STAR OF THE SOUTH

Commonwealth Environmental Impact Statement

Chapter 18 – Onshore ecology (EPBC matters)

Chapter 18 Onshore ecology (EPBC matters)

18.1 Introduction

This chapter summarises the existing conditions related to onshore ecology and assesses the impacts and risks associated with the construction, operation and decommissioning of the Star of the South Offshore Wind Farm (the project) on Commonwealth legislated onshore ecology. The chapter describes how impacts will be avoided, minimised or managed.

Ecology

Refers to native flora (plants) and fauna (animals) and their supporting environments

This chapter is based on the impact assessment presented in *Technical Report G – Onshore Ecology*. This chapter covers Commonwealth legislated onshore ecological aspects only. Victorian legislated onshore ecology aspects are detailed in the Star of the South Victorian Environment Effects Statement.

18.2 Assessment scope

The study objective for Victorian and Commonwealth regulated onshore ecology is to assess and avoid, minimise or offset potential adverse effects on native vegetation, habitats, listed threatened species and ecological communities, migratory species, and other protected flora and fauna, including within the more ecologically significant areas of McLoughlins Beach-Seaspray Coastal Reserve and Woodside Bushland Reserve H28.

All detailed technical methodologies and assessment on onshore ecology can be found in *Technical Report G – Onshore Ecology.*

18.2.1 Commonwealth matters

The EIS guidelines for the project inform the preparation of the EIS about the relevant impacts of the project to enable the Commonwealth Minister for the Environment to make an informed decision on whether to approve the project under the EPBC Act.

The aspects of the EIS guidelines are directly relevant to onshore ecology are:

- Section 2.5 – Description of the environment
- Section 2.6.1 – Description of the ecological character
- Section 2.7 – Provision of technical data and other information
- Section 2.7 – Predictions of changes to physico-chemical status.

Further information about the EIS guidelines is listed in *Attachment V – EIS Guidelines Checklist.*

18.3 Evaluation framework

18.3.1 Key legislation, policy, guidelines and standards

Table 18-1 lists the key legislation, policy, guidelines and standards relevant to onshore ecology. Refer to *Chapter 5 – Commonwealth Legislative Framework* for further details.

Table 18-1 Key legislation, policy, guidelines and standards

Type	Applicable legislation, policy, guideline or standard
Commonwealth government	*Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*
	Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (DEWHA 2013)

18.3.2 Assessment criteria

To assess the project, the predicted impacts and risks are compared to criteria that set required environmental performance outcomes that must be achieved (refer *Chapter 6 – Assessment Framework*).

The criteria for onshore ecology were derived from legislation and policy, relevant standards and guidelines, stakeholder feedback and industry best practice.

The assessment criteria are defined as where project impacts on onshore ecology could impact on matters of national environmental significance that include:

- Threatened ecological communities
- Habitat for threatened flora
- Habitat for threatened or migratory fauna.

18.4 Methods

The purpose of the onshore ecology impact assessment was to assess the potential impacts and risks of the project on onshore ecology.

Impacts refer to the consequences of planned project actions, which are given a rating determined by combining the magnitude of the impact and the sensitivity of the receptor.

Risks are an unexpected (accidental) event and are determined by combining the likelihood of an event occurring and the consequences that would result if the event were to occur.

