising the adverse impacts of roads, dogs, pigs and cyclone events; • Progress an effective cassowary rescue, rehabilitation and release programme; • Cassowary populations are monitored to assess population size, trends and status; • Improve understanding of cassowary ecology and threats to its survival to better inform cassowary recovery; • Engage the community in cassowary conservation and education; and • Manage the recovery programme. 	<p>The Project will implement a Vegetation Management Plan, a Fauna Management Plan and a Rehabilitation Plan to minimise the risk of further isolating the small, fragmented patches of cassowary habitat within the Project area, and to maintain connectivity for the species across the broader landscape.</p>
Spectacled Flying Fox Recovery Plan	<p>The spectacled flying fox (<i>Pteropus conspicillatus</i>) is listed as ‘Vulnerable’ under the EPBC Act. The NC Act includes general restrictions regarding moving of roosts that are relevant to genus <i>Pteropus</i>. However <i>Pteropus conspicillatus</i> is not listed under the NC Act.</p>	<p>The overall objectives of recovery are to secure the long-term protection of the spectacled flying fox through a reduction in the impact of threats to species’ survival and to improve the standard of information available to guide recovery. Actions to recovery include:</p>	<p>Ecological assessments of the Project area were completed between October 2020 and March 2021. Surveys were designed and completed in accordance with State and Federal guidelines including seasonality requirements, effort and methods to target potentially occurring MNES. Field surveys were</p>



Recovery Plan or Threat Abatement Plan	Background to the Issue	Objectives of the Plan	Project Response
	<p>Known threats to the spectacled flying fox include loss of habitat, conflict with humans and/or man-made obstacles, entanglement in nets, illegal shooting, electrocution on powerlines, entanglement in barbed wire fencing and backyard drape netting, tick paralysis, genetic disorders (e.g. cleft palate syndrome), agricultural pesticide residue poisoning and vehicle-related mortality.</p> <p>Due to its role as a pollen and seed disperser, protection of spectacled flying foxes will contribute to the protection of ecological processes within the vegetation communities of these areas. The protection of habitat used by the spectacled flying fox will also provide protection for other species listed under the EPBC Act.</p>	<ul style="list-style-type: none"> • Research practicable and cost effective flying fox deterrent systems for commercial fruit growers; • Identify and protect native foraging habitat critical to the survival of the spectacled flying fox; • Accurately assess the short and long term population size and population trends of the spectacled flying-fox; • Improve the public perception of the spectacled flying-fox and the standard of information available to guide recovery; • Increase knowledge of <i>P. conspicillatus</i> roosting requirements and protect important camps; • Improve understanding of incidence of tick paralysis and actions to minimise paralysis mortality in flying foxes; • Implement strategies to reduce incidence of electrocution and entanglement of <i>P. conspicillatus</i>; and • Investigate the causes of birth abnormalities such as cleft palate syndrome. 	<p>informed by the results of desktop analyses.</p> <p>Completed surveys are described in Section 4.7.10.3.</p> <p>No habitat critical to the survival of the species has been mapped within the Project area. Large areas of spectacled flying-fox foraging habitat throughout the Project area will be retained. Vegetation clearing will be minimised as much as practicable through micro-siting within the proposed Project footprint.</p>



Recovery Plan or Threat Abatement Plan	Background to the Issue	Objectives of the Plan	Project Response
<p>Threat Abatement Plan for Feral Pigs, DOEE 2017</p>	<p>Predation, habitat degradation, competition and disease transmission by feral pigs (<i>Sus scrofa</i>) as a key threatening process under the EPBC Act.</p> <p>This revised plan provides a national framework for feral pig management, research and education. It also aims to capture scientific research and other developments that have occurred since the first threat abatement plan was made, and capture changing priorities for feral pig management.</p>	<p>The overarching goals of this threat abatement plan are to prevent further species and ecological communities from becoming threatened or extinct due to predation, habitat degradation, competition and disease transmission by feral pigs, and to improve protection for EPBC-listed species and ecological communities currently threatened by feral pigs.</p> <p>To achieve these goals, the threat abatement plan has the following six objectives:</p> <ul style="list-style-type: none"> • Prioritise key species, ecological communities, ecosystems and locations across Australia for strategic feral pig management • Encourage the integration of feral pig management into land management activities at regional, state and territory, and national levels • Encourage further scientific research into feral pig impacts on nationally threatened species and ecological communities, and feral pig ecology and control 	<p>Feral pigs have been extensively recorded within the Project area by camera trap.</p> <p>A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread, management of pest infestations (including specific advice for amphibian chytrid fungus) and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.</p> <p>The Project will work with stakeholders such as the Wet Tropics Management Authority to design appropriate control measures for feral pigs in parts of the Project area most at risk of detrimental effects (such as potential habitat for rainforest frogs, Australian lace-lid and mountain mistfrog, as determined through their SPRAT listing).</p>



Recovery Plan or Threat Abatement Plan	Background to the Issue	Objectives of the Plan	Project Response
		<ul style="list-style-type: none"> Record and monitor feral pig control programs, so their effectiveness can be evaluated Build capacity for feral pig management and raise feral pig awareness amongst landholders and land managers; and Improve public awareness about feral pigs and the environmental damage and problems they cause, and the need for feral pig control. 	
Mabi Forest Recovery Plan	<p>Mabi Forest or Complex Notophyll Vine Forest Type 5b (Tracey 1982) is listed as 'Critically Endangered' under the EPBC Act. The Queensland Regional Ecosystem framework has been updated such that Mabi Forest (Tracey and Webb 1975, Tracey 1982) is now identified as Regional Ecosystems 7.8.3 (Complex Semi-Evergreen Notophyll Vine Forest of uplands on basalt) and 7.3.37 (Complex Semi-Evergreen Notophyll Vine Forest of uplands on alluvium). Both regional ecosystems are listed under the VM Act as 'Endangered' (EPA 2005).</p> <p>Clearing of Mabi Forest has left a severely fragmented and modified landscape,</p>	<p>The overall objective of this recovery plan is to protect and rehabilitate Mabi Forest and, where possible, expand Mabi Forest into adjacent areas through an integrated program of habitat protection, on-ground management, rehabilitation, research and public involvement.</p> <p>Actions for recovery include:</p> <ul style="list-style-type: none"> Identify and evaluate the extent and quality of Mabi Forest and component species; Enhance planning, management and conservation of Mabi Forest; Reduce threats to, and improve ecological condition of fragments 	<p>No Mabi Forest TEC has been mapped within the Project area and vegetation surveys have confirmed the absence of this TEC within the Project area.</p>



Recovery Plan or Threat Abatement Plan	Background to the Issue	Objectives of the Plan	Project Response
	<p>comprising remnant patches of various sizes, shapes, connectivity and condition. Fragmentation has allowed penetration by a range of serious weed species displacing native species and degrading habitat. Ecological processes such as seed dispersal are under threat, as fragments no longer support populations of the southern cassowary and musky rat-kangaroo; key seed dispersers in the Wet Tropics rainforests. Feral and domestic animals continue to threaten Mabi Forest wildlife due to predation. Grazing and other incompatible land management practices in the landscape, contribute to ongoing degradation of Mabi Forest remnants. Highly fragmented ecosystems like Mabi Forest, with their abrupt boundaries and high edge-to-area ratios, are vulnerable to the destructive forces of a severe cyclone.</p>	<p>ensuring a landscape approach to Mabi Forest conservation;</p> <ul style="list-style-type: none"> • Implement a monitoring and research program to inform conservation management decisions; • Develop public awareness of, and facilitate community participation in Mabi Forest recovery; and • Manage the recovery program. 	
<p>Magnificent Brood Frog Recovery Plan</p>	<p><i>P. covacevichae</i> is currently listed as vulnerable under the EPBC Act and the NC Act. However, a recent re-assessment using the 1994 IUCN criteria indicates that the species is endangered.</p> <p>Habitat loss and degradation appear to be the greatest threats to <i>P. covacevichae</i>. Ninety-seven percent of frog sites are located on unprotected land, most of</p>	<p>The general objective of this recovery plan is to improve the status of <i>P. covacevichae</i> through survey for new populations and through implementing relevant management and site protection for at least 50 percent of sites within five years.</p> <p>Conservation actions to achieve this include:</p>	<p>Ecological assessments of the Project area were completed between October 2020 and January 2022. Surveys were designed and completed in accordance with State and Federal guidelines including seasonality requirements, effort and methods to target potentially occurring MNES. Field surveys were</p>



Recovery Plan or Threat Abatement Plan	Background to the Issue	Objectives of the Plan	Project Response
	<p>which is in state forest or timber reserve. Several activities are likely to impact on the amount and quality of the frog's habitat, including grazing, logging, road works, clearing and development. The population at the Ravenshoe rubbish dump has declined. Dump activities have destroyed or modified habitat, and previously known populations are now absent.</p>	<ul style="list-style-type: none"> • Identify land uses and practices which may impact on habitat quality; • Identify and protect the known sites at greatest risk of degradation; • Design simple and effective guidelines and protective measures for <i>P. covacevichae</i> populations which can be implemented by land managers and users; • Obtain hydrological and ecological information about <i>P. covacevichae</i> affected by the impact of management actions; • Support further efforts to locate new populations based on the frog's habitat preference; • Engage local governments and community groups interested in conservation of <i>P. covacevichae</i>; and • Involve interested community groups in locating and monitoring populations and in their management. 	<p>informed by the results of desktop analyses.</p> <p>Completed surveys are described in Section 4.5.2.3.</p> <p>The species was observed in field surveys, generally adjacent to existing areas of disturbance such as access tracks and the existing powerline easement. The Project will result in the clearing of approximately 58.4 ha of critical habitat, with 40.1 ha of this comprising temporary disturbance areas that will be available for rehabilitation on completion of construction. Notwithstanding this, a comprehensive offsets package will also be provided, including 255 ha of direct land-based offset (5:1 ratio) as well as a significant indirect offset to advance the scientific knowledge for this species in the form of contribution towards research of up to \$250,000 (see Sections 7.0 and 9.0 respectively).</p>
Rainforest Frogs Recovery Plan	Species in this recovery plan include <i>Taudactylus acutirostris</i> , <i>T. rheophilus</i> , <i>Litoria lorica</i> , <i>L. nannotis</i> , <i>L. nyakalensis</i> , <i>L. rheocola</i> and <i>Nyctimystes</i> and are listed as	The overall recovery objective of this plan is to improve significantly the conservation status and long-term survival of each species through	Surveys undertaken in accordance with the Survey guidelines for Australia's threatened frogs (DEWHA, 2010c) have not confirmed the presence of these



Recovery Plan or Threat Abatement Plan	Background to the Issue	Objectives of the Plan	Project Response
	<p>endangered under the NC Act and the EPBC Act.</p> <p>All have undergone range contractions, with dramatic population declines in most populations at altitudes greater than about 300 m. The declining species are associated with rainforest streams in upland areas. Declines occurred suddenly for highly susceptible species which had close associations with streams. Despite considerable effort, the cause(s) of these declines have not been determined, although several hypotheses have been put forward for testing. The aim of this recovery plan is to explain these threatening processes.</p>	<p>protection of existing populations, location of additional populations, or expansion of existing populations into areas previously inhabited.</p> <p>Actions to achieve this include:</p> <ul style="list-style-type: none"> • Establish the continued existence of populations of <i>T. acutirostris</i>, <i>T. rheophilus</i>, <i>L. lorica</i> and <i>L. nyakalensis</i>; • Secure the existing populations of all extant species; • Identify and reduce or eliminate the major threatening process(es); • Increase the number of stable populations of all extant species by expansion into their former ranges; and • Ensure that frog conservation is incorporated into all appropriate land management decisions by raising the awareness of the declining frog problem within all levels of government and the general community. 	<p>species within the Project area, Nevertheless, a preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread, management of pest infestations (including specific advice for amphibian chytrid fungus) and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.</p> <p>The Project will implement control procedures to limit the spread of these invasive species further and will aim to minimise the threats posed by invasive species within the Project area as far as reasonably practicable.</p>
Spotted-Tailed Quoll National Recovery Plan	<p><i>Dasyurus maculatus gracilis</i> is listed as Endangered under the EPBC Act.</p>	<p>The overall objective of recovery is to reduce the rate of decline of the Spotted-tailed Quoll, and ensure that viable</p>	<p>Ecological assessments of the Project area were completed between October 2020 and January 2022. Surveys were designed and completed in accordance</p>



Recovery Plan or Threat Abatement Plan	Background to the Issue	Objectives of the Plan	Project Response
	<p>The species is restricted to north-eastern Queensland with major threats thought to include habitat loss, modification and fragmentation, timber harvesting, poison baiting, competition and predation from introduced carnivores, deliberate killing, road mortality, bushfire and prescribed burning, poisoning by Cane Toads, and climate change.</p>	<p>populations remain throughout its current range in eastern Australia.</p> <p>Actions to achieve this are:</p> <ul style="list-style-type: none"> • Determine the distribution and status of Spotted-tailed Quoll populations throughout the range, and identify key threats and implement threat abatement management practices; • Investigate key aspects of the biology and ecology of the Spotted-tailed Quoll to acquire targeted information to aid recovery; • Reduce the rate of habitat loss and fragmentation on private land; • Evaluate and manage the risk posed by silvicultural practices; • Determine and manage the threat posed by introduced predators (foxes, cats, wild dogs) and of predator control practices on Spotted-tailed Quoll populations; • Determine and manage the impact of fire regimes on Spotted-tailed Quoll populations; • Reduce deliberate killings of Spotted-tailed Quolls; 	<p>with State and Federal guidelines including seasonality requirements, effort and methods to target potentially occurring MNES. Field surveys were informed by the results of desktop analyses.</p> <p>Completed surveys are described in Section 4.7.11.3.</p> <p>No habitat critical to the survival of the species has been mapped within the Project area, as there are no known records of the species within the Project area and it was not recorded during field surveys. There is limited potential habitat for the spotted-tailed quoll within the Project area.</p>



Recovery Plan or Threat Abatement Plan	Background to the Issue	Objectives of the Plan	Project Response
		<ul style="list-style-type: none"> • Reduce the frequency of Spotted-tailed Quoll road mortality; • Assess the threat Cane Toads pose to Spotted-tailed Quolls and develop threat abatement actions if necessary; • Determine the likely impact of climate change on Spotted-tailed Quoll populations; and • Increase community awareness of the Spotted-tailed Quoll and involvement in the Recovery Program. 	
Northern Quoll Recovery Plan	<p><i>Dasyurus hallucatus</i> is classified as Endangered under the EPBC Act and Endangered on the 2009 IUCN Red List. Population decline in Queensland is associated with habitat degradation (inappropriate grazing and fire regimes) although the mechanisms are complex and not well known at this stage, habitat loss and isolation, weeds, disease, and feral predators through competition or direct predation. Cane toads are considered a high threat to populations of Quoll in western Australia, however, in Queensland some populations have persisted following the invasion of cane toads as individuals appear to either avoid eating cane toads or</p>	<p>The overall objective of this recovery plan is to minimise the rate of decline of the northern quoll in Australia, and ensure that viable populations remain in each of the major regions of distribution into the future.</p> <p>Actions to achieve this include:</p> <ul style="list-style-type: none"> • Protect northern quoll populations on offshore islands from invasion and establishment of cane toads, cats and other potential invasive species; • Foster the recovery of northern quoll sub-populations in areas where the species has survived alongside cane toads; 	<p>Ecological assessments of the Project area were completed between October 2020 and January 2022. Surveys were designed and completed in accordance with State and Federal guidelines including seasonality requirements, effort and methods to target potentially occurring MNES. Field surveys were informed by the results of desktop analyses.</p> <p>Completed surveys are described in Section 4.7.8.3.</p> <p>The presence of northern quoll within the Project area has not been confirmed. Extensive camera trapping effort (nearly 6,000 camera trap nights) failed to record</p>



Recovery Plan or Threat Abatement Plan	Background to the Issue	Objectives of the Plan	Project Response
	<p>have adapted mechanisms to cope with the toxin.</p>	<ul style="list-style-type: none"> • Halt northern quoll declines in areas not yet colonised by cane toads; • Halt declines in areas recently colonised by cane toads; • Maintain secure populations and source animals for future reintroductions/introductions, if they become appropriate; • Reduce the risk of northern quoll populations being impacted by disease; • Reduce the impact of feral predators on northern quolls; and • Raise public awareness of the plight of northern quolls and the need for biosecurity of islands and WA. 	<p>a single image of the northern quoll and no latrines were observed during habitat assessments. Large boulder habitat is generally absent from the Project area, with rocky habitat typically comprising smaller rocks on scree slopes or flat areas of exposed bedrock. However, there are open eucalypt woodlands which provide potential foraging and dispersal habitat. In the absence of a confirmed population of northern quoll, no habitat critical to the survival of the species has been mapped within the Project area. Large areas of potential quoll habitat throughout the Project area will be retained. Design has sought to avoid and minimise clearing within mapped areas of rocky relief which are more likely to support dens in the preferred form of boulder piles as well as adjacent foraging and dispersal habitat.</p>
<p>Masked Owl Recovery Plan (included within a multi-species recovery plan-- Large Forest Owl Recovery Plan) (not current, but not superseded)</p>	<p>Masked owl is currently listed as Vulnerable under the EPBC Act and the NC Act. The species is threatened by clearing of forest and woodland for agriculture, pine plantations, mining, major infrastructure, urban developments and intensive harvesting practices for wood production in native forests. Logging and assorted</p>	<p>The overall objective of this recovery plan is to ensure that viable populations of the three species continue in the wild. Depending on the full implementation and success of the proposed actions, a further objective is to reassess the conservation status of the species and down-list from Vulnerable to secure if appropriate.</p>	<p>Ecological assessments of the Project area were completed between October 2020 and January 2022. Surveys were designed and completed in accordance with State and Federal guidelines including seasonality requirements, effort and methods to target potentially occurring MNES. Field surveys were</p>



Recovery Plan or Threat Abatement Plan	Background to the Issue	Objectives of the Plan	Project Response
	<p>management practices potentially remove many of the hollow trees on which the owls and their prey depend.</p>	<p>Actions to achieve this are:</p> <ul style="list-style-type: none"> Assess the distribution and amount of high-quality habitat across public and private lands to get an estimate of the number and proportion of occupied territories of each species that are, and are not, protected; Monitor trends in population parameters (numbers, distribution, territory fidelity and breeding success) across the range and across different land tenures and disturbance histories; Assess the implementation and effectiveness of forest management prescriptions designed to mitigate the impact of timber-harvesting operations, (if necessary), to use this information to refine the prescriptions so that forestry activities on state forests are not resulting in adverse changes in species abundance and breeding success; Ensure the impacts on large forest owls and their habitats are adequately assessed during planning and environmental assessment processes; 	<p>informed by the results of desktop analyses.</p> <p>Completed surveys are described in Section 4.6.2.3</p> <p>During field surveys, the species was observed (through calls) at two locations and both potential and critical habitat identified in the Project area. Clearing represents 0.01 % of the critical habitat for the species mapped within the Project area.</p>



Recovery Plan or Threat Abatement Plan	Background to the Issue	Objectives of the Plan	Project Response
		<ul style="list-style-type: none"> • Minimise further loss and fragmentation of habitat by protection and more informed management of significant owl habitat (including protection of individual nest sites); • Improve the recovery and management based on an improved understanding of key areas of their biology and ecology; • Raise awareness of the conservation requirements and involve the community in owl conservation efforts and in so doing increase the information base about owl habitats and biology; and • Coordinate the implementation of the recovery plan and continually seek to integrate actions in this plan with actions in other recovery plans or conservation initiatives. 	
Threat Abatement Plan for Five Listed Grasses in Northern Australia	Ecosystem degradation, habitat loss and species decline due to invasion of northern Australia by introduced gamba grass (<i>Andropogon gayanus</i>), para grass (<i>Urochloa mutica</i>), olive hymenachne (<i>Hymenachne amplexicaulis</i>), mission grass	The overarching goal of this Plan is to minimise the adverse impacts of the five listed grasses on affected native species and ecological communities. To achieve this goal, six main objectives that were	<ul style="list-style-type: none"> • Staying on established access tracks. • Weed hygiene protocols for equipment/personnel/vehicles and Weed washdown certification.



Recovery Plan or Threat Abatement Plan	Background to the Issue	Objectives of the Plan	Project Response
	<p>(<i>Pennisetum polystachion</i>) and annual mission grass (<i>Pennisetum pedicellatum</i>) (the Five Listed Grasses) is listed as a key threatening process under Commonwealth EPBC Act.</p> <p>These invasive high-biomass species can increase fuel loads and/or alter nitrogen cycling and water availability within systems (Douglas et al., 2004; Rossiter et al., 2004; TSSC, 2009), resulting in ecosystem degradation, habitat loss and biodiversity decline.</p>	<p>developed in consultation with experts in relevant jurisdictions.</p> <p>These objectives are:</p> <ul style="list-style-type: none"> • Develop an understanding of the extent and spread pathways of infestation by the five listed grasses; • Support and facilitate coordinated management strategies through the design of tools, systems and guidelines; • Identify and prioritise key assets and areas for strategic management; • Build capacity and raise awareness among stakeholders; • Implement coordinated, cost-effective on-ground management strategies in high-priority areas; and • Monitor, evaluate and report on the effectiveness of management programs. 	<ul style="list-style-type: none"> • Coordinate with landholders for current fire management in place. • Targeted weed surveys to identify magnitude of infestation if recorded in Project area (PMST/Wildlife Online).



8.2 Threatened Ecological Communities

8.2.1 Mabi Forest TEC

As discussed in **Section 4.3.1**, vegetation surveys undertaken to ground-truth vegetation communities within the Project area did not confirm the presence of Mabi Forest TEC (nor the two potentially corresponding rEs). It is therefore considered that there is no Mabi Forest TEC within the Project area. Regional ecosystem mapping by the Queensland Department of Resources indicates the presence of 15.4 ha of the two rEs potentially corresponding to Mabi Forest within the broader Study area. These vegetation patches have not been ground-truthed (they are outside the Project area) and may or may not actually comprise the Mabi Forest TEC. These non-verified patches are sufficiently separated from the Project to be considered no risk of being impacted directly or indirectly by the Project.

8.2.1.1 Potential Construction Impacts from the Project and Relevant Mitigation

Vegetation surveys have not confirmed the presence of Mabi Forest within the Project area. The Project will therefore not result in any direct or indirect impacts on Mabi Forest during the construction phase.

Notwithstanding, potential construction impacts and proposed mitigation measures for Mabi Forest as required by the Guidelines are considered in **Table 8-4**.

Table 8-4 Potential Construction Impacts and Proposed Mitigation – Mabi Forest TEC

Potential Impact	Assessment	Proposed Mitigation
Vegetation and habitat clearance	Vegetation surveys within the Project area have confirmed the TEC to be absent. The Project will not result in any clearing of Mabi Forest.	Mitigation measures are not required.
Habitat degradation/disturbance from uncontrolled access	Vegetation surveys within the Project area have confirmed this TEC to be absent. The Project will not result in any habitat degradation or disturbance of Mabi Forest.	The approved disturbance area will be clearly demarcated on site to ensure personnel, plant and vehicles stay within the approved footprint. Measures to ensure clearing limits are adhered to will be documented in the Project's Construction EMP and associated sub-plans (see Appendix H) and covered in site inductions.
Indirect impacts such as smothering by dust and accidental release of hazardous materials such as fuel	Vegetation surveys within the Project area have confirmed this TEC to be absent. The Project will not result in any indirect impacts such as smothering by dust or accidental release of hazardous materials to Mabi Forest.	Smothering by dust is not expected to pose a significant risk to plants in this high-rainfall area. Dust generating activities will be minimised during dry, windy conditions and areas of exposed soils will be rehabilitated as soon as practicable, to minimise dust emissions. Dust suppression (water spraying) will be used during the dry season as necessary, including in areas of



Potential Impact	Assessment	Proposed Mitigation
		<p>sensitive vegetation adjacent to the construction footprint if visible dust is observed.</p> <p>Accidental releases of hazardous materials is highly unlikely as these materials would be securely stored in dedicated areas within the construction compound, away from sensitive sites. Spills would be limited to small drips from machinery hoses and similar, and would be cleaned up immediately, with the waste disposed of in accordance with the Construction EMP.</p>
Weed and pest incursion	Weeds may be brought to or translocated across the site on project plant and equipment.	<p>The Project area is currently subjected to existing weed and pest impacts. During construction of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue.</p> <p>A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread (with specific advice for key identified species), management of pest infestations and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.</p>
Erosion and sedimentation	Construction activities may alter surface water overland flow, leading to increased erosion of suitable habitat.	<p>A preliminary Erosion and Sediment Control Plan (ESCP) (see Appendix I), and a Sediment and Erosion Management Plan (Appendix J) have been prepared and will be further developed by the Construction Contractor prior to works commencing on site. Implementation of these plans will minimise soil loss from the disturbance areas.</p>
Bushfire risk	The Project is not expected to increase the risk of high intensity bushfires in the Project area.	<p>A Bushfire Management Plan will be prepared prior to construction and will be implemented during all on-site activities. Fuel loads will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management.</p>

8.2.1.2 Potential Operational Impacts from the Project and Relevant Mitigation

The Mabi Forest TEC does not occur within the Project Area and there will therefore be no direct or indirect impacts during the operations phase of the Project, as outlined in **Table 8-5**.



Table 8-5 Potential Operational Impacts and Proposed Mitigation – Mabi Forest TEC

Potential Impact	Assessment	Proposed Mitigation
Indirect impacts such as smothering by dust and accidental release of hazardous materials such as fuel	Vegetation surveys within the Project area have confirmed this TEC is absent. The Project will not result in any indirect impacts on Mabi Forest through dust smothering or accidental release of hazardous materials.	Standard mitigation measures will be implemented by way of an Operations EMP.
Weed and pest incursion	Weeds may be brought to or translocated across the site on operational plant and maintenance equipment.	The Project area is currently subjected to existing weed and pest impacts. During operation of the Project, weed and pest control measures will be established and implemented to minimise the risk of the Project further exacerbating this issue.
Bushfire risk	The Project is not expected to increase the risk of high intensity bushfires in the Project area.	A Project Bushfire Management Plan will be prepared and operational activities will be undertaken in accordance with this plan. This may include measures to manage fuel loads in proximity to known populations of this species.

8.2.1.3 Assessment of Significant Residual Impacts

The Mabi Forest TEC (Critically Endangered) is not located within the Project area and therefore the potential for a significant residual impact is unlikely. For completeness, a full significance assessment following the Significant Impact Guidelines (DoE 2013) is presented in **Table 8-6**.

Table 8-6 Significant Residual Impact on Mabi Forest TEC

Significant Impact Criteria	Assessment
Reduce the extent of an ecological community	Unlikely Mabi Forest does not occur within the Project area and no clearing of Mabi Forest will occur as a result of the Project.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	Unlikely Mabi Forest does not occur within the Project area and no clearing of Mabi Forest will occur as a result of the Project.
Adversely affect habitat critical to the survival of an ecological community	Unlikely Habitat critical to the survival of the community is defined as all areas that meet the definition of the ecological community (Latch 2008). There is no Mabi Forest within



Significant Impact Criteria	Assessment
	the Project area and therefore no habitat critical to the survival of the TEC.
Modify or destroy abiotic (non-living) factors (such as water, nutrients or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	<p>Unlikely</p> <p>Measures to ensure water and nutrient cycles are maintained within the Project area will be documented in the Project's Construction EMP and associated sub-plans (see Appendix H), and covered in site inductions.</p>
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	<p>Unlikely</p> <p>There is no Mabi Forest within the Project area and no evidence of functionally important species to the TEC, such as southern cassowary.</p>
<p>Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to:</p> <ul style="list-style-type: none"> • Assisting invasive species, that are harmful to the listed ecological community, to become established, or • Causing regular mobilization of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community 	<p>Unlikely</p> <p>There is no Mabi Forest within the Project area.</p> <p>The Project area is currently subjected to existing weed and pest impacts. During construction of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue. A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread (with specific advice for key identified species), management of pest infestations and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.</p> <p>There is no intention to undertake regular application of fertilisers, herbicides or other chemicals.</p>
Interfere with the recovery of an ecological community	<p>Unlikely</p> <p>There is no Mabi Forest within the Project area and only two small, mapped areas of corresponding RE 7.8.3 within the broader Study area. These have not been ground truthed and may not meet the diagnostic characteristics of the TEC.</p> <p>There is no regrowth vegetation of the two rEs that correspond to the TEC within the Project area.</p> <p>The opportunity for recovery of the ecological community within the Project area would appear to be limited, irrespective of whether the Project proceeds.</p>

8.2.2 Broad Leaf Tea-tree Woodland TEC

As discussed in **Section 4.3.2**, the broad leaf tea-tree woodland TEC has been confirmed as not present within the Project area. A number of small patches of RE 7.3.8 occur within the Project area however these did not meet the diagnostic characteristics of the TEC as in both cases the canopy was dominated by *Eucalyptus lockyeri*, with *Melaleuca*



viridiflora only present in the T2 layer. Notwithstanding, there will be no disturbance to RE 7.3.8 as illustrated in **Figure 4-12**.

8.2.2.1 Potential Construction Impacts from the Project and Relevant Mitigation

Vegetation surveys have confirmed that the broad leaf tea-tree woodland TEC is not present within the Project area. The Project will not result in any direct or indirect impacts on broad leaf tea-tree woodland TEC during the construction phase, including RE 7.3.8 which does not meet the diagnostic characteristics of the TEC.

Notwithstanding, potential construction impacts and proposed mitigation measures for broad leaf tea-tree woodland TEC as required by the Guidelines are considered below in **Table 8-7**.

Table 8-7 Potential Construction Impacts and Proposed Mitigation – Broad Leaf Tea-tree Woodland TEC

Potential Impact	Assessment	Proposed Mitigation
Vegetation and habitat clearance	Vegetation surveys within the Project area have confirmed this TEC is not present. The Project will not result in any clearing of broad leaf tea-tree woodland.	Mitigation measures are not required.
Habitat degradation/disturbance from uncontrolled access	Vegetation surveys within the Project area have confirmed this TEC is not present. The Project will not result in any habitat degradation or disturbance of broad leaf tea-tree woodland.	The approved disturbance area will be clearly demarcated on site to ensure personnel, plant and vehicles stay within the approved footprint. Measures to ensure clearing limits are adhered to will be documented in the Project's Construction EMP and associated sub-plans (see Appendix H) and covered in site inductions.
Indirect impacts such as smothering by dust and accidental release of hazardous materials such as fuel	Vegetation surveys within the Project area have confirmed this TEC is not present. The Project will not result in any indirect impacts such as smothering by dust or accidental release of hazardous materials to broad leaf tea-tree woodland.	Smothering by dust is not expected to pose a significant risk to plants in this high-rainfall area. Dust generating activities will be minimised during dry, windy conditions and areas of exposed soils will be rehabilitated as soon as practicable, to minimise dust emissions. Dust suppression (water spraying) will be used during the dry season as necessary, including in areas of sensitive vegetation adjacent to the construction footprint if visible dust is observed. Accidental releases of hazardous materials is highly unlikely as these materials would be securely stored in dedicated areas within the construction compound, away from sensitive sites. Spills would be limited to small drips from machinery hoses and similar, and would be



Potential Impact	Assessment	Proposed Mitigation
		cleaned up immediately, with the waste disposed of in accordance with the Construction EMP.
Weed and pest incursion	Weeds may be brought to or translocated across the site on project plant and equipment.	The Project area is currently subjected to existing weed and pest impacts. During construction of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue. A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread (with specific advice for key identified species), management of pest infestations and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.
Erosion and sedimentation	Construction activities may alter surface water overland flow, leading to increased erosion of suitable habitat.	A preliminary Erosion and Sediment Control Plan (ESCP) (Appendix I) and a Sediment and Erosion Management Plan (Appendix J) have been prepared for the Project and will be further developed by the Construction Contractor prior to works commencing on site. Implementation of these plans will minimise soil loss from the disturbance areas.
Bushfire risk	The Project is not expected to increase the risk of high intensity bushfires in the Project area.	A Bushfire Management Plan will be prepared prior to construction and will be implemented during all on-site activities. Fuel loads will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management.

8.2.2.2 Potential Operational Impacts from the Project and Relevant Mitigation

The broad leaf tea-tree woodland TEC does not occur within the Project Area and there will therefore be no direct or indirect impacts during the operations phase of the Project, as outlined in **Table 8-8**.

Table 8-8 Potential Operational Impacts and Proposed Mitigation – Broad Leaf Tea-tree Woodland TEC

Potential Impact	Assessment	Proposed Mitigation
Indirect impacts such as smothering by dust and accidental release of hazardous materials such as fuel	Vegetation surveys within the Project area have confirmed this TEC is not present. The Project will not result in any indirect impacts on broad leaf tea-tree woodland through dust smothering or	Standard mitigation measures will be implemented by way of an Operations EMP.



Potential Impact	Assessment	Proposed Mitigation
	accidental release of hazardous materials.	
Weed and pest incursion	Weeds may be brought to or translocated across the site on operational plant and maintenance equipment.	The Project area is currently subjected to existing weed and pest impacts. During operation of the Project, weed and pest control measures will be established and implemented to minimise the risk of the Project further exacerbating this issue.
Bushfire risk	The Project is not expected to increase the risk of high intensity bushfires in the Project area.	A Project Bushfire Management Plan will be prepared and operational activities will be undertaken in accordance with this plan. This may include measures to manage fuel loads in proximity to known populations of this species.

8.2.2.3 Assessment of Significant Residual Impacts

The broad leaf tea-tree woodland TEC (Endangered) is not located within the Project Area and therefore the potential for a significant residual impact is unlikely. For completeness, a full significance assessment following the Significant Impact Guidelines (DoE 2013) is presented in **Table 8-9**.

Table 8-9 Significant Residual Impact on Broad Leaf Tea-tree Woodland TEC

Significant Impact Criteria	Assessment
Reduce the extent of an ecological community	Unlikely Broad leaf tea-tree woodland does not occur within the Project area and no clearing of the TEC will occur as a result of the Project.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	Unlikely Broad leaf tea-tree woodland does not occur within the Project area and no clearing of the TEC will occur as a result of the Project.
Adversely affect habitat critical to the survival of an ecological community	Unlikely Habitat critical to the survival of the community has not been defined. There is no broad leaf tea-tree woodland within the Project area and it is therefore assumed that there is no habitat critical to the survival of the TEC.
Modify or destroy abiotic (non-living) factors (such as water, nutrients or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	Unlikely Measures to ensure water and nutrient cycles are maintained within the Project area will be documented in the Project's Construction EMP and associated sub-plans (see Appendix H), and covered in site inductions.



Significant Impact Criteria	Assessment
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	<p>Unlikely</p> <p>There is no broad leaf tea-tree woodland within the Project area and no evidence of functionally important species to the TEC, such as southern cassowary.</p>
<p>Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to:</p> <ul style="list-style-type: none"> Assisting invasive species, that are harmful to the listed ecological community, to become established, or Causing regular mobilization of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community 	<p>Unlikely</p> <p>There is no broad leaf tea-tree woodland within the Project area.</p> <p>The Project area is currently subjected to existing weed and pest impacts. During construction of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue. A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread (with specific advice for key identified species), management of pest infestations and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.</p> <p>There is no intention to undertake regular application of fertilisers, herbicides or other chemicals.</p>
Interfere with the recovery of an ecological community	<p>Unlikely</p> <p>There is no broad leaf tea-tree woodland within the Project area. There are a number of small areas of RE 7.3.8; however, these were found not to meet the diagnostic characteristics of the TEC as <i>Melaleuca viridiflora</i> was not the dominant canopy species.</p> <p>There is no regrowth vegetation of the two rEs that correspond to the TEC within the Project area and there are no other mapped patches of any of the potentially corresponding rEs within the broader Study area.</p> <p>The opportunity for recovery of the ecological community within the Project area would appear to be limited, irrespective of whether the Project proceeds.</p>

8.3 Listed Threatened Flora Species

8.3.1 North Queensland Lace

As discussed in **Section 4**, North Queensland lace has not been definitively recorded within the Project area, either historically or through targeted Project surveys. Potential habitat for this aquatic species has been mapped as non-ephemeral / semi-permanent watercourses fringed with riparian vegetation that is likely to provide the light and temperature regimes needed to support the species (as determined through field surveys).