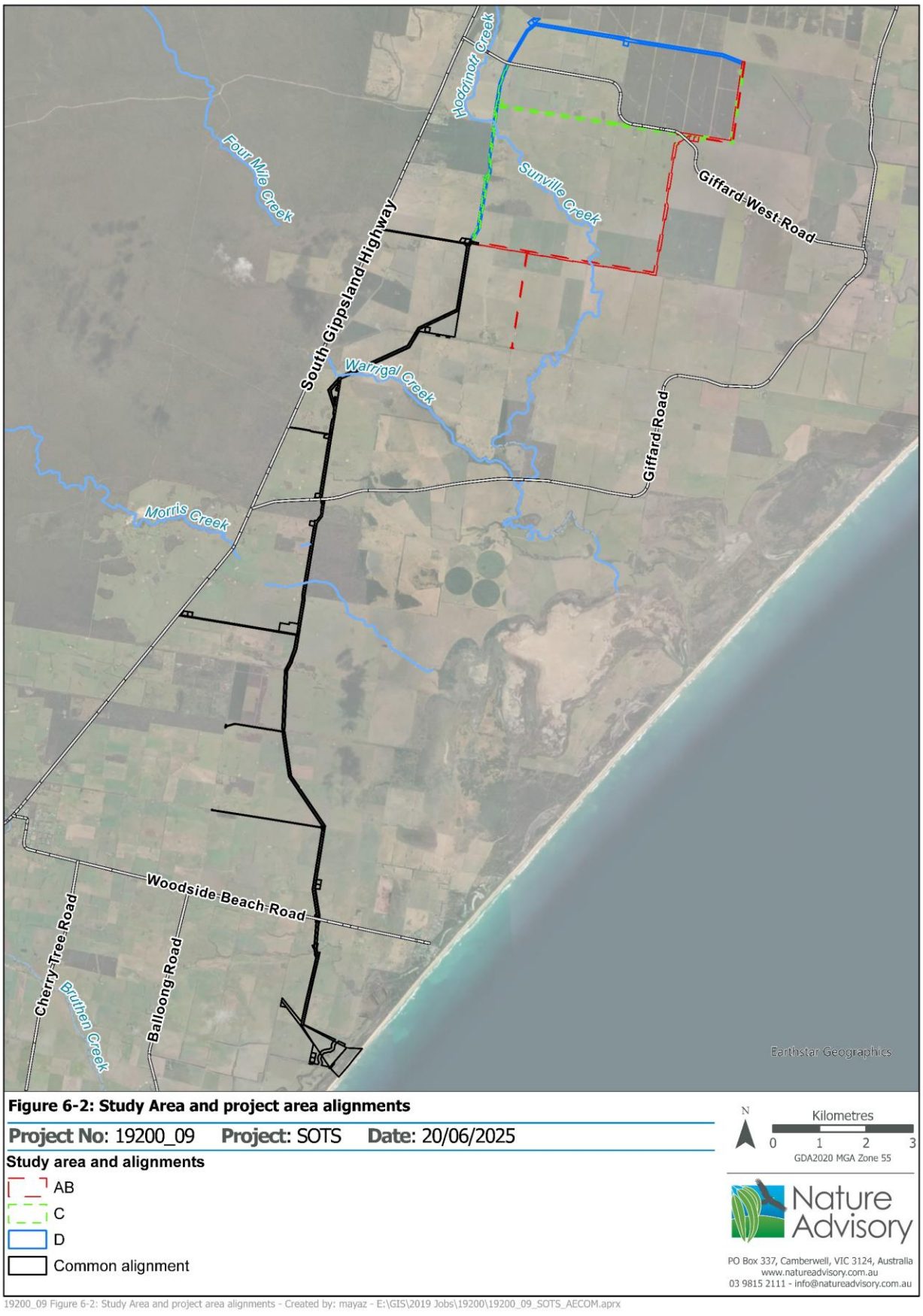
The technical chapters consider **key impacts and risks** with a residual consequence rating of moderate to severe. **Other impacts and risks** are those with a residual consequence rating of negligible to minor.

Refer to *Chapter 6 – Assessment Framework* for more detail on how impact and risk ratings are derived.