8.3.1.1 Potential Construction Impacts from the Project and Relevant Mitigation

Approximately 189 ha of potential habitat occurs within the Project area and 392 ha within the broader Study area. Approximately 2.7 ha of potential habitat along Blunder Creek and a small tributary to Limestone Creek will require clearing for construction. The proposed watercourse crossings were surveyed for North Queensland lace in February 2022 and the species was not recorded. In the absence of the species' confirmed presence, the Project area is not considered to be habitat critical to the survival of North Queensland lace.

Potential construction impacts and proposed mitigation measures for North Queensland lace are discussed further in **Table 8-10**.

Table 8-10 Potential Construction Impacts and Proposed Mitigation – North Queensland Lace

Potential Impact	Assessment	Proposed Mitigation
Habitat clearance	<p>There are no known populations of this species within the proposed Project footprint.</p> <p>The Project may lead to the removal of a small area of aquatic habitat that is potential habitat for the species, associated with two watercourse crossings. These crossings have been surveyed and were not found to support North Queensland lace at the time of the survey.</p>	<p>The crossing of Blunder Creek will require a bridge whereas the tributary to Limestone Creek would be crossed using a culvert. The detailed design of these crossings is yet to be undertaken and will incorporate the need to minimise habitat loss within the watercourses.</p> <p>Pre-clearance surveys in areas of potential habitat will be undertaken prior to construction to confirm absence from the Project footprint. In the unlikely event that individuals are observed within the Project footprint, micro-siting and redesign actions will be explored in preference to impacting the species.</p>
Indirect impacts such as accidental release of hazardous materials such as fuel	<p>The construction of watercourse crossings has the potential to alter light conditions and water quality in the watercourses to the extent that potential habitat for North Queensland lace is degraded. The species has not been confirmed on site during targeted surveys.</p>	<p>The detailed design of the watercourse crossings is yet to be undertaken and will incorporate the need to minimise habitat alteration (e.g. shading) within the watercourses. Accidental releases of hazardous materials in proximity to watercourses is highly unlikely as these materials would be securely stored in dedicated areas within the construction compound, away from sensitive sites. Spills would be limited to small drips from machinery hoses and similar, and would be cleaned up immediately, with the waste disposed of in accordance with the Construction EMP.</p>
Weed and pest incursion	<p>Weeds may be brought to or translocated across the site on project plant and equipment.</p>	<p>The Project area is currently subjected to existing weed and pest impacts, including dense cover of lantana within the riparian zone. During construction of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue.</p> <p>A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread (with</p>



Potential Impact	Assessment	Proposed Mitigation
		specific advice for key identified species), management of pest infestations and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.
Erosion and sedimentation	Construction activities within the bed and banks of a watercourse may result in erosion of potential North Queensland lace habitat. However, it is noted that the species requires permanent, flowing watercourses (Dr Paul Forster, <i>pers. comm.</i>) and these are not present within the Project area.	The detailed design of the watercourse crossings is yet to be undertaken and will incorporate the need to minimise erosion of the bed and banks, taking into consideration the specific hydrology and morphology of the waterways. A preliminary Erosion and Sediment Control Plan (ESCP) (Appendix I) and a Sediment and Erosion Management Plan (Appendix J) have been prepared for the Project and will be further developed by the Construction Contractor prior to works commencing on site. Implementation of these plans will minimise erosion during construction.

8.3.1.2 Potential Operational Impacts from the Project and Relevant Mitigation

Potential impacts to North Queensland lace during the operations phase will be very limited, as outlined in **Table 8-11**.

Table 8-11 Potential Operational Impacts and Proposed Mitigation – North Queensland Lace

Potential Impact	Assessment	Proposed Mitigation
Indirect impacts such as accidental release of hazardous materials such as fuel	There is a very low risk of vehicles associated with Project operation causing indirect impacts on potential North Queensland lace habitat due to the release of hazardous materials.	Standard mitigation measures, implemented by way of an Operations EMP, are considered appropriate to manage this risk.
Weed and pest incursion	Weeds may be brought to or translocated across the site on operational plant and maintenance equipment.	The Project area is currently subjected to existing weed and pest impacts. During operation of the Project, weed and pest control measures will be established and implemented to minimise the risk of the Project further exacerbating this issue.

8.3.1.3 Assessment of Significant Residual Impacts

The Project is unlikely to have a significant residual impact on North Queensland lace (Endangered). A full significance assessment following the Significant Impact Guidelines (DoE 2013) is presented in **Table 8-12**.



Table 8-12 Significant Residual Impact on North Queensland Lace

Significant Impact Criteria	Assessment
Lead to a long-term decrease in the size of a population of a species	<p>Unlikely</p> <p>The species has not been confirmed within the Project area during targeted surveys. Indirect impacts on potential habitat will be minimised through careful design of watercourse crossings and managed appropriately during construction. There will therefore be no long-term decrease in the size of a population of North Queensland lace.</p>
Reduce the area of occupancy of the species	<p>Unlikely</p> <p>The species has not been confirmed within the Project area during targeted surveys. Potential indirect impacts will be managed appropriately and therefore there will be no reduction in the area of occupancy of North Queensland lace.</p>
Fragment an existing population into two or more populations	<p>Unlikely</p> <p>The species has not been confirmed within the Project area during targeted surveys. The Project will not fragment an existing population of North Queensland lace into two or more populations.</p>
Adversely affect habitat critical to the survival of a species	<p>Unlikely</p> <p>The species has not been confirmed within the Project area during targeted surveys and the Project area is therefore not considered to represent habitat critical to the survival of the species. The Project may lead to the removal of less than 1 ha of potential habitat. Potential indirect impacts will be managed appropriately. There will be no impacts to habitat critical to the survival of North Queensland lace.</p>
Disrupt the breeding cycle of a population	<p>Unlikely</p> <p>The species has not been confirmed within the Project area during targeted surveys. Potential indirect impacts will be managed appropriately and therefore there will be disruption to the breeding cycle of a population of North Queensland lace.</p>
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>Unlikely</p> <p>The species has not been confirmed within the Project area during targeted surveys. Potential indirect impacts will be managed appropriately and therefore there will be no impacts to habitat critical to the survival of North Queensland lace.</p> <p>The Project may lead to the removal of less than 1 ha of potential habitat but this is not considered habitat that is critical to the survival of the species as the species has not been confirmed present.</p> <p>The Project is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that North Queensland lace is likely to decline.</p>
Result in invasive species that are harmful to an endangered species becoming	<p>Unlikely</p> <p>The species has not been confirmed within the Project area during targeted surveys. Potential indirect impacts will be managed</p>



Significant Impact Criteria	Assessment
established in the endangered species' habitat	appropriately and the risk of invasive species will be managed through a Project-specific Weed and Pest Management Plan. This will include measures to ensure that potential habitat for North Queensland lace is protected from invasive species.
Introduce disease that may cause the species to decline	Unlikely The species has not been confirmed within the Project area during targeted surveys. Disease is not a known threat for the species (SPRAT 2022). The Project is not anticipated to increase the risk of disease impacting North Queensland lace.
Interfere with the recovery of the species	Unlikely The species has not been confirmed within the Project area during targeted surveys. Potential indirect impacts will be managed appropriately and therefore there will be no impacts to habitat critical to the survival of North Queensland lace. The Project may lead to the removal of less than 1 ha of potential habitat but this is not considered habitat that is critical to the survival of the species as the species has not been confirmed present. The Project is not expected to interfere with the recovery of North Queensland lace.

8.3.2 *Homoranthus porteri*

As discussed in **Section 4.4.2**, populations of *Homoranthus porteri* have been confirmed at four general locations on site through the completion of targeted flora surveys. Known and potential habitat was mapped across the Project area and incorporated into the ecological constraints analysis as 'very highly constrained' and 'highly constrained' respectively (see **Section 6.1.4**). Project infrastructure has been realigned to avoid all known populations of *Homoranthus porteri*. Potential habitat has also been avoided to a large extent, and where this has not been possible, field surveys have confirmed the species is not present.

8.3.2.1 Potential Construction Impacts from the Project and Relevant Mitigation

Approximately 1,556 ha of potential habitat occurs within the Project area and 3,150 ha in the broader Study area, the latter based on DoR's mapping of relevant REs rather than the more detailed analysis that was undertaken for the Project area.

Of the 1,556 ha of potential habitat within the Project area, approximately 24 ha of potential habitat for *Homoranthus porteri* will require clearing for construction. Field surveys of these locations has confirmed that populations of *Homoranthus porteri* are not present within the potential habitat that requires clearing. Accordingly, there will be no actual or potential impact on of *Homoranthus porteri* associated with the Project.

Potential construction impacts and proposed mitigation measures for *Homoranthus porteri* are discussed further in **Table 8-13**.



Table 8-13 Potential Construction Impacts and Proposed Mitigation – *Homoranthus porteri*

Potential Impact	Assessment	Proposed Mitigation
Vegetation and habitat clearance	<p>The Project has been designed to avoid any direct disturbance to this species. No known populations of this species are within the proposed Project footprint.</p> <p>The Project may lead to the removal of approximately 24 ha of rocky pavement shrub complex which is potential habitat for the species; all areas of this habitat within the Project footprint have been surveyed for this species' presence.</p>	<p>The Project footprint has been specifically designed to avoid all known populations of the species.</p> <p>Pre-clearance surveys in areas of potential habitat will be undertaken prior to construction to confirm absence from the Project footprint. In the unlikely event that individuals are observed within the Project footprint, micro-siting and redesign actions will be explored in preference to impacting the species.</p>
Habitat degradation/disturbance from uncontrolled access	<p>Trampling of individual plants may occur if project construction related plant and equipment venture off designated access tracks and disturbance areas.</p>	<p>The approved disturbance area will be clearly demarcated on site to ensure personnel, plant and vehicles stay within the approved footprint. Measures to ensure clearing limits are adhered to will be documented in the Project's Construction EMP and associated sub-plans (see Appendix H) and covered in site inductions.</p>
Indirect impacts such as smothering by dust and accidental release of hazardous materials such as fuel	<p>Construction activities have the potential to result in indirect impacts on vegetation (including protected plant species) if not undertaken in accordance with the Construction EMP and associated sub-plans.</p>	<p>Smothering by dust is not expected to pose a significant risk to plants in this high-rainfall area. Dust generating activities will be minimised during dry, windy conditions and areas of exposed soils will be rehabilitated as soon as practicable, to minimise dust emissions. Dust suppression (water spraying) will be used during the dry season as necessary, including in areas of sensitive vegetation adjacent to the construction footprint if visible dust is observed.</p> <p>Accidental releases of hazardous materials in proximity to protected plant populations is highly unlikely as these materials would be securely stored in dedicated areas within the construction compound, away from sensitive sites. Spills would be limited to small drips from machinery hoses and similar, and would be cleaned up immediately, with the waste disposed of in accordance with the Construction EMP.</p>
Weed and pest incursion	<p>Weeds may be brought to or translocated across the site on project plant and equipment.</p>	<p>The Project area is currently subjected to existing weed and pest impacts. During construction of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue.</p>



Potential Impact	Assessment	Proposed Mitigation
		A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread (with specific advice for key identified species), management of pest infestations and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.
Erosion and sedimentation	Construction activities may alter surface water overland flow, leading to increased erosion of suitable habitat. This considered a low risk for this particular species as it occurs at the top of ridgelines whereas erosion and sedimentation from overland flow would be more likely to occur on lower parts of slopes.	A preliminary Erosion and Sediment Control Plan (ESCP) (Appendix I) and a Sediment and Erosion Management Plan (Appendix J) have been prepared for the Project and will be further developed by the Construction Contractor prior to works commencing on site. Implementation of these plans will minimise soil loss from the disturbance areas.
Bushfire risk	Inappropriate fire regimes are likely to be a threat to this species. The Project is not expected to increase the risk of high intensity bushfires in the Project area.	A Bushfire Management Plan will be prepared prior to construction and will be implemented during all on-site activities. Fuel loads will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management.

8.3.2.2 Potential Operational Impacts from the Project and Relevant Mitigation

Potential impacts to *Homoranthus porteri* during the operations phase will be very limited, as outlined in **Table 8-14**.

Table 8-14 Potential Operational Impacts from the Project and Relevant Mitigation – *Homoranthus porteri*

Potential Impact	Assessment	Proposed Mitigation
Indirect impacts such as smothering by dust and accidental release of hazardous materials such as fuel	There is a very low risk of vehicles associated with Project operation causing indirect impacts on <i>Homoranthus porteri</i> due to the release of dust or hazardous materials.	Standard mitigation measures, implemented by way of an Operations EMP, are considered appropriate to manage this risk.
Weed and pest incursion	Weeds may be brought to or translocated across the site on operational plant and maintenance equipment.	The Project area is currently subjected to existing weed and pest impacts. During operation of the Project, weed and pest control measures will be established and implemented to minimise the risk of the Project further exacerbating this issue.



Potential Impact	Assessment	Proposed Mitigation
Bushfire risk	Inappropriate fire regimes are likely to be a threat to this species. The Project is not expected to increase the risk of high intensity bushfires in the Project area.	A Project Bushfire Management Plan will be prepared and operational activities will be undertaken in accordance with this plan. This may include measures to manage fuel loads in proximity to known populations of this species.

8.3.2.3 Assessment of Significant Residual Impacts

The Project is unlikely to have a significant residual impact on *Homoranthus porteri* (Vulnerable). A full significance assessment following the Significant Impact Guidelines (DoE 2013) is presented in **Table 8-15**.

Table 8-15 Significant Residual Impact Assessment – *Homoranthus porteri*

Significant Impact Criteria	Assessment
Lead to a long-term decrease in the size of an important population of a species	Unlikely The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no long-term decrease in the size of a population of <i>H. porteri</i> .
Reduce the area of occupancy of an important population	Unlikely The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no reduction in the area of occupancy of <i>H. porteri</i> .
Fragment an existing important population into two or more populations	Unlikely The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no long-term decrease in the size of a population of <i>H. porteri</i> .
Adversely affect habitat critical to the survival of a species	Unlikely The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no impacts to habitat critical to the survival of <i>H. porteri</i> . The Project may lead to the removal of approximately 24 ha of potential habitat but this is not considered habitat that is critical to the survival of the species as the species has been confirmed absent from these areas.
Disrupt the breeding cycle of an important population	Unlikely The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and



Significant Impact Criteria	Assessment
	therefore there will be disruption to the breeding cycle of a population of <i>H. porteri</i> .
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>Unlikely</p> <p>The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no impacts to habitat critical to the survival of <i>H. porteri</i>.</p> <p>The Project may lead to the removal of approximately 24 ha of potential habitat but this is not considered habitat that is critical to the survival of the species as the species has been confirmed absent from these areas. The Project is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that <i>H. porteri</i> is likely to decline.</p>
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	<p>Unlikely</p> <p>The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and the risk of invasive species will be managed through a Project-specific Weed and Pest Management Plan. This will include measures to ensure that the known locations of <i>H. porteri</i> are protected from invasive species.</p>
Introduce disease that may cause the species to decline	<p>Unlikely</p> <p>The Project has been designed to avoid all known populations of the species. Disease is not a known threat for the species (SPRAT 2021). The Project is not anticipated to increase the risk of disease impacting <i>H. porteri</i>.</p>
Interfere substantially with the recovery of the species	<p>Unlikely</p> <p>The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no impacts to habitat critical to the survival of <i>H. porteri</i>.</p> <p>The Project may lead to the removal of approximately 24 ha of potential habitat but this is not considered habitat that is critical to the survival of the species as the species has been confirmed absent from these areas. The Project is not expected to interfere with the recovery of <i>H. porteri</i>.</p>

8.3.3 *Prostanthera clotteniana*

As discussed in **Section 4.4.3**, populations of *Prostanthera clotteniana* have been confirmed at two general locations on site through the completion of targeted flora surveys. Known and potential habitat was mapped across the Project area and incorporated into the ecological constraints analysis as 'very highly constrained' and 'highly constrained' respectively (see **Section 6.1.4**). Project infrastructure has been realigned to avoid both known populations of *Prostanthera clotteniana*. Potential habitat has also been avoided to a large extent, and where this has not been possible, field surveys have confirmed the species is not present.



8.3.3.1 Potential Construction Impacts from the Project and Relevant Mitigation

Approximately 1,556 ha of potential *Prostanthera clotteniana* habitat occurs within the Project area and 3,150 ha occurs within the broader Study area, with the latter based on DoR's mapping of relevant REs rather than the more detailed analysis that was undertaken for the Project area.

Of the 1,556 ha of potential habitat in the Project area, approximately 24 ha will require clearing for construction. Field surveys of these locations have confirmed that populations of *Prostanthera clotteniana* are not present within the potential habitat that requires clearing. Accordingly, there will be no actual or potential direct impact on *Prostanthera clotteniana* associated with the Project. In one location near Turbine 59 (see sheet 6 of **Figure 4-15**), the Project will require clearing of approximately 0.1 ha of potential habitat for the species that is within approximately 500 m of a confirmed *Prostanthera clotteniana* observation. This area represents potential habitat for future recruitment of the species that will be lost through construction of the Project.

Potential construction impacts and proposed mitigation measures for *Prostanthera clotteniana* are discussed further in **Table 8-16**.

Table 8-16 Potential Construction Impacts and Proposed Mitigation – *Prostanthera clotteniana*

Potential Impact	Assessment	Proposed Mitigation
Vegetation and habitat clearance	<p>The Project has been designed to avoid any direct disturbance to this species. No known populations of this species are within the proposed Project footprint.</p> <p>The Project may lead to the removal of approximately 24 ha of rocky pavement shrub complex which is potential habitat for the species; all areas of this habitat within the Project footprint have been surveyed for this species' presence.</p> <p>The Project may lead to the removal of approximately 0.1 ha of potential habitat for future recruitment of the species.</p>	<p>The Project footprint has been specifically designed to avoid all known populations of the species.</p> <p>Pre-clearance surveys in areas of potential habitat will be undertaken prior to construction to confirm absence from the Project footprint. In the unlikely event that individuals are observed within the Project footprint, micro-siting and redesign actions will be explored in preference to impacting the species. The possibility of translocation may also be explored, noting that this is likely to be challenging due to the highly specialised habitat requirements of the species.</p>
Habitat degradation/disturbance from uncontrolled access	<p>Trampling of individual plants may occur if project construction related plant and equipment venture off designated access tracks and disturbance areas.</p>	<p>The approved disturbance area will be clearly demarcated on site to ensure personnel, plant and vehicles stay within the approved footprint. Measures to ensure clearing limits are adhered to will be documented in the Project's Construction EMP and associated sub-plans (see Appendix H) and covered in site inductions.</p>
Indirect impacts such as smothering by dust and accidental release of	<p>Construction activities have the potential to result in indirect impacts on vegetation (including protected plant species) if not</p>	<p>Smothering by dust is not expected to pose a significant risk to plants in this high-rainfall area. Dust generating activities will be minimised during dry, windy conditions and areas of</p>



Potential Impact	Assessment	Proposed Mitigation
hazardous materials such as fuel	undertaken in accordance with the Construction EMP and associated sub-plans.	<p>exposed soils will be rehabilitated as soon as practicable, to minimise dust emissions. Dust suppression (water spraying) will be used during the dry season as necessary, including in areas of sensitive vegetation adjacent to the construction footprint if visible dust is observed.</p> <p>Accidental releases of hazardous materials in proximity to protected plant populations is highly unlikely as these materials would be securely stored in dedicated areas within the construction compound, away from sensitive sites. Spills would be limited to small drips from machinery hoses and similar, and would be cleaned up immediately, with the waste disposed of in accordance with the Construction EMP.</p>
Weed and pest incursion	Weeds may be brought to or translocated across the site on project plant and equipment.	<p>The Project area is currently subjected to existing weed and pest impacts. During construction of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue.</p> <p>A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread (with specific advice for key identified species), management of pest infestations and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.</p>
Erosion and sedimentation	Construction activities may alter surface water overland flow, leading to increased erosion of suitable habitat. This considered a low risk for this particular species as it occurs at the top of ridgelines whereas erosion and sedimentation from overland flow would be more likely to occur on lower parts of slopes.	A preliminary Erosion and Sediment Control Plan (ESCP) (Appendix I) and a Sediment and Erosion Management Plan (Appendix J) have been prepared for the Project and will be further developed by the Construction Contractor prior to works commencing on site. Implementation of these plans will minimise soil loss from the disturbance areas.
Bushfire risk	This species is highly susceptible to impacts from fire. The Project is not expected to increase the risk of high intensity bushfires in the Project area.	A Bushfire Management Plan will be prepared prior to construction and will be implemented during all on-site activities. Fuel loads will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management.



8.3.3.2 Potential Operational Impacts from the Project and Relevant Mitigation

Potential impacts to *Prostanthera clotteniana* during the operations phase will be very limited, as outlined in **Table 8-17**.

Table 8-17 Potential Operational Impacts and Proposed Mitigation – *Prostanthera clotteniana*

Potential Impact	Assessment	Proposed Mitigation
Indirect impacts such as smothering by dust and accidental release of hazardous materials such as fuel	There is a very low risk of vehicles associated with Project operation causing indirect impacts on <i>Prostanthera clotteniana</i> due to the release of dust or hazardous materials.	Standard mitigation measures, implemented by way of an Operations EMP, are considered appropriate to manage this risk.
Weed and pest incursion	Weeds may be brought to or translocated across the site on operational plant and maintenance equipment.	The Project area is currently subjected to existing weed and pest impacts. During operation of the Project, weed and pest control measures will be established and implemented to minimise the risk of the Project further exacerbating this issue.
Bushfire risk	This species is highly susceptible to impacts from fire. The Project is not expected to increase the risk of high intensity bushfires in the Project area.	A Project Bushfire Management Plan will be prepared and operational activities will be undertaken in accordance with this plan. This may include measures to manage fuel loads in proximity to known populations of this species.

8.3.3.3 Assessment of Significant Residual Impacts

The Project is unlikely to have a significant residual impact on *Prostanthera clotteniana* (Critically Endangered). A full significance assessment following the Significant Impact Guidelines (DoE 2013) is presented in **Table 8-18**.

Table 8-18 Significant Residual Impact on *Prostanthera clotteniana*

Significant Impact Criteria	Assessment
Lead to a long-term decrease in the size of a population	Unlikely The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no long-term decrease in the size of a population of <i>P. clotteniana</i> .
Reduce the area of occupancy of the species	Unlikely The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no reduction in the area of occupancy of <i>P. clotteniana</i> .



Significant Impact Criteria	Assessment
Fragment an existing population into two or more populations	<p>Unlikely</p> <p>The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no long-term decrease in the size of a population of <i>P. clotteniana</i>.</p>
Adversely affect habitat critical to the survival of a species	<p>Unlikely</p> <p>The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no impacts to habitat critical to the survival of <i>P. clotteniana</i>.</p> <p>The Project may lead to the removal of approximately 24 ha of potential habitat but this is not considered habitat that is critical to the survival of the species as the species has been confirmed absent from these areas. The majority of this potential habitat is considered to be too far (i.e. greater than 500 m) from confirmed species records to be considered potential habitat for future recruitment of the species. The Project may impact 0.1 ha of potential habitat for future recruitment of the species.</p>
Disrupt the breeding cycle of a population	<p>Unlikely</p> <p>The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be disruption to the breeding cycle of a population of <i>P. clotteniana</i>.</p>
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>Unlikely</p> <p>The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no impacts to habitat critical to the survival of <i>P. clotteniana</i>.</p> <p>The Project may lead to the removal of approximately 24 ha of potential habitat but this is not considered habitat that is critical to the survival of the species as the species has been confirmed absent from these areas. The Project is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that <i>P. clotteniana</i> is likely to decline.</p>
Result in invasive species that are harmful to the critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat	<p>Unlikely</p> <p>The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and the risk of invasive species will be managed through a Project-specific Weed and Pest Management Plan. This will include measures to ensure that the known locations of <i>P. clotteniana</i> are protected from invasive species.</p>
Introduce disease that may cause the species to decline	<p>Unlikely</p> <p>The Project has been designed to avoid all known populations of the species. Disease is not a known threat for the species (SPRAT 2021). The</p>



Significant Impact Criteria	Assessment
	Project is not anticipated to increase the risk of disease impacting <i>P. clotteniana</i> .
Interfere with the recovery of the species	<p>Unlikely</p> <p>The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no impacts to habitat critical to the survival of <i>P. clotteniana</i>.</p> <p>The Project may lead to the removal of approximately 24 ha of potential habitat but this is not considered habitat that is critical to the survival of the species as the species has been confirmed absent from these areas. The Project may lead to the removal of 0.1 ha of potential habitat for future recruitment of the species (where currently unoccupied potential habitat is within 500 m of a confirmed <i>P. clotteniana</i> observation). This minimal loss is not expected to interfere with the recovery of <i>P. clotteniana</i>.</p> <p>One of the largest threats to the species is inappropriate fire regimes (DoE 2015b), with evidence of previous fires within the Project area having affected <i>P. clotteniana</i> habitat. The Project will develop a Bushfire Management Plan which will outline how fire will be managed during construction and operation of the Project, and this is anticipated to improve <i>P. clotteniana</i> habitat which may ultimately benefit the long-term recovery of the species.</p>

8.3.4 *Triplarina nitchaga*

As discussed in **Section 4.4.4**, populations of *Triplarina nitchaga* have been confirmed at two locations on site through the completion of targeted flora surveys. Known and potential habitat was mapped across the Project area and incorporated into the ecological constraints analysis as 'very highly constrained' and 'highly constrained' respectively (see **Section 6.1.4**). Project infrastructure has been realigned to avoid both known populations of *Triplarina nitchaga*. Potential habitat has also been avoided to a large extent, and where this has not been possible, field surveys have confirmed the species is not present.

8.3.4.1 Potential Construction Impacts from the Project and Relevant Mitigation

Approximately 1,556 ha of potential *Triplarina nitchaga* habitat occurs within the Project area and 3,150 ha occurs within the broader Study area, with the latter based on DoR's mapping of relevant rEs rather than the more detailed analysis that was undertaken for the Project area.

Of the 1,556 ha of potential habitat in the Project area, approximately 24 ha will require clearing for construction. Field surveys of these locations has confirmed that populations of *Triplarina nitchaga* are not present within the potential habitat that requires clearing. Accordingly, there will be no actual or potential direct impact on *Triplarina nitchaga* associated with the Project.

Potential construction impacts and proposed mitigation measures for *Triplarina nitchaga* are discussed further in **Table 8-19**



Table 8-19 Potential Construction Impacts and Proposed Mitigation – *T. nitchaga*

Potential Impact	Assessment	Proposed Mitigation
Vegetation and habitat clearance	<p>The Project has been designed to avoid any direct disturbance to this species. No known populations of this species are within the proposed Project footprint.</p> <p>The Project may lead to the removal of approximately 24 ha of rocky pavement shrub complex which is potential habitat for the species; all areas of this habitat within the Project footprint have been surveyed for this species' presence.</p>	<p>The Project footprint has been specifically designed to avoid all known populations of the species.</p> <p>Pre-clearance surveys in areas of potential habitat will be undertaken prior to construction to confirm absence from the Project footprint. In the unlikely event that individuals are observed within the Project footprint, micro-siting and redesign actions will be explored in preference to impacting the species.</p>
Habitat degradation/disturbance from uncontrolled access	<p>Trampling of individual plants may occur if project construction related plant and equipment venture off designated access tracks and disturbance areas.</p>	<p>The approved disturbance area will be clearly demarcated on site to ensure personnel, plant and vehicles stay within the approved footprint. Measures to ensure clearing limits are adhered to will be documented in the Project's Construction EMP and associated sub-plans (see Appendix H) and covered in site inductions.</p>
Indirect impacts such as smothering by dust and accidental release of hazardous materials such as fuel	<p>Construction activities have the potential to result in indirect impacts on vegetation (including protected plant species) if not undertaken in accordance with the Construction EMP and associated sub-plans.</p>	<p>Smothering by dust is not expected to pose a significant risk to plants in this high-rainfall area. Dust generating activities will be minimised during dry, windy conditions and areas of exposed soils will be rehabilitated as soon as practicable, to minimise dust emissions. Dust suppression (water spraying) will be used during the dry season as necessary, including in areas of sensitive vegetation adjacent to the construction footprint if visible dust is observed.</p> <p>Accidental releases of hazardous materials in proximity to protected plant populations is highly unlikely as these materials would be securely stored in dedicated areas within the construction compound, away from sensitive sites. Spills would be limited to small drips from machinery hoses and similar, and would be cleaned up immediately, with the waste disposed of in accordance with the Construction EMP.</p>
Weed and pest incursion	<p>Weeds may be brought to or translocated across the site on project plant and equipment.</p>	<p>The Project area is currently subjected to existing weed and pest impacts. During construction of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue.</p>



Potential Impact	Assessment	Proposed Mitigation
		A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread (with specific advice for key identified species), management of pest infestations and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.
Erosion and sedimentation	Construction activities may alter surface water overland flow, leading to increased erosion of suitable habitat. This considered a low risk for this particular species as it occurs at the top of ridgelines whereas erosion and sedimentation from overland flow would be more likely to occur on lower parts of slopes.	A preliminary Erosion and Sediment Control Plan (ESCP) (Appendix I) and a Sediment and Erosion Management Plan (Appendix J) have been prepared for the Project and will be further developed by the Construction Contractor prior to works commencing on site. Implementation of these plans will minimise soil loss from the disturbance areas.
Bushfire risk	Inappropriate fire regimes are known to be a threat to this species. The Project is not expected to increase the risk of high intensity bushfires in the Project area.	A Bushfire Management Plan will be prepared prior to construction and will be implemented during all on-site activities. Fuel loads will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management.

8.3.4.2 Potential Operational Impacts from the Project and Relevant Mitigation

Potential impacts to *Triplarina nitchaga* during the operations phase will be very limited, as outlined in **Table 8-20**.

Table 8-20 Potential Operational Impacts and Proposed Mitigation – *T. nitchaga*

Potential Impact	Assessment	Proposed Mitigation
Indirect impacts such as smothering by dust and accidental release of hazardous materials such as fuel	There is a very low risk of vehicles associated with Project operation causing indirect impacts on <i>Triplarina nitchaga</i> due to the release of dust or hazardous materials.	Standard mitigation measures, implemented by way of an Operations EMP, are considered appropriate to manage this risk.
Weed and pest incursion	Weeds may be brought to or translocated across the site on operational plant and maintenance equipment.	The Project area is currently subjected to existing weed and pest impacts. During operation of the Project, weed and pest control measures will be established and implemented to minimise the risk of the Project further exacerbating this issue.



Potential Impact	Assessment	Proposed Mitigation
Bushfire risk	Inappropriate fire regimes are known to be a threat to this species. The Project is not expected to increase the risk of high intensity bushfires in the Project area.	A Project Bushfire Management Plan will be prepared and operational activities will be undertaken in accordance with this plan. This may include measures to manage fuel loads in proximity to known populations of this species.

8.3.4.3 Assessment of Significant Residual Impacts

The Project is unlikely to have a significant residual impact on *Triplarina nitchaga* (Vulnerable). A full significance assessment following the Significant Impact Guidelines (DoE 2013) is presented in **Table 8-21**.

Table 8-21 Significant Residual Impact Assessment-- *Triplarina nitchaga*

Significant Impact Criteria	Assessment
Lead to a long-term decrease in the size of an important population of a species	Unlikely The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no long-term decrease in the size of a population of <i>T. nitchaga</i> .
Reduce the area of occupancy of an important population	Unlikely The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no reduction in the area of occupancy of <i>T. nitchaga</i> .
Fragment an existing important population into two or more populations	Unlikely The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no long-term decrease in the size of a population of <i>T. nitchaga</i> .
Adversely affect habitat critical to the survival of a species	Unlikely The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no impacts to habitat critical to the survival of <i>T. nitchaga</i> . The Project may lead to the removal of approximately 24 ha of potential habitat but this is not considered habitat that is critical to the survival of the species as the species has been confirmed absent from these areas.
Disrupt the breeding cycle of an important population	Unlikely The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be disruption to the breeding cycle of a population of <i>T. nitchaga</i> .



Significant Impact Criteria	Assessment
<p>Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</p>	<p>Unlikely</p> <p>The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no impacts to habitat critical to the survival of <i>T. nitchaga</i>.</p> <p>The Project may lead to the removal of approximately 24 ha of potential habitat but this is not considered habitat that is critical to the survival of the species as the species has been confirmed absent from these areas.</p> <p>The Project is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that <i>T. nitchaga</i> is likely to decline.</p>
<p>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</p>	<p>Unlikely</p> <p>The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and the risk of invasive species will be managed through a Project-specific Weed and Pest Management Plan. This will include measures to ensure that the known locations of <i>T. nitchaga</i> are protected from invasive species.</p>
<p>Introduce disease that may cause the species to decline</p>	<p>Unlikely</p> <p>The Project has been designed to avoid all known populations of the species. Disease is not a known threat for the species (SPRAT 2021). The Project is not anticipated to increase the risk of disease impacting <i>T. nitchaga</i>.</p>
<p>Interfere substantially with the recovery of the species</p>	<p>Unlikely</p> <p>The Project has been designed to avoid all known populations of the species. Potential indirect impacts will be managed appropriately and therefore there will be no impacts to habitat critical to the survival of <i>T. nitchaga</i>.</p> <p>The Project may lead to the removal of approximately 24 ha of potential habitat but this is not considered habitat that is critical to the survival of the species as the species has been confirmed absent from these areas.</p> <p>The Project is not expected to interfere with the recovery of <i>T. nitchaga</i>.</p>

8.4 Listed Threatened Amphibian Species

8.4.1 Australian Lace-lid

As discussed in Section 4, the Australian lace-lid has not been recorded previously within the Project area and was last recorded within the broader Study area in 1977 (near Koombooloomba Dam). It is a rainforest specialist that has reportedly disappeared from upland sites throughout the Wet Tropics but lowland and foothill populations still exist (SPRAT 2021). There is limited potential habitat for the Australian lace-lid within the Project area, which has been mapped as upland rainforest and wet sclerophyll forest alongside perennial streams.



8.4.1.1 Potential Construction Impacts from the Project and Relevant Mitigation

Approximately 4 ha of potential habitat for Australian lace-lid occurs within the Project area and 220.5 ha occurs within the broader Study area. There is no potential habitat for Australian lace-lid within the proposed Project footprint.

Potential construction impacts and proposed mitigation measures for Australian lace-lid are discussed further in **Table 8-22**.

Table 8-22 Potential Construction Impacts and Relevant Mitigation – Australian lace-lid

Potential Impact	Assessment	Proposed Mitigation
Vegetation and habitat clearance	The Project will not result in any clearing of potential Australian lace-lid habitat.	Only minimal areas of potential habitat for Australian lace-lid have been mapped within the Project area. Project infrastructure has been sited to avoid clearing any of this habitat.
Fragmentation (of populations and habitat)	The Project will not result in any clearing of potential Australian lace-lid habitat.	Retained vegetation will be maintained through implementation of a Vegetation Management Plan to reduce hazards from fire, pest species, degradation and other potential impacts. This will assist in maintaining the integrity of the vegetation as habitat and will reduce disturbance to surrounding habitat and conservation areas.
Indirect impacts such as smothering of creek-side vegetation by dust and accidental release of hazardous materials such as fuel	Construction activities have the potential to result in indirect impacts on potential habitat for Australian lace-lid if not undertaken in accordance with the Construction EMP and associated sub-plans.	Smothering of creek-side vegetation by dust is not expected to pose a significant risk in this high-rainfall area. Dust generating activities will be minimised during dry, windy conditions and areas of exposed soils will be rehabilitated as soon as practicable, to minimise dust emissions. Dust suppression (water spraying) will be used during the dry season as necessary, including in areas of sensitive vegetation adjacent to the construction footprint if visible dust is observed. Accidental releases of hazardous materials in proximity to potential Australian lace-lid habitat is highly unlikely as these materials would be securely stored in dedicated areas within the construction compound, away from sensitive sites. Spills would be limited to small drips from machinery hoses and similar, and would be cleaned up immediately, with the waste disposed of in accordance with the Construction EMP.
Weed and pest incursion	The Project has the potential to facilitate the spread of weeds and pests through machinery, vehicles and materials brought to site from outside the Project area. The Australian lace-lid is likely to be	The Project area is currently subjected to existing weed and pest impacts. During construction of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue.