The assessment was achieved by undertaking the following key tasks:

- Defining a study area which includes the project area boundary plus a 15 metre buffer to allow for the assessment of indirect impacts (refer to Figure 18-1)
- Reviewing national, state and local legislation relevant to the protection of onshore ecology
- Characterising existing conditions and identifying sensitive assets, values and uses (including through field surveys and consultation)
- Reviewing the project description to determine the location, type, timing, extent, intensity, and duration of potential project interactions with sensitive receptors
- Defining the maximum design scenario(s) based on project design envelope parameters that provide the basis for impact assessment. This is defined further in *Technical Report G – Onshore Ecology*
- Undertaking a proportional assessment of risks and impacts, based on the outcomes of the initial assessment of issues and consultation insights, to examine the potential severity, extent and duration of identified issues
- Evaluating predicted outcomes against performance benchmarks and assessment criteria derived from applicable legislation, policy and standards
- Identifying mitigation measures where necessary to address potentially significant environmental impacts
- Evaluating residual environmental impacts and risks against assessment criteria, taking into account the proposed mitigation measures and likely effectiveness.

Figure 18-1 Study area



18.5 Existing environment

This section describes the existing conditions within the study area, as they relate to Commonwealth legislated onshore ecology. The study area is defined as the project area boundary plus an additional 15 metre buffer for assessment of indirect impacts. The section provides a description of the following existing environment elements:

- Landscape description
- Native vegetation
- Ramsar wetlands
- Threatened ecological communities
- Threatened flora
- Threatened fauna.

18.5.1 Landscape description

The project is located within the coast of central Gippsland across two distinct landscapes:

- Coastal and near-coastal areas
- Plains and lowland plains.

Coastal and near-coastal landscapes comprise dunes, which separate the beachfront from the inland environments. The plains and lowland plains landscapes consist of low elevation plains, interspersed with ephemeral waterways.

Ephemeral waterway

Watercourses that are typically dry or have very limited flow for most of the year

Both landscape types are generally considered to be altered from an ecological, pre-settlement perspective due to the historic and current day agricultural land uses.

18.5.2 Native vegetation

Native vegetation across the project is highly fragmented. The most intact native vegetation is associated with the conservation reserves along the coastline (Seaspray McLoughlin Coastal Reserve) and a former native forest timber production plot (Woodside H28 Bushland Reserve) (refer to Figure 7-2 in *Technical Report G – Onshore Ecology*). Smaller pockets of native vegetation are also scattered throughout the largely agricultural landscape and are typically associated with ephemeral waterways, roadside vegetation and scattered trees. Planted vegetation exists along an unnamed waterway (UFI:42806331), and along various fence lines throughout the study area.

18.5.3 Ramsar wetlands

Ramsar wetlands are wetlands of international importance designated under the Ramsar Convention. Ramsar wetlands are protected for their important habitat for international migratory shorebirds. The Corner Inlet Ramsar site is the closest Ramsar wetland to the project. The wetland is located at the mouth of the Bruthen Creek estuary. Unnamed waterway (UFI:42806331), an ephemeral watercourse, feeds into Bruthen Creek infrequently.

18.5.4 EPBC Act threatened ecological communities

No threatened ecological communities listed under the EPBC Act were recorded within the study area. EPBC Act threatened communities are therefore not discussed further in this chapter.

18.5.5 EPBC Act listed threatened flora

Targeted surveys were undertaken for nine EPBC Act listed threatened flora species which, from desktop review were known and considered likely or possibly occurring within the study area. Survey finding summaries are provided in section 18.6.1.1.

No threatened flora species listed under the EPBC Act were found in the study area during targeted surveys. Following targeted surveys, a review likelihood of occurrence was undertaken. EPBC listed threatened flora species that were possible to occur (due to the presence of suitable habitat) are listed in Table 18-2 (refer to Figure 7-6 in *Technical Report G – Onshore Ecology*). While targeted surveys cannot guarantee absence of a species, it is considered unlikely that the remaining six EPBC Act threatened flora species surveyed for are present within the study area.