Potential Impact	Assessment	Proposed Mitigation
	particularly susceptible to the amphibian chytrid fungus.	A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread, management of pest infestations (including specific advice for amphibian chytrid fungus) and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.
Species mortality (vehicle collision, vegetation clearance)	During vegetation clearing, there is potential for direct mortality in the unlikely event that the Australian lace-lid is present. The risk of vehicle strike is negligible.	Clearing of habitat could potentially result in significant injury or death to individual Australian lace-lids, however, it is highly unlikely that the species is present within the Project area and the proposed Project footprint does not intersect any potential habitat for the species. Clearing operations will be conducted in accordance with the provisions outlined in a sequential clearing procedure including the use of a fauna spotter catcher. The process will significantly mitigate any potential impacts associated with clearing operations ensuring and animals are detected providing procedures are followed and spotters are allowed ample opportunity to check areas before site clearing.
Erosion and sedimentation	Construction activities may alter surface water overland flow, leading to increased erosion and subsequent sedimentation of potential habitat for the Australian lace-lid.	A preliminary Erosion and Sediment Control Plan (ESCP) (Appendix I) and a Sediment and Erosion Management Plan (Appendix J) have been prepared for the Project and will be further developed by the Construction Contractor prior to works commencing on site. Implementation of these plans will minimise soil loss from the disturbance areas and subsequent sedimentation of nearby watercourses that may provide habitat for the Australian lace-lid.
Noise and lighting	These potential impacts are considered to be negligible risks for the Australian lace-lid.	Mitigation measures outlined in Section 6.0 are considered appropriate to manage these negligible risks.
Reduced air quality	These potential impacts are considered to be negligible risks for the Australian lace-lid.	Mitigation measures outlined in Section 6.0 are considered appropriate to manage these negligible risks.
Bushfire risk	These potential impacts are considered to be negligible risks for the Australian lace-lid.	Mitigation measures outlined in Section 6.0 are considered appropriate to manage these negligible risks.



8.4.1.2 Potential Operational Impacts from the Project and Relevant Mitigation

Potential impacts to Australian lace-lid during the operations phase will be very limited, as outlined in **Table 8-23**.

Table 8-23 Potential Operational Impacts and Relevant Mitigation – Australian lace-lid

Potential Impact	Assessment	Mitigation
Indirect impacts such as smothering of creek-side vegetation by dust and accidental release of hazardous materials such as fuel	There is a very low risk of vehicles associated with Project operation causing indirect impacts on Australian lace-lid habitat due to the release of dust or hazardous materials.	Standard mitigation measures, implemented by way of an Operations EMP, are considered appropriate to manage this risk given the low probability of the species being present within the Project area.
Weed and pest incursion	The Project has the potential to facilitate the spread of weeds and pests, including the amphibian chytrid fungus, through machinery, vehicles and materials brought to site from outside the Project area.	The Project area is currently subjected to existing weed and pest impacts. During operation of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue.

8.4.1.3 Assessment of Significant Residual Impacts

The Project is unlikely to have a significant residual impact on the Australian lace-lid (Vulnerable). A full significance assessment following the Significant Impact Guidelines (DoE 2013) is presented in **Table 8-24**.

Table 8-24 Significant Residual Impact Assessment – Australian Lace-lid

Significant Impact Criteria	Project Outcome
Lead to a long-term decrease in the size of an important population of a species	Unlikely The Project area is highly unlikely to support a population of Australian lace-lid, which has not been observed in the broader Study area since 1981 and is considered potentially extinct. The Project area supports a limited area of potential habitat for the species and none of this habitat will be cleared as a result of the Project. Aside from the sensitive design measures already employed for the Project, the measures proposed to manage vegetation clearing and fragmentation are expected to be effective in ensuring that the Project does not lead to a long-term decrease in the size of the Project area's Australian lace-lid population, should it be present.
Reduce the area of occupancy of an important population	Unlikely The Project footprint has been designed to avoid clearing any potential habitat for the Australian lace-lid.
Fragment an existing important population into two or more populations	Unlikely The Project area is highly unlikely to support a population of Australian lace-lid.



Significant Impact Criteria	Project Outcome
	<p>Risks of fragmentation are likely to be highest where access roads and overhead transmission line infrastructure crosses areas of critical habitat. The Project area supports a limited area of potential habitat for the species and none of this habitat will be cleared or bisected as a result of the Project.</p> <p>Aside from the sensitive design measures already employed for the Project, the measures proposed to manage vegetation clearing and fragmentation are expected to be effective in ensuring that the Project does not lead to fragmentation of an existing important population into two or more populations.</p>
Adversely affect habitat critical to the survival of a species	<p>Unlikely</p> <p>The Project area is highly unlikely to support a population of Australian lace-lid.</p> <p>The Project area supports a limited area of potential habitat for the species and none of this habitat will be cleared as a result of the Project.</p>
Disrupt the breeding cycle of an important population	<p>Unlikely</p> <p>The Project area is highly unlikely to support a population of Australian lace-lid. The Project area supports a limited area of potential habitat for the species and none of this habitat will be cleared or bisected as a result of the Project. It is therefore unlikely that the Project would affect the breeding cycle of the species, should it be present.</p>
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>Unlikely</p> <p>The Project area supports a limited area of potential habitat for the species and none of this habitat will be cleared or bisected as a result of the Project.</p>
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	<p>Unlikely</p> <p>Clearing activities associated with the Project have the potential to open up areas that may be subject to weed incursion and increased prevalence of pests.</p> <p>A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread, management of pest infestations (including specific advice for amphibian chytrid fungus) and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.</p>
Introduce disease that may cause the species to decline	<p>Unlikely</p> <p>The Australian lace-lid is likely to be susceptible to the effects of amphibian chytrid fungus, the spread of which is considered to be responsible for the species' decline. Specific measures for controlling the spread of amphibian chytrid fungus have been incorporated into the preliminary Weed and Pest Management Plan (see Appendix F).</p>
Interfere substantially with the recovery of the species	<p>Unlikely</p>



Significant Impact Criteria	Project Outcome
	The Project is not expected to interfere substantially with the recovery of the species. No potential habitat for Australian lace-lid will be cleared and the Project will not isolate areas of potential habitat within the Project area to potential habitat within the broader Study area.

8.4.2 Magnificent Brood Frog

As discussed in **Section 4.5.1**, magnificent brood frog has been recorded at 11 locations across the Project area. Many additional locations were surveyed and returned negative results (see **Figure 4-18**). Potential habitat for magnificent brood-frog was mapped as open eucalypt forest on rhyolites of the Glen Gordon volcanics within 50 m of seepages, and zero and first order streams; known habitat was delineated as the habitat within 200 m of a positive record. As per the Conservation Advice for the species (TSSC 2017), all known habitat is considered to be critical to the survival of the species.

8.4.2.1 Potential Construction Impacts from the Project and Relevant Mitigation

Habitat removal

Approximately 8,085 ha of habitat for magnificent brood frog occurs within the Project area. The species has been positively recorded in approximately 102 ha of this whilst the remaining 7,983 ha has been mapped as potential habitat on a precautionary basis and is likely to be an over-estimate. The area of habitat within the broader Study area has not been estimated in the absence of the detailed LiDAR data for this extent. The Project will require the clearing of 67.9 ha of habitat for magnificent brood frog during Stage 1 and 52.6 ha during Stage 2. This is 120.5 ha in total across the two Stages, of which 6.4 ha is considered known habitat associated with a positive record and 114.1 ha is potential habitat where species presence has not been confirmed. This is primarily associated with access tracks crossing spring lines and minor watercourses that cannot be avoided in order to access Project infrastructure along the ridgelines (see **Figure 8-1**, which distinguishes between potential habitat and known habitat where the species has definitively been recorded).

Sedimentation of habitat

There is also the potential for sediment runoff from the Project area to reduce water quality and cause sediment deposition which may degrade the quality of habitat for the magnificent brood frog. The risk of this potential sedimentation impact is highest during the construction phase of the Project. The methodology for determining areas of greater risk is provided in **Appendix S**. This methodology determines that there is approximately 39 ha of potential magnificent brood frog habitat within the Stage 1 Project area "at risk" from offsite sediment runoff and a further 26.4 ha in the Stage 2 Project area; however, the Project is not expected to impact these areas with appropriate installation of erosion and sediment control measures, as identified through the potential soil loss calculations contained within **Appendix J**. These soil loss calculations demonstrate that the rate of soil loss during construction and operation of the Project is not expected to be elevated above existing levels.

The range of potential construction impacts and proposed mitigation measures for magnificent brood frog are discussed further in **Table 8-25**.



Table 8-25 Potential Construction Impacts and Relevant Mitigation – Magnificent Brood Frog

Potential Impact	Assessment	Proposed Mitigation
Vegetation and habitat clearance	<p>The Project may lead to the clearing of 6.4ha of known habitat and 114.1ha of potential habitat critical to the survival of the species (120.5ha in total).</p> <p>Section 4.5.2 summarises the current state of knowledge on the species, its population dynamics and its habitat requirements. Further understanding could be gained through additional funding towards research priorities for this species. Nevertheless, it cannot be overlooked that many of the observed populations of the species within the Project area occur within, or on the margins of, existing anthropogenic disturbances (e.g. the existing Powerlink easement) (see Figure 4-18). This suggests that the species is somewhat resilient to anthropogenic disturbances of this nature.</p>	<p>Large areas of potential critical habitat for magnificent brood frog throughout the Project area will be retained.</p> <p>Design has sought to avoid and minimise clearing as far as practical. If practical during construction, micrositing of access tracks will seek to avoid seepage areas. Seepage areas within the Project footprint and not required for Project purposes following construction will be rehabilitated in line with the principles outlined within the Preliminary Rehabilitation Plan (Appendix K). Critical habitat both (a) retained in proximity to the Project footprint, and (b) rehabilitated will be subject to a monitoring program post-construction to determine their ongoing viability for the magnificent brood frog.</p> <p>Vegetation clearing will be minimised as much as practicable through micrositing within the proposed Project footprint.</p> <p>Project infrastructure including laydown areas, construction compounds and substation have been sited in cleared areas where practicable to avoid clearing of potential habitat.</p> <p>Clearing of magnificent brood frog habitat will occur sequentially and in accordance with an approved Species Management Program.</p> <p>The Project has sought to avoid and minimise potential magnificent brood frog impacts to the greatest reasonable extent and to the point where these are considered appropriate and manageable. Management of direct and indirect impacts can be further informed through contributions to research on this species, which is a further commitment of the Project (see Section 9.0 and Appendix O).</p>
Fragmentation (of populations and habitat)	<p>The Project may lead to the clearing of 6.4ha of known habitat and 114.1ha of potential habitat critical to the survival of the species (120.5ha in total).</p>	<p>Retained vegetation will be maintained through implementation of a Vegetation Management Plan to reduce hazards from fire, pest species, degradation and other potential impacts. This will assist in maintaining the integrity of the vegetation as habitat and will reduce disturbance to surrounding habitat and conservation areas.</p> <p>Project design has sought to minimise the width of access tracks in areas of critical magnificent brood-frog habitat.</p>



Potential Impact	Assessment	Proposed Mitigation
		<p>Where Project access roads cross spring lines and watercourses, these crossings will be appropriately designed so as to maintain the flow of water and connectivity across the disturbance footprint.</p> <p>Areas required for construction but not operation will be revegetated on completion of construction – this accounts for approximately 73 % of the impacted habitat.</p>
<p>Indirect impacts such as smothering of vegetation by dust and accidental release of hazardous materials such as fuel</p>	<p>Construction activities have the potential to result in indirect impacts on habitat for magnificent brood frog if not undertaken in accordance with the Construction EMP and associated sub-plans.</p>	<p>Smothering of vegetation by dust is not expected to pose a significant risk in this high-rainfall area. Dust generating activities will be minimised during dry, windy conditions and areas of exposed soils will be rehabilitated as soon as practicable, to minimise dust emissions. Dust suppression (water spraying) will be used during the dry season as necessary, including in areas of sensitive vegetation adjacent to the construction footprint if visible dust is observed.</p> <p>Accidental releases of hazardous materials in proximity to magnificent brood frog habitat is highly unlikely as these materials would be securely stored in dedicated areas within the construction compound, away from sensitive sites. Spills would be limited to small drips from machinery hoses and similar, and would be cleaned up immediately, with the waste disposed of in accordance with the Construction EMP.</p>
<p>Weed and pest incursion</p>	<p>The Project has the potential to facilitate the spread of weeds and pest fauna through machinery, vehicles and materials brought to site from outside the Project area. In particular, the species may be susceptible to the amphibian chytrid fungus.</p>	<p>The Project area is currently subjected to existing weed and pest impacts. During construction of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue.</p> <p>A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread, management of pest infestations (including specific advice for amphibian chytrid fungus) and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.</p>
<p>Species mortality (vehicle collision, vegetation clearance)</p>	<p>During vegetation clearing, there is potential for direct mortality if magnificent brood frogs are</p>	<p>Clearing of habitat could potentially result in significant injury or death to individual magnificent brood frogs, however, clearing operations will be conducted in accordance with the provisions outlined in a sequential clearing</p>









Potential Impact	Assessment	Proposed Mitigation
	<p>present. The risk of vehicle strike is negligible.</p>	<p>procedure including the use of a fauna spotter catcher. The process will significantly mitigate any potential impacts associated with clearing operations ensuring magnificent brood frogs are detected, provided procedures are followed and spotters are allowed ample opportunity to check seepage areas before site clearing.</p>
<p>Erosion and sedimentation</p>	<p>Construction activities may alter surface water overland flow, leading to increased erosion and subsequent sedimentation of potential habitat for the magnificent brood frog. While 65.4 ha of magnificent brood frog habitat is identified as “at risk” of sedimentation impacts associated with the Project (Appendix S), effective implementation of erosion and sediment control within the Project footprint will mean that these areas of habitat are not impacted. Sediment loss from within the Project footprint during construction and operation has been modelled as generally on par with, or better than, the existing conditions within the Project area (Appendix J).</p>	<p>A preliminary Erosion and Sediment Control Plan (ESCP) (Appendix I) and a Sediment and Erosion Management Plan (Appendix J) have been prepared for the Project and will be further developed by the Construction Contractor prior to works commencing on site. Implementation of these plans will minimise soil loss from the disturbance areas and subsequent sedimentation of nearby potential habitat for the magnificent brood frog.</p>
<p>Noise and lighting</p>	<p>These potential impacts are considered to be negligible risks for the magnificent brood-frog.</p>	<p>Mitigation measures outlined in Section 6.0 are considered appropriate to manage these negligible risks.</p>
<p>Reduced air quality</p>	<p>These potential impacts are considered to be negligible risks for the magnificent brood-frog.</p>	<p>Mitigation measures outlined in Section 6.0 are considered appropriate to manage these negligible risks.</p>
<p>Bushfire risk</p>	<p>These potential impacts are considered to be negligible risks for the magnificent brood-frog.</p>	<p>Mitigation measures outlined in Section 6.0 are considered appropriate to manage these negligible risks.</p>

Chalumbin Wind Farm

Impacts to Magnificent broodfrog habitat

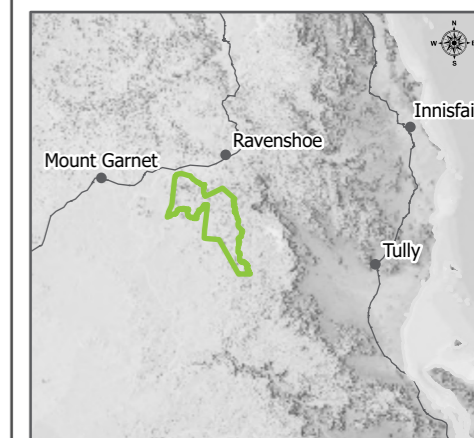
Sheet 1 of 4

Figure 8.1

-  Project Area Boundary
-  Turbine
-  Met-mast
-  Facilities
- Clearance Envelope**
-  Stage 1
-  Stage 2
-  Known Habitat
-  Potential Habitat
-  Stream Order Zero watercourse (Gully)
-  Significant Residual Impact
-  Glen Gordon Volcanics
-  Existing HV Transmission Line
-  Watercourse
-  WTQ Boundary
-  Lot Boundary
-  Easement

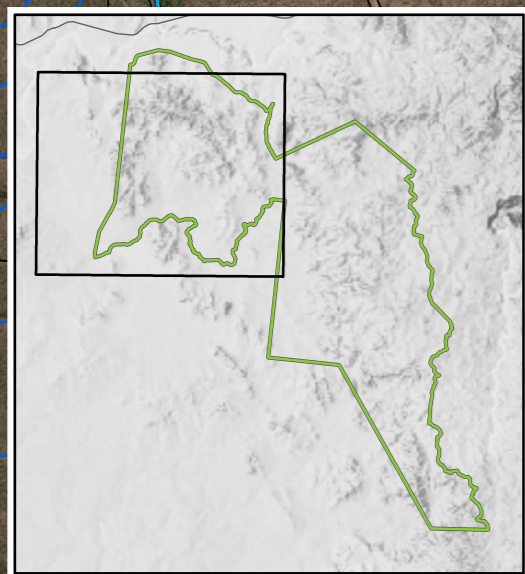
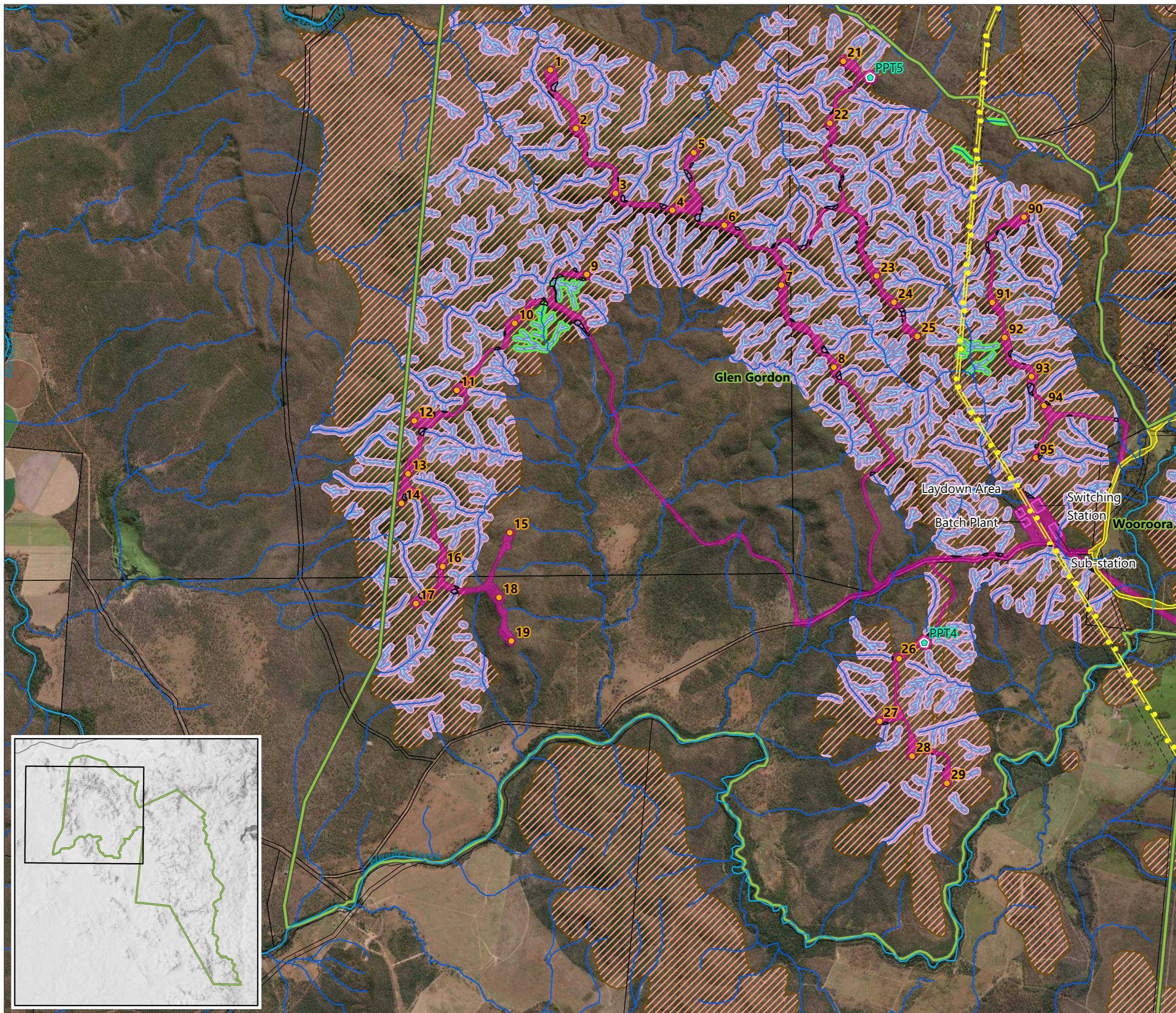
Date: 28/02/2023
Project: EPU-004