Table 18-2 EPBC Act listed threatened flora species possibly occurring in the study area

Scientific name	Common name	Status	Likelihood
Caladenia tessellata	Thick-lip Spider-orchid	Vulnerable	Possible
Prasophyllum spicatum	Dense Leek-orchid	Vulnerable	Possible
Thelymitra matthewsii#	Spiral-leaved Sun-orchid	Vulnerable	Possible

Notes # - Species listed as threatened under the EPBC Act after the referral decision was made (2 June 2020) therefore not required to be assessed as a matter of national environmental significance in accordance with Section 158A(4) of the EPBC Act.

18.5.6 EPBC Act listed threatened fauna

Based on a review of desktop information and field surveys, the likelihood of occurrence of threatened fauna within the study area has been assessed. The results of the analysis are presented in Sections 18.5.6.1 to 18.5.6.5.

18.5.6.1 EPBC Act listed threatened birds

Field surveys recorded two listed threatened bird species within the study area. Based on potential habitat, the ecological assessment identified five EPBC Act listed threatened birds as either present, likely or possibly occurring within the study area (refer to Figures 8-4, 8-5 and 8-8 in *Technical Report G – Onshore Ecology*). The majority of habitat identified for the threatened birds related to fly-over and foraging habitats. For the Gang-gang Cockatoo (*Callocephalon fimbriatum)*, breeding habitat was also identified. A summary of the likelihood of occurrence is provided in Table 18-3.

Table 18-3 Likelihood of EPBC Act listed threatened birds within the study area

Scientific name	Common name	EPBC Act listing	Likelihood of occurrence
Neophema chrysostoma	Blue-winged Parrot	VU#	Likely visitor from time to time
Apus pacificus	Fork-tailed Swift	M (CAMBA, ROKAMBA, JAMBA)	Likely to fly over and forage
Callocephalon fimbriatum	Gang-gang Cockatoo	EN#	Recorded, suitable breeding habitat exists in footprint
Gallinago hardwickii	Latham's Snipe	VU# M (Bonn A2H, ROKAMBA, JAMBA, CAMBA)	Likely to occur from time to time
Neophema chrysogaster	Orange-bellied Parrot	CR	Possible. Occurrence and abundance in the study area is likely to be low and sporadic. Habitat represents a small proportion of available habitat
Lathamus discolor	Swift Parrot	CR	Recorded. Likely at times in the very limited areas of potential habitat within the footprint

Scientific name	Common name	EPBC Act listing	Likelihood of occurrence
Hirundapus caudacutus	White-throated Needletail	VU, M (CAMBA, ROKAMBA, JAMBA)	Likely to fly over and forage

Notes EPBC-T = threatened species status under EPBC Act (CR = Critically endangered; EN = endangered; VU = vulnerable); EPBC-M: migratory status under the EPBC Act (M = listed migratory taxa; Bonn Convention (A2H) – listed as a member of a family; Bonn Convention (A2S) - species listed explicitly; CAMBA - China-Australia Migratory Birds Agreement; JAMBA - Japan-Australia Migratory Birds Agreement; ROKAMBA - Republic of Korea Australia Migratory Birds Agreement); #- Species listed as threatened under the EPBC Act after the referral decision was made (2 June 2020) therefore not required to be assessed as a matter of national environmental significance in accordance with Section 158A(4) of the EPBC Act.

18.5.6.2 EPBC Act listed threatened mammals

Field surveys did not record any EPBC listed threatened mammals within the study area. Based on potential habitat, the ecological assessment identified two EPBC Act listed threatened mammals as likely or possibly occurring within the study area (refer to Figure 8-9 in *Technical Report G – Onshore Ecology*). The habitat identified was either recorded as foraging or of limited quality or disconnected from known locations. A summary of the likelihood of occurrence is provided in Table 18-4.

Table 18-4 Likelihood of EPBC Act listed threatened mammals within the study area

Scientific name	Common name	EPBC listing	Likelihood of occurrence
Pteropus poliocephalus	Grey-headed Flying-Fox	VU	Likely to forage within suitable habitat
Pseudomys novaehollandiae	New Holland Mouse	VU	Possible due to lack of records, lack of habitat, and known distribution.

Notes EPBC-T = threatened species status under EPBC Act (CR = Critically endangered; EN = endangered; VU = vulnerable)

18.5.6.3 EPBC Act listed threatened reptiles

No EPBC Act listed threatened reptiles were identified as present, likely or possibly occurring within the study area. While targeted surveys cannot guarantee absence of a species, it is considered unlikely that any EPBC Act threatened reptile species are present within the study area. EPBC Act threatened reptile species are therefore not discussed further in this chapter.

18.5.6.4 EPBC Act listed threatened frogs

Field surveys did not record any EPBC listed threatened frogs within the study area. Based on potential habitat, one EPBC Act listed threatened frog (Martins toadlet) was assumed to be present within the study area (refer to Figure 8-11 in *Technical Report G – Onshore Ecology*). The Martin's Toadlet (*Uperoleia martini*) was listed as threatened under the EPBC Act after the referral decision was made (2 June 2020) therefore is not required to be assessed as a matter of national environmental significance in accordance with Section 158A(4) of the EPBC Act.

18.5.6.5 EPBC Act listed threatened fish

No EPBC Act listed threatened fish were identified as present, likely or possibly occurring within the study area. While targeted surveys cannot guarantee absence of a species, it is considered unlikely that any EPBC Act threatened fish species are present within the study area. EPBC Act threatened fish species are therefore not discussed further in this chapter.

18.6 Construction impacts

This section discusses the impacts and risks associated with the construction of the project that relate to onshore ecology and the respective receptor groups.

18.6.1 Key impacts

18.6.1.1 EPBC Act listed threatened fauna (FFM-I006)

Potential impact

Potential impacts to EPBC Act listed threatened fauna relates to the direct and indirect removal of species habitat. Removal of habitat can have direct impacts to the species through mortality and displacement. Habitat removal can also fragment, deplete and reduce the quality of suitable habitat.

The ecological assessment identified eight listed threatened birds, two listed mammals and one listed frog under the EPBC Act as possibly, likely or known to occur within the study area. A summary of the species' impact within the study area is provided in section 18.5. Unmitigated, the impacts related to EPBC Act threatened fauna are considered localised and short to medium-term and rated as negligible to minor.

Mitigation

In addition to the mitigations to seek opportunities to further avoid impacts to native vegetation as far as reasonably practicable during the detailed design phase (FFM-M001) and the implementation of 'no-go zones' to protect retained native vegetation (FFM-M005), the project will also develop an environmental line list (FFM-M002), which identifies and documents ecological values at relevant chainages across the project area. The environmental line list will guide contractors in the development specific management requirements for these values. In support of the environmental line list, the project will prevent construction impacting on retained vegetation and habitat through installation of no-go zones (FFM-M005).

To minimise disturbance, injury or death of wildlife, the project will document mitigation measures to minimise disturbance, injury or death of wildlife during construction in a flora and fauna management plan (FFM-M006), including pre-habitat clearing surveys to ensure nests and hollows are free from threatened fauna prior to their removal.

Post construction, revegetation for habitats impacted by temporary construction will be implemented to restore habitat connectivity as far as reasonably practicable (FFM-M013).

Residual impact

Following effective implementation of mitigations, residual impacts related to EPBC Act listed threatened fauna are localised, short to medium-term and rated as negligible and moderate (refer to Table 18-5). The project is unlikely to have a significant impact on EPBC Act listed fauna.