Author: TOD
Reviewed: NOD



Scale: 1:50,000@A3

Data Source(s):
Digital Cadastral Database - Department of Resources (2022)
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


Chalumbin Wind Farm

Impacts to Magnificent broodfrog habitat

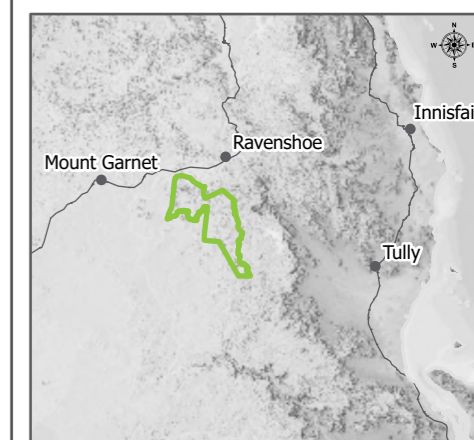
Sheet 2 of 4

Figure 8.1

-  Project Area Boundary
-  Turbine
-  Met-mast
-  Facilities
- Clearance Envelope**
-  Stage 1
-  Stage 2
-  Known Habitat
-  Potential Habitat
-  Stream Order Zero watercourse (Gully)
-  Significant Residual Impact
-  Glen Gordon Volcanics
-  Existing HV Transmission Line
-  Watercourse
-  WTQ Boundary
-  Lot Boundary
-  Easement

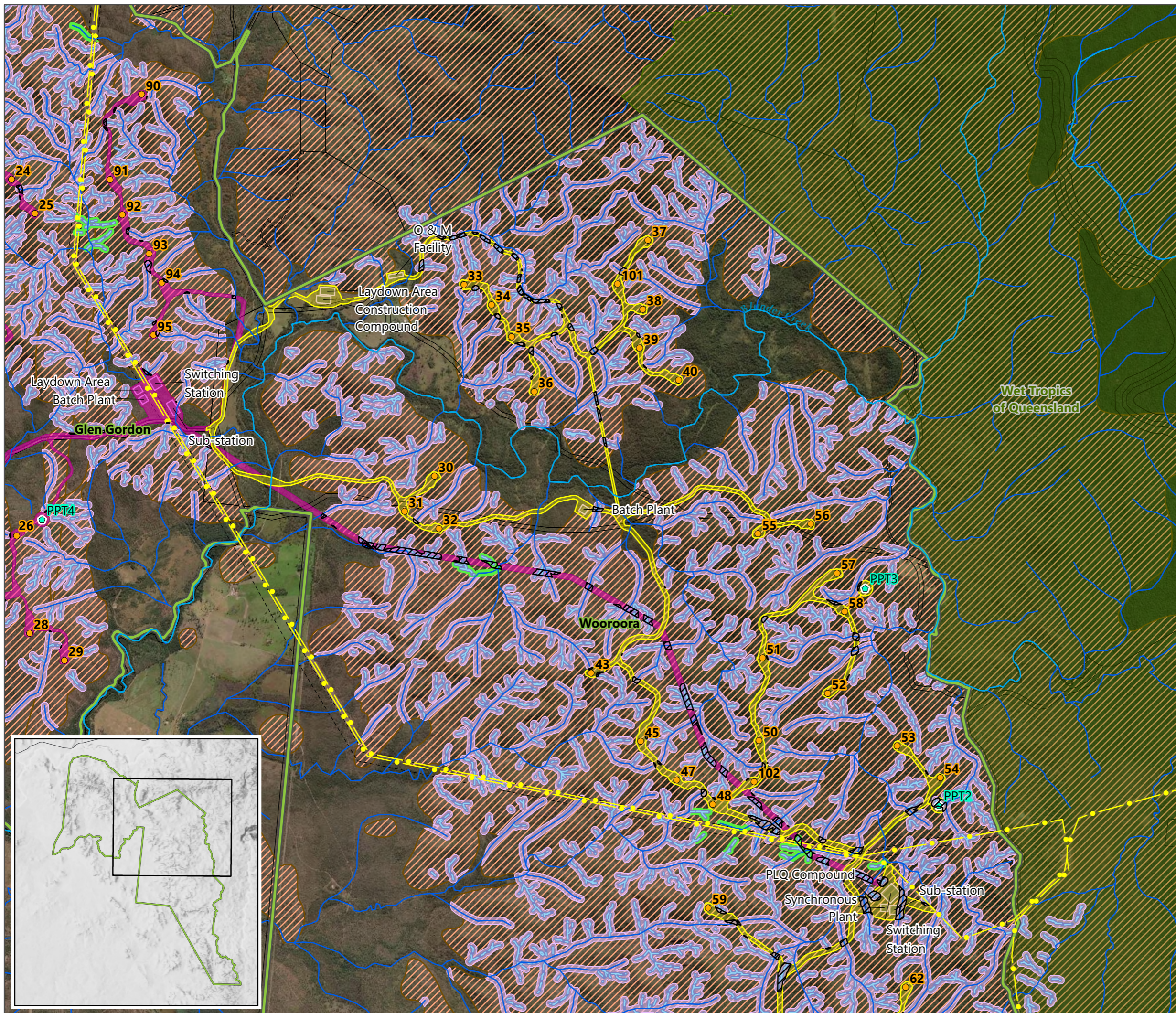
Date: 28/02/2023
Project: EPU-004

Author: TOD
Reviewed: NOD



Scale: 1:50,000@A3

Data Source(s):
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


Chalumbin Wind Farm

Impacts to Magnificent broodfrog habitat

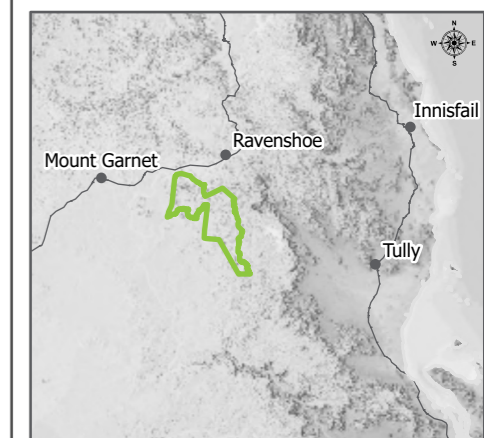
Sheet 3 of 4

Figure 8.1

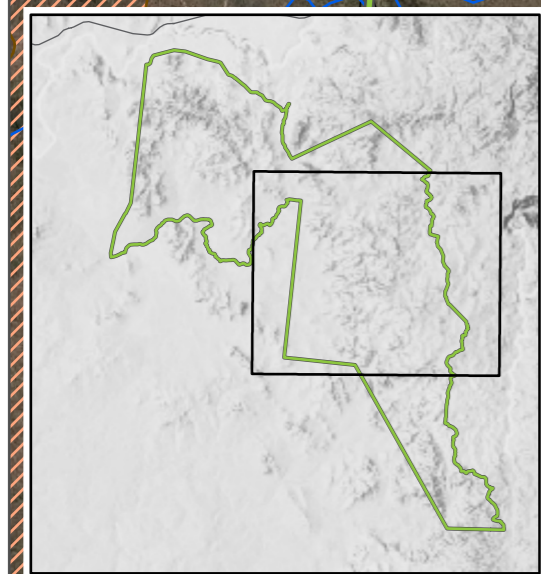
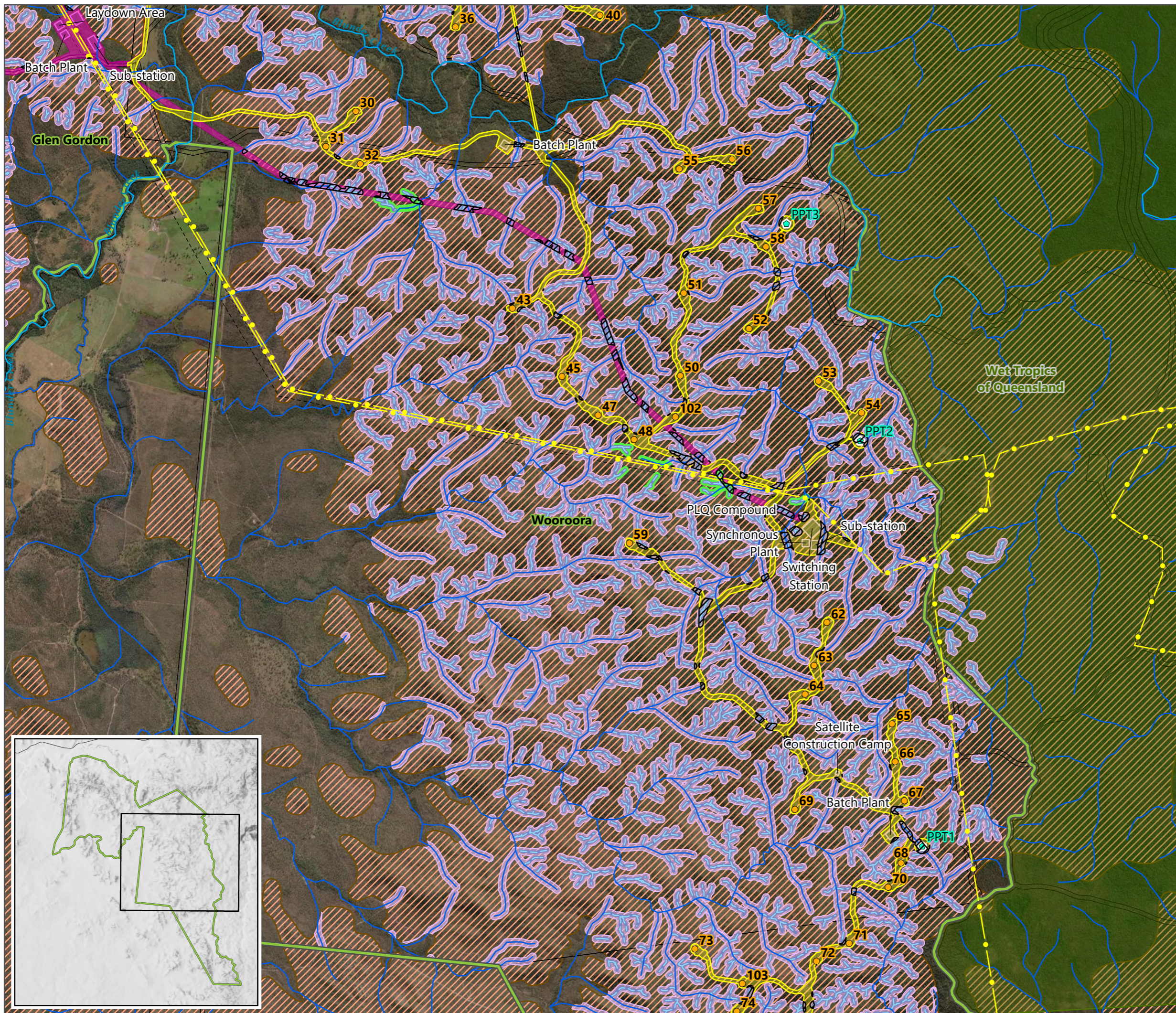
-  Project Area Boundary
-  Turbine
-  Met-mast
-  Facilities
- Clearance Envelope**
-  Stage 1
-  Stage 2
-  Known Habitat
-  Potential Habitat
-  Stream Order Zero watercourse (Gully)
-  Significant Residual Impact
-  Glen Gordon Volcanics
-  Existing HV Transmission Line
-  Watercourse
-  WTQ Boundary
-  Lot Boundary
-  Easement

Date: 28/02/2023
Project: EPU-004

Author: TOD
Reviewed: NOD



Scale: 1:50,000@A3
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









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Chalumbin Wind Farm

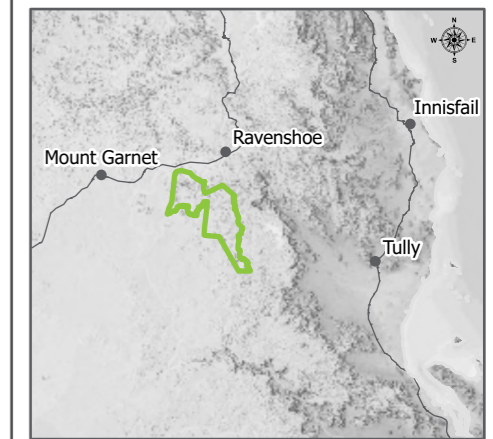
Impacts to Magnificent broodfrog habitat

Sheet 4 of 4

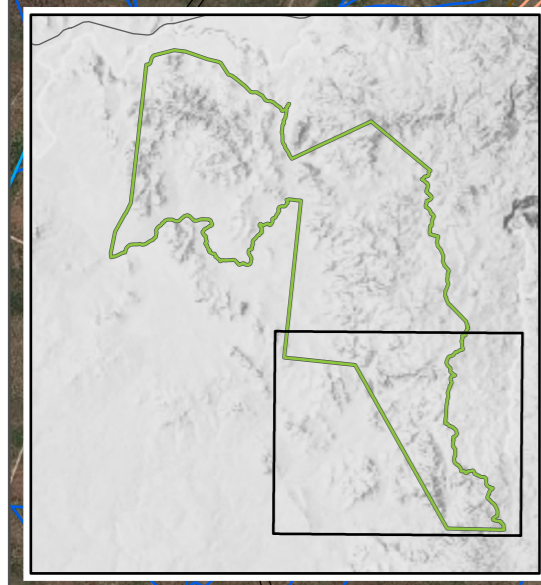
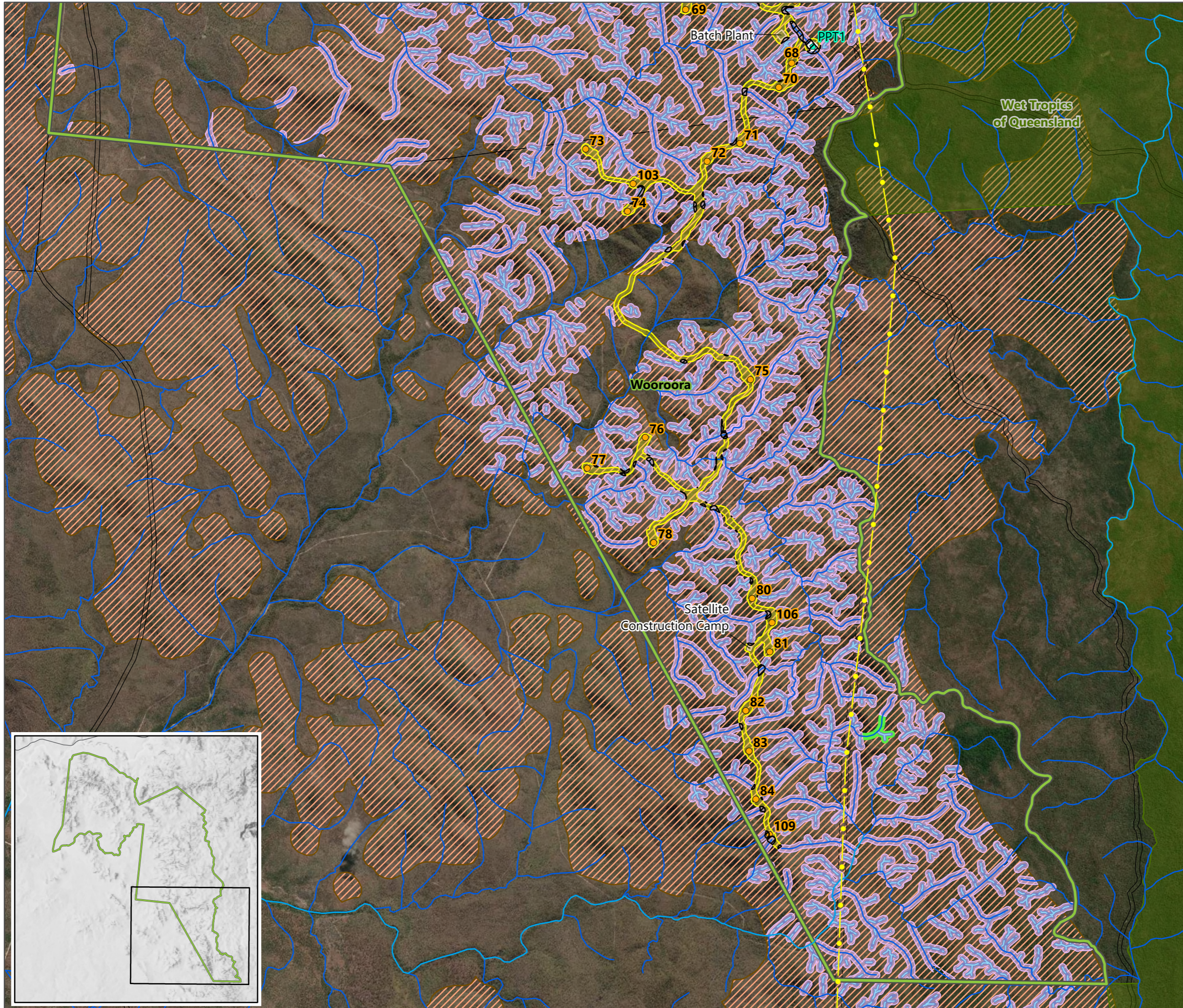
Figure 8.1

-  Project Area Boundary
-  Turbine
-  Met-mast
-  Facilities
- Clearance Envelope**
-  Stage 1
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8.4.2.2 Potential Operational Impacts from the Project and Relevant Mitigation

Potential impacts to magnificent brood frog during the operations phase will be very limited, as outlined in **Table 8-26**.