Table 18-5 Summary of impacts on EPBC Act threatened fauna from construction

Scientific name	Common name	Initial impact	Residual impact			Residual impact
			Common alignment & option AB	Common alignment & option C	Common alignment & option D	
Apus pacificus	Fork-tailed Swift	Loss of small proportion of habitat	Nil			Negligible
Gallinago hardwickii	Latham's Snipe	Loss of low lying swamp and wetland habitat	Loss of <0.1 ha potential habitat			Negligible
Lathamus discolor	Swift Parrot	Loss of open forest and woodland foraging habitat	Loss of ~6.5 ha potential habitat	Loss of ~8.5 ha potential habitat	Loss of ~9 ha potential habitat	Minor
Hirundapus caudacutus	White-throated Needletail	Loss of small proportion of habitat	Nil			Negligible
Neophema chrysogaster	Orange-bellied Parrot	Loss of degraded pasture habitat	Loss of ~25 ha potential degraded pasture habitat			Minor
Pteropus poliocephalus	Grey-headed Flying-Fox	Loss of foraging habitat	Loss of ~8 ha potential habitat	Loss of ~10 ha potential habitat	Loss of ~10.5 ha potential habitat	Minor
Pseudomys novaehollandiae	New Holland Mouse	Loss of open forest and woodland habitat	Loss of ~4 ha potential habitat	Loss of ~2.5 ha potential habitat	Loss of ~2 ha potential habitat	Moderate

Table 18-6 Residual impacts on EPBC Act threatened fauna

Potential impact	Receptor group	Receptor sensitivity	Magnitude	Initial impact	Mitigations	Residual impact
Clearance of native vegetation removing habitat for EPBC Act listed threatened fauna	Habitat for EPBC Act listed threatened fauna	Minor-medium	Negligible - medium	Negligible Minor Moderate	FFM-M001; FFM-M002; FFM-M003; FFM-M004; FFM-M005; FFM-M009; FFM-M011; FFM-M012; FFM-M013	Negligible Minor Moderate

18.6.1.2 EPBC Act listed threatened flora (FFM-I007)

Potential impact

The ecological assessment identified habitat suitable for three EPBC listed threatened flora species and assessed these species as possibly occurring within the study area. Construction of the project may have direct and indirect impacts to the habitat for these threatened species. Direct impacts relate to the physical removal of the species habitat within the project area before or during construction. Indirect impacts relate to the excavation, generation of dust and compaction of areas adjacent to the species habitat which leads to effects on their viability. Without controls in place, the impacts related to EPBC Act threatened flora is considered localised and long-term and rated as moderate. A summary of impacts to threatened flora following implementation of mitigation measures is provided in Table 18-7.

Mitigation

To avoid and minimise impacts to native vegetation, the project discounted other transmission alignment options with more vegetation and has located infrastructure in areas without native vegetation where possible. Where the project intersects high value native vegetation, the project has sought to:

- Reduce the construction footprint
- Implement trenchless construction techniques to install underground cables
- implement no-go zones to avoid native vegetation (refer to Figure 14-1 in *Technical Report G – Onshore Ecology*).

The project will seek to further reduce impacts to native vegetation, as far as reasonably practicable, through ongoing design refinement which will:

- Confirmation any additional trenchless crossing sites (FFM-M001)
- Develop further no-go zones to reduce impacts to native vegetation by delineating and preventing specific construction activities within areas of native vegetation (FFM-M005).

By implementing no-go zones, native vegetation within and adjacent to construction areas can be retained. The project will develop an environmental line list (FFM-M002), which identifies and documents ecological values at relevant chainages across the project area. The environmental line list will guide contractors in the development specific management requirements for these values. In support of the environmental line list, the project will develop a flora and fauna management plan (FFM-M005) which will document the controls and procedures for construction staff to follow to protect threatened flora during construction.

Post construction, revegetation for habitats impacted by temporary construction will be implemented to restore habitat connectivity as far as reasonably practicable (FFM-M013). Table 18-7 details impact to native vegetation before and after the implementation of mitigations.

Residual impact

Although the project will have residual impact on habitat for EPBC Act listed threatened flora species, the localised loss of individuals or discrete populations is unlikely to result in a significant impact to the species. Following the effective implementation of mitigations, residual impacts related to threatened species that cannot be retained are considered localised and long-term and rated as moderate (refer to Table 18-8). Significant impacts to threatened EPBC Act flora species are unlikely.