Table 8-26 Potential Operational Impacts and Relevant Mitigation – Magnificent Brood Frog

Potential Impact	Assessment	Mitigation
Indirect impacts such as smothering of vegetation by dust and accidental release of hazardous materials such as fuel	There is a very low risk of vehicles associated with Project operation causing indirect impacts on magnificent brood frog habitat due to the release of dust or hazardous materials.	Standard mitigation measures, implemented by way of an Operations EMP, are considered appropriate to manage this risk given the low probability of the species being active during the dry (non-breeding) season when dust is more likely to be created.
Weed and pest incursion	The Project has the potential to facilitate the spread of weeds and pest fauna through machinery, vehicles and materials brought to site from outside the Project area.	The Project area is currently subjected to existing weed and pest impacts. During operation of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue.

8.4.2.3 Assessment of Significant Residual Impacts

The Project could potentially have a significant residual impact on the magnificent brood-frog (Vulnerable). A full significance assessment following the Significant Impact Guidelines (DoE 2013) is presented in **Table 8-27**.

Table 8-27 Significant Residual Impact Assessment – Magnificent Brood Frog

Significant Impact Criteria	Project Outcome
Lead to a long-term decrease in the size of an important population of a species	Unlikely As the species has a highly restricted range (associated with particular surface geology) it is considered that any population of magnificent brood frog within the Project area is part of an important population. The Project area is considered to contain habitat critical to the survival of the species, the vast majority of which will be retained. Aside from the sensitive design measures already employed for the Project, the measures proposed to manage vegetation clearing and fragmentation are expected to be effective in ensuring that the Project does not lead to a long-term decrease in the size of the Project area's population of magnificent brood frog.
Reduce the area of occupancy of an important population	Unlikely The proposed habitat removal associated with the Project is not concentrated in a manner that will remove one or more 4km ² grid



Significant Impact Criteria	Project Outcome
	squares from the magnificent brood frog population's area of occupancy.
Fragment an existing important population into two or more populations	<p>Unlikely</p> <p>The Project area supports an important population of magnificent brood frog and contains habitat critical to the survival of the species, the vast majority of which will be retained. Risks of fragmentation are likely to be highest where access roads and overhead transmission line infrastructure crosses areas of critical habitat.</p> <p>Aside from the sensitive design measures already employed for the Project, the measures proposed to manage vegetation clearing and fragmentation are expected to be effective in ensuring that the Project does not lead to fragmentation of an existing important population into two or more populations.</p> <p>Large area of magnificent brood frog habitat will remain within the Project area post clearing. These retained and adjacent habitats will support the species and provide connectivity. The Project is not expected to fragment an existing population into two or more populations.</p>
Adversely affect habitat critical to the survival of a species	<p>Likely</p> <p>The Project will involve the removal of 6.4ha of known habitat and 114.1ha of potential habitat critical to the survival of the species (120.5ha in total). Effective implementation of erosion and sediment control within the Project footprint will mean that areas of habitat at higher risk of influence from sediment runoff are not impacted. Sediment loss from within the Project footprint during construction and operation has been modelled as generally on par with, or better than, the existing conditions within the Project area (see Appendix J). Despite the extent of habitat remaining in the locality, coupled with the implementation of the proposed mitigation measures, the loss of 120.5 ha of critical habitat is considered likely to constitute a significant impact to the species.</p>
Disrupt the breeding cycle of an important population	<p>Likely</p> <p>Very little is known about the life cycle of the magnificent brood frog. Males start calling at the onset of the wet season (typically in December, but dependent on weather conditions) and continue until approximately April (provided there are sufficient rain events during this period). It is considered likely that eggs are laid on moist soil in or near a seepage and that after hatching, the tadpoles make their way down the seepage or are washed into first order streams where development continues in small pools (McDonald et al, 2000). Construction activities have the potential to degrade and destroy seepage areas, which are dependent on climate factors and difficult to map year-on-year. A clear commitment not to undertake any soil disturbance activities in the period January to March inclusive will result in avoidance of the peak</p>



Significant Impact Criteria	Project Outcome
	<p>breeding season. Seepage areas would remain outside of the Project footprint.</p> <p>Nonetheless, the Project could potentially disrupt the breeding cycle of an important population.</p>
<p>Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</p>	<p>Unlikely</p> <p>The Project area contains critical habitat for the species, the vast majority of which will be retained within the Project area. Nevertheless, the Project will involve the removal of 120.5 ha of critical habitat for the magnificent brood frog.</p> <p>Large tracts of magnificent brood frog habitat will remain within the Project area post clearing which are connected to larger habitats in adjacent areas. These retained and adjacent habitats will support the species and provide connectivity. Rehabilitation activities will also aim to restore woodland habitats that will provide magnificent brood frog habitats over the short to medium term. Aside from the sensitive design measures already employed for the Project, the measures proposed to manage vegetation clearing and fragmentation are expected to be effective in ensuring that the Project does not lead to a decline in the species.</p>
<p>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</p>	<p>Unlikely</p> <p>Clearing activities associated with the Project have the potential to open up areas that may be subject to weed incursion and increased prevalence of pests.</p> <p>A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread, management of pest infestations (including specific advice for amphibian chytrid fungus) and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.</p>
<p>Introduce disease that may cause the species to decline</p>	<p>Unlikely</p> <p>The magnificent brood frog is likely to be susceptible to the effects of amphibian chytrid fungus, the spread of which is considered to be responsible for the species' decline. Specific measures for controlling the spread of amphibian chytrid fungus have been incorporated into the preliminary Weed and Pest Management Plan (see Appendix F).</p>
<p>Interfere substantially with the recovery of the species</p>	<p>Unlikely</p> <p>The Project is not expected to interfere substantially with the recovery of the species. Clearing of habitat will be undertaken sequentially, and large areas of potential critical habitat will be retained across the Project area. This availability and connectivity of foraging and breeding habitat will ensure any magnificent brood frogs within the Project area will have available foraging and breeding resources. Fire will also be managed on site to ensure hot wildfires are minimised.</p> <p>Large tracts of habitat will remain within the Project area which are connected to larger habitats in adjacent areas. These retained and</p>



Significant Impact Criteria	Project Outcome
	adjacent habitats will support the species and provide connectivity and maintain gene flow for the species.

8.4.3 Mountain Mistfrog

As discussed in **Section 4.5.3**, the mountain mistfrog has not been recorded since 1990 and is possibly now extinct but may still persist in remote areas. It is a rainforest specialist with an obligate association with perennial streams. There is limited potential habitat for the mountain mistfrog within the Project area, which has been mapped as upland rainforest and wet sclerophyll forest alongside perennial streams.

8.4.3.1 Potential Construction Impacts from the Project and Relevant Mitigation

Approximately 4 ha of potential habitat for mountain mistfrog occurs within the Project area and 220.5 ha occurs within the broader Study area. There is no potential habitat for mountain mistfrog within the proposed Project footprint.

Potential construction impacts and proposed mitigation measures for mountain mistfrog are discussed further in **Table 8-28**.

Table 8-28 Potential Construction Impacts and Relevant Mitigation – Mountain Mistfrog

Potential Impact	Assessment	Proposed Mitigation
Vegetation and habitat clearance	The Project will not result in any clearing of potential mountain mistfrog habitat.	Only minimal areas (3.8 ha) of potential habitat for mountain mistfrog have been mapped within the Project area. Project infrastructure has been sited to avoid clearing any of this habitat.
Fragmentation (of populations and habitat)	The Project will not result in any clearing of potential mountain mistfrog habitat.	Retained vegetation will be maintained through implementation of a Vegetation Management Plan to reduce hazards from fire, pest species, degradation and other potential impacts. This will assist in maintaining the integrity of the vegetation as habitat and will reduce disturbance to surrounding habitat and conservation areas.
Indirect impacts such as smothering of creek-side vegetation by dust and accidental release of hazardous materials such as fuel	Construction activities have the potential to result in indirect impacts on potential habitat for mountain mistfrog if not undertaken in accordance with the Construction EMP and associated sub-plans.	Smothering of creek-side vegetation by dust is not expected to pose a significant risk in this high-rainfall area. Dust generating activities will be minimised during dry, windy conditions and areas of exposed soils will be rehabilitated as soon as practicable, to minimise dust emissions. Dust suppression (water spraying) will be used during the dry season as necessary, including in areas of sensitive vegetation adjacent to the construction footprint if visible dust is observed. Accidental releases of hazardous materials in proximity to potential mountain mistfrog habitat



Potential Impact	Assessment	Proposed Mitigation
		<p>is highly unlikely as these materials would be securely stored in dedicated areas within the construction compound, away from sensitive sites. Spills would be limited to small drips from machinery hoses and similar, and would be cleaned up immediately, with the waste disposed of in accordance with the Construction EMP.</p>
Weed and pest incursion	<p>The Project has the potential to facilitate the spread of weeds and pests through machinery, vehicles and materials brought to site from outside the Project area. The mountain mistfrog is likely to be particularly susceptible to the amphibian chytrid fungus.</p>	<p>The Project area is currently subjected to existing weed and pest impacts. During construction of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue.</p> <p>A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread, management of pest infestations (including specific advice for amphibian chytrid fungus) and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.</p>
Species mortality (vehicle collision, vegetation clearance)	<p>During vegetation clearing, there is potential for direct mortality in the unlikely event that the mountain mistfrog is present. The risk of vehicle strike is negligible.</p>	<p>Clearing of habitat could potentially result in significant injury or death to individual mountain mistfrogs, however, it is highly unlikely that the species is present within the Project area and the proposed Project footprint does not intersect any potential habitat for the species. Clearing operations will be conducted in accordance with the provisions outlined in a sequential clearing procedure including the use of a fauna spotter catcher. The process will significantly mitigate any potential impacts associated with clearing operations ensuring and animals are detected providing procedures are followed and spotters are allowed ample opportunity to check areas before site clearing.</p>
Erosion and sedimentation	<p>Construction activities may alter surface water overland flow, leading to increased erosion and subsequent sedimentation of potential habitat for the mountain mistfrog.</p>	<p>A preliminary Erosion and Sediment Control Plan (ESCP) (Appendix I) and a Sediment and Erosion Management Plan (Appendix J) have been prepared for the Project and will be further developed by the Construction Contractor prior to works commencing on site. Implementation of these plans will minimise soil loss from the disturbance areas and subsequent sedimentation of nearby watercourses that may provide habitat for the mountain mistfrog.</p>



Potential Impact	Assessment	Proposed Mitigation
Noise and lighting	These potential impacts are considered to be negligible risks for the mountain mistfrog.	Mitigation measures outlined in Section 6.0 are considered appropriate to manage these negligible risks.
Reduced air quality		
Bushfire risk		

8.4.3.2 Potential Operational Impacts from the Project and Relevant Mitigation

Potential impacts to mountain mistfrog during the operations phase will be very limited, as outlined in **Table 8-29**.

Table 8-29 Potential Operational Impacts and Relevant Mitigation – Mountain Mistfrog

Potential Impact	Assessment	Mitigation
Indirect impacts such as smothering of creek-side vegetation by dust and accidental release of hazardous materials such as fuel	There is a very low risk of vehicles associated with Project operation causing indirect impacts on mountain mistfrog habitat due to the release of dust or hazardous materials.	Standard mitigation measures, implemented by way of an Operations EMP, are considered appropriate to manage this risk given the low probability of the species being present within the Project area.
Weed and pest incursion	The Project has the potential to facilitate the spread of weeds and pests, including the amphibian chytrid fungus, through machinery, vehicles and materials brought to site from outside the Project area.	The Project area is currently subjected to existing weed and pest impacts. During operation of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue.

8.4.3.3 Assessment of Significant Residual Impacts

The Project is unlikely to have a significant residual impact on the mountain mistfrog (Critically Endangered). A full significance assessment following the Significant Impact Guidelines (DoE 2013) is presented in **Table 8-30**.

Table 8-30 Significant Residual Impact Assessment – Mountain Mistfrog

Significant Impact Criteria	Project Outcome
Lead to a long-term decrease in the size of a population	<p>Unlikely</p> <p>The Project area is highly unlikely to support a population of mountain mistfrog, which has not been observed in the broader Study area since 1981 and is considered potentially extinct.</p> <p>The Project area supports a limited area of potential habitat for the species and none of this habitat will be cleared as a result of the Project. Aside from the sensitive design measures already employed for the Project, the measures proposed to manage vegetation clearing and fragmentation are expected to be effective in ensuring that the Project does not lead to a long-term decrease in the size of the Project area's mountain mistfrog population, should it be present.</p>



Significant Impact Criteria	Project Outcome
Reduce the area of occupancy of the species	<p>Unlikely</p> <p>The Project footprint has been designed to avoid clearing any potential habitat for the mountain mistfrog.</p>
Fragment an existing population into two or more populations	<p>Unlikely</p> <p>The Project area is highly unlikely to support a population of mountain mistfrog.</p> <p>Risks of fragmentation are likely to be highest where access roads and overhead transmission line infrastructure crosses areas of critical habitat. The Project area supports a limited area of potential habitat for the species and none of this habitat will be cleared or bisected as a result of the Project.</p> <p>Aside from the sensitive design measures already employed for the Project, the measures proposed to manage vegetation clearing and fragmentation are expected to be effective in ensuring that the Project does not lead to fragmentation of an existing important population into two or more populations.</p>
Adversely affect habitat critical to the survival of a species	<p>Unlikely</p> <p>The Project area is highly unlikely to support a population of mountain mistfrog.</p> <p>The Project area supports a limited area of potential habitat for the species and none of this habitat will be cleared as a result of the Project.</p>
Disrupt the breeding cycle of a population	<p>Unlikely</p> <p>The Project area is highly unlikely to support a population of mountain mistfrog. The Project area supports a limited area of potential habitat for the species and none of this habitat will be cleared or bisected as a result of the Project. It is therefore unlikely that the Project would affect the breeding cycle of the species, should it be present.</p>
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>Unlikely</p> <p>The Project area supports a limited area of potential habitat for the species and none of this habitat will be cleared or bisected as a result of the Project.</p>
Result in invasive species that are harmful to the critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat	<p>Unlikely</p> <p>Clearing activities associated with the Project have the potential to open up areas that may be subject to weed incursion and increased prevalence of pests.</p> <p>A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread, management of pest infestations (including specific advice for amphibian chytrid fungus) and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.</p>
Introduce disease that may cause the species to decline	<p>Unlikely</p>



Significant Impact Criteria	Project Outcome
	The mountain mistfrog is likely to be susceptible to the effects of amphibian chytrid fungus, the spread of which is considered to be responsible for the species' decline. Specific measures for controlling the spread of amphibian chytrid fungus have been incorporated into the preliminary Weed and Pest Management Plan (see Appendix F).
Interfere with the recovery of the species	Unlikely The Project is not expected to interfere substantially with the recovery of the species. No potential habitat for mountain mistfrog will be cleared and the Project will not isolate areas of potential habitat within the Project area to potential habitat within the broader Study area.

8.5 Listed Threatened Bird Species

8.5.1 Buff-breasted Button-quail

As discussed in **Section 4.6.1.4**, the buff-breasted button-quail has not been recorded previously within the Project area nor the broader Study area. The Project is outside the species' known range as reported by Debus and Kirwan 2020 and BirdLife International 2020. The entire Project area is also higher than the species' reported upper elevation limit of 500 m (BirdLife International). The Project area is therefore not thought to provide habitat for the buff-breasted button-quail.

8.5.1.1 Potential Construction Impacts from the Project and Relevant Mitigation

The Project area is considered highly unlikely to support the buff-breasted button-quail and hence construction impacts on this species are not anticipated.

8.5.1.2 Potential Operational Impacts from the Project and Relevant Mitigation

The Project area is considered highly unlikely to support the buff-breasted button-quail and hence operational impacts on this species are not anticipated.

8.5.1.3 Assessment of Significant Residual Impacts

The Project is unlikely to have a significant residual impact on the buff-breasted button-quail (Endangered). A full significance assessment following the Significant Impact Guidelines (DoE 2013) is presented in **Table 8-31**.

Table 8-31 Significant Residual Impact – Buff-breasted Button-quail

Significant Impact Criteria	Project Outcome
Lead to a long-term decrease in the size of a population	Unlikely The Project area is highly unlikely to support a population of buff-breasted button-quail, which has not been definitively recorded since 2015 and has never been recorded in the broader Study area.



Significant Impact Criteria	Project Outcome
	The entire Project area is above the reported upper elevation limit of the species and therefore does not provide habitat for the buff-breasted button-quail.
Reduce the area of occupancy of the species	Unlikely The Project area does not overlap with the species' area of occupancy as presented by Debus and Kirwan 2020, and BirdLife International 2020.
Fragment an existing population into two or more populations	Unlikely The Project area is highly unlikely to support a population of buff-breasted button-quail as it is outside the species' known range and does not provide habitat for the species.
Adversely affect habitat critical to the survival of a species	Unlikely The Project area is highly unlikely to support a population of buff-breasted button-quail. The Project area does not provide habitat for this species.
Disrupt the breeding cycle of a population	Unlikely The Project area is highly unlikely to support a population of buff-breasted button-quail. The Project area does not provide habitat for this species.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely The Project area does not provide habitat for the buff-breasted button-quail.
Result in invasive species that are harmful to the critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat	Unlikely The Project area does not provide habitat for the buff-breasted button-quail. The Project area is already subject to established populations of invasive species (feral cat, feral pig) that are known to be threatening processes to this species. A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) which includes management of invasive species populations and monitoring the effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.
Introduce disease that may cause the species to decline	Unlikely The buff-breasted button-quail is not known to be susceptible to any particular disease. The Project area does not provide habitat for the buff-breasted button-quail.
Interfere with the recovery of the species	Unlikely The Project is not expected to interfere substantially with the recovery of the species. The Project area does not provide habitat for the buff-breasted button-quail.



8.5.2 Masked Owl

As discussed in **Section 4.6.1**, the masked owl was recorded at two locations within the Project area during the January 2021 surveys. Across the Project area, nesting habitat was mapped as rainforest, riparian forest and open eucalypt forest containing large trees (DBH > 41.2 cm) at a density of > 25 trees per hectare. Additional foraging habitat was mapped as rainforest, riparian forest and open eucalypt forest within a buffer area around nesting habitat based on a core home range of 155 ha. Potential within the broader Study area (where LIDAR data was not available to derive tree heights) was conservatively mapped as rainforest, riparian forest and open eucalypt forest.

8.5.2.1 Potential Construction Impacts from the Project and Relevant Mitigation

Approximately 15,315.7 ha of nesting habitat and 15,009 ha of additional foraging habitat for masked owl occurs within the Project area. Approximately 90,118.8 ha of potential habitat occurs within the broader Study area.

The Project will require clearing of masked owl habitat as summarised in **Table 8-32** and **Figure 8-2**.

Table 8-32 Proposed Clearing of Masked Owl Habitat

	Stage 1 Clearing	Stage 2 Clearing	Total Clearing
Nesting habitat	350.2 ha	179.3 ha	529.5 ha
Foraging habitat	225.9 ha	270.9 ha	496.8 ha
Total masked owl habitat	576.1 ha	450.2 ha	1,026.3 ha

Potential construction impacts and proposed mitigation measures for masked owl are discussed in **Table 8-33**.

Table 8-33 Potential Construction Impacts and Proposed Mitigation – Masked owl

Potential Impact	Assessment	Proposed Mitigation
Vegetation and habitat clearance	The Project will result in the clearing of 529.5.2 ha of nesting habitat and 496.8 ha of foraging habitat for the species.	<p>Large areas of masked owl habitat throughout the Project area will be retained.</p> <p>The Project design has sought to avoid and minimise clearing within nesting habitat.</p> <p>If practical during construction, micro-siting of access tracks will seek to avoid large hollow-bearing trees.</p> <p>Vegetation clearing will be minimised as much as practicable through micro-siting within the proposed Project footprint.</p> <p>Project infrastructure including laydown areas, construction compounds and substation have been sited in cleared areas where practicable to avoid clearing of potential habitat.</p> <p>Clearing of masked owl habitat will occur sequentially and in accordance with an approved Species Management Program.</p> <p>Unavoidable impacts to nesting trees will be mitigated through installation of nest boxes</p>



Potential Impact	Assessment	Proposed Mitigation
		<p>and/or translocated stags within retained habitat on a 2:1 basis. The re-use of large hollows has been demonstrated to have potential for uptake success by comparison to artificial nest boxes with owl species in particular showing a clear preference for natural hollows (Central Coast Council, 2016). When specifically targeting masked owl, the relocation of a complete trunk section (rather than just a large hollow section) may be a suitable option if the cavity of the hollow extends a long way down the trunk, as this species is known to utilise deep trunk hollows (Central Coast Council, 2016).</p>
Habitat fragmentation	The Project will result in the clearing of 1,026.3 ha of masked owl habitat.	<p>Existing access tracks within the Project area were prioritised as part of the design to minimise any further clearing and fragmentation of vegetation communities.</p> <p>Vegetation clearing will be minimised as much as practicable through micro-siting within the proposed Project footprint.</p> <p>Retained vegetation will be maintained through implementation of a Vegetation Management Plan to reduce hazards from fire, pest species, degradation and other potential impacts. This will assist in maintaining the integrity of the vegetation as habitat and will reduce disturbance to surrounding habitat and conservation areas.</p> <p>Areas cleared for construction that are not required for the operational footprint will be sequentially rehabilitated as soon as practicable following construction.</p>
Weed and pest incursion	The Project has the potential to facilitate the spread of weeds and pest fauna through machinery, vehicles and materials brought to site from outside the Project area.	<p>The Project area is currently subjected to existing weed and pest impacts. During construction of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue.</p> <p>A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread (with specific advice for key identified species), management of pest infestations and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.</p>

















Potential Impact	Assessment	Proposed Mitigation
Species mortality (vehicle collision, vegetation clearance)	During vegetation clearing, there is potential for direct mortality if masked owls are present (i.e. denning in the hollow-bearing trees to be cleared). The risk of vehicle strike is negligible.	Clearing of habitat could potentially result in significant injury or death to individual masked owls, however clearing operations will be conducted in accordance with the provisions outlined in a sequential clearing procedure including the use of a fauna spotter catcher and retention of habitat trees overnight. The process will significantly mitigate any potential impacts associated with clearing operations ensuring masked owls are detected, provided procedures are followed and spotters are allowed ample opportunity to check trees before felling. Hollow-bearing trees will be marked and hollows inspected where possible for the presence of arboreal fauna prior to tree-felling. Clearing protocols will be developed including methods for clearing hollow-bearing trees (e.g. remove surrounding trees on previous day) and check for any injured species. Any injured individuals will be taken to a vet for treatment. Where practicable, dead standing timber and living, hollow-bearing trees should be retained.
Erosion and sedimentation	The masked owl is unlikely to be directly impacted by erosion and reduced water quality resulting from Project construction.	A preliminary Erosion and Sediment Control Plan (ESCP) (Appendix I) and a Sediment and Erosion Management Plan (Appendix J) have been prepared for the Project and will be further developed by the Construction Contractor prior to works commencing on site. Implementation of these plans will minimise soil loss from the disturbance areas.
Bushfire risk	Inappropriate fire regimes may be a threat to this species. The Project is not expected to increase the risk of high intensity bushfires in the Project area	A Bushfire Management Plan will be prepared prior to construction and will be implemented during all on-site activities. Fuel loads will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management.
Noise and lighting	As the masked owl is a nocturnal species, there is the potential for it to be disturbed by noise and lighting impacts during Project construction.	Standard construction work hours will generally be between 6.30am and 6.30pm, therefore site lighting will be kept to the minimum required for safety. Where necessary, construction lighting will be directed to the required areas and designed to minimise light spill to adjacent areas. Construction equipment will be fitted with noise reduction devices where practicable and switched off when not in use

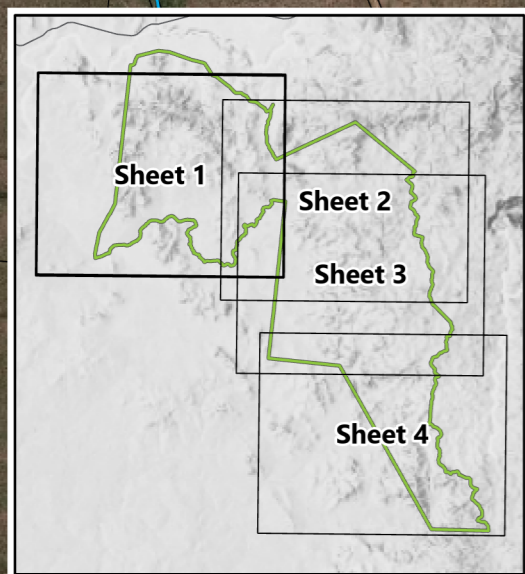
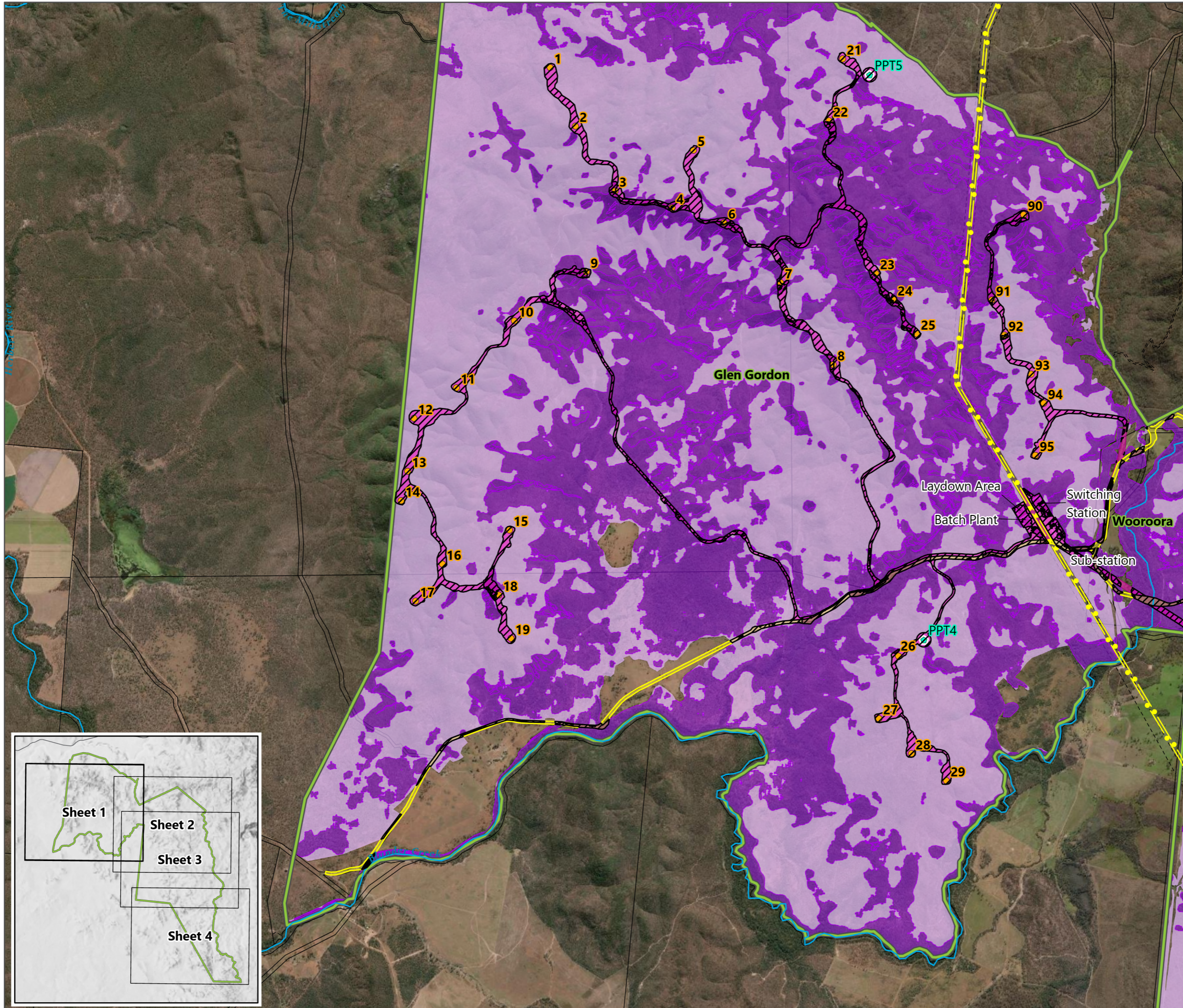


Potential Impact	Assessment	Proposed Mitigation
Dust emissions	There is limited scope for indirect impacts from dust emissions on this species resulting from Project construction.	Generally, dust is not expected to pose a significant risk in this high-rainfall area. Dust generating activities will be minimised during dry, windy conditions and areas of exposed soils will be rehabilitated as soon as practicable, to minimise dust emissions. Dust suppression (water spraying) will be used during the dry season as necessary.

Chalumbin Wind Farm
Impacts to Masked owl habitat
Sheet 1 of 4

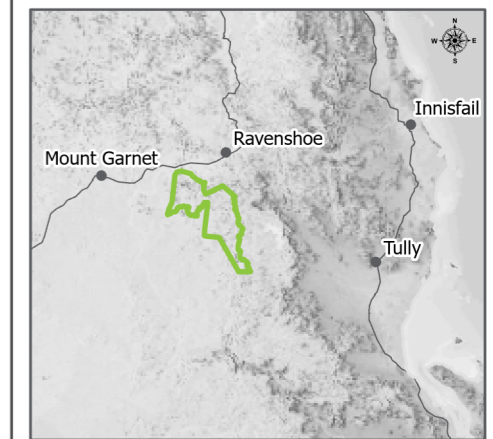
Figure 8.2

-  Project Area Boundary
-  Turbine
-  Met-mast
-  Facilities
- Clearance Envelope
-  Stage 1
-  Stage 2
-  Significant Residual Impact
-  Nesting Habitat
-  Foraging Habitat
-  Existing HV Transmission Line
-  Watercourse
-  WTQ Boundary
-  Lot Boundary
-  Easement



Date: 10/10/2022
Project: EPU-004















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Reviewed: NOD

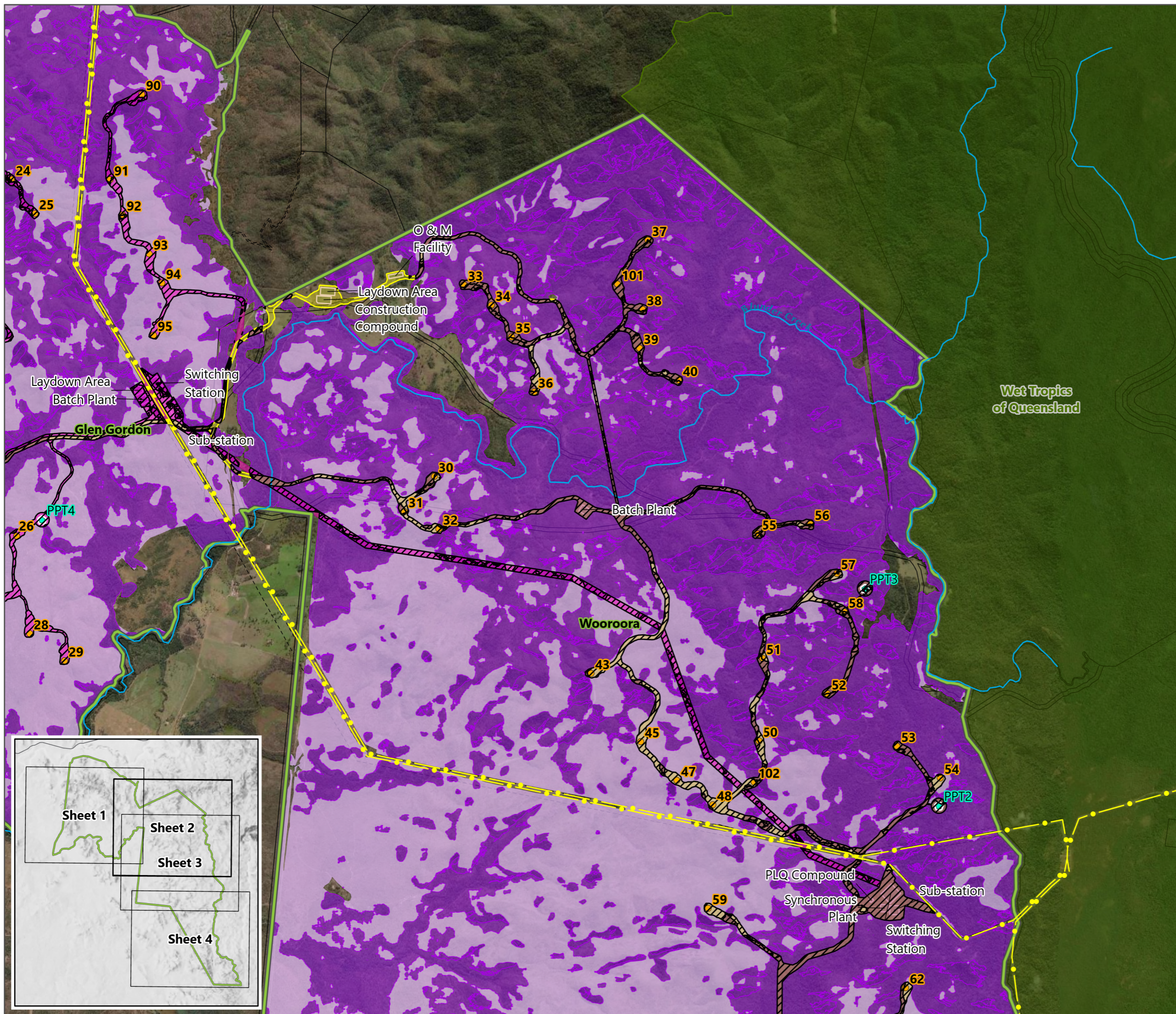


Data Source(s):
Digital Cadastral Database - Department of Resources (2022)
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Chalumbin Wind Farm
Impacts to Masked owl habitat
Sheet 2 of 4

Figure 8.2

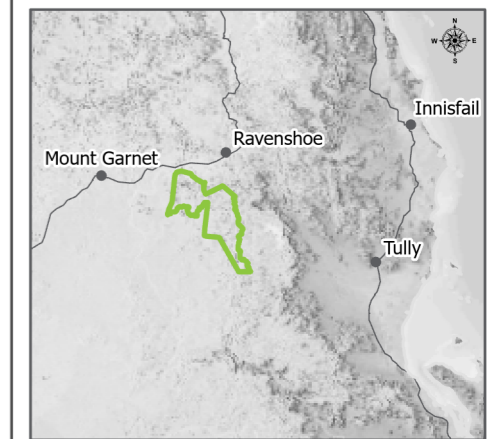
-  Project Area Boundary
-  Turbine
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Wet Tropics
of Queensland

Wooroora

Date: 10/10/2022
Project: EPU-004
Author: TOD
Reviewed: NOD



Scale: 1:50,000@A3

Data Source(s):
Digital Cadastral Database - Department of Resources (2022)
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