Table 18-7 Summary of impacts to EPBC Act threatened flora

Scientific name	Common name	Initial impact	Residual impact			Residual impact rating
			Common alignment & option AB	Common alignment & option C	Common alignment & option D	
Caladenia tessellata	Thick-lip Spider-orchid	Loss of potential habitat within Plains Grassy Woodland ecological vegetation classes.	Loss of 2.901 ha potential habitat	Loss of 4.201 ha potential habitat	Loss of 4.201 ha potential habitat	Moderate
Prasophyllum spicatum	Dense Leek-orchid	Loss of potential habitat within Heathy Woodland ecological vegetation classes.	No impact	Loss of 0.101 ha potential habitat	No impact	Moderate

Table 18-8 Residual impacts on EPBC Act listed threatened flora

Potential impact	Receptor group	Receptor sensitivity	Magnitude	Initial consequence	Mitigations	Residual consequence
Clearance of native vegetation impacting EPBC Act listed threatened flora	Habitat for EPBC Act listed threatened flora	High	Low	Moderate	FFM-M001; FFM-M002; FFM-M003; FFM-M004; FFM-M005; FFM-M009; FFM-M011; FFM-M012; FFM-M013	Moderate

18.6.2 Potential risks

18.6.2.1 Habitat fragmentation (FFM-R009)

Potential risk

Installation of the underground cables will be carried out within a construction corridor up to 60 metres wide. This may disrupt continuity of native vegetation, potentially causing habitat fragmentation, in areas that that intersect with the construction corridor. These areas include:

- Roadsides containing corridors of native vegetation
- Waterways with fringing native vegetation
- The H28 Bushland Reserve which adjoins native vegetation on private land.

Habitat fragmentation has the potential to affect species that are dependent on continuous patches of vegetation for movement and dispersal, including include reptiles, frogs, small mammals, and small birds.

Disruption to movement of fauna is unlikely to be significant as most species likely to use the roadsides are mobile and able to stay in fragmented landscapes. The project has selected a transmission route that avoids large tracts of remnant vegetation, leading only to discrete areas of the project experiencing fragmentation elements.

Mitigation

The project proposes to further reduce impacts to native vegetation through refinement of the design (FFM-M001), during the development of the detailed design as far as reasonably practicable. The project will implement of 'no-go zones' throughout the alignment to further reduce impacts and protect retained native vegetation (FFM-M005). The project will develop an environmental line list (FFM-M002) which identifies and documents ecological values at relevant chainages across the project area. The environmental line list will guide contractors in the development specific management requirements for these values. In support of the environmental line list, the project will prevent construction impacting on retained vegetation and habitat through installation of no-go zones (FFM-M005).

To minimise disturbance, injury or death of wildlife, the project will document mitigation measures to minimise disturbance, injury or death of wildlife during construction in a flora and fauna management plan (FFM-M006), including pre-habitat clearing surveys to ensure nests and hollows are free from threatened fauna prior to their removal. Post construction, revegetation for habitats impacted by temporary construction will be implemented to restore habitat connectivity as far as reasonably practicable (FFM-M013).

Residual risk

Following effective implementation of mitigations FFM-M005 (flora and fauna management plan), FFM-M006 (fencing and trenching design) and FFM-M013 (revegetation program), residual risks related to fragmentation are considered localised and short to medium-term and rated as low (refer to Table 18-9).

Table 18-9 Risk of habitat fragmentation

Potential risk	Receptor group	Receptor sensitivity	Magnitude	Initial risk	Mitigations	Residual risk
Clearance of native vegetation disrupting connectivity for wildlife (habitat fragmentation) leading to exacerbation of EPBC Act threatening processes	Native vegetation and habitat	Low	Medium	Low	FFM01; FFM02; FFM03; FFM04; FFM05; FFM09; FFM11; FFM12; FFM13	Low

18.6.2.2 Indirect impacts on retained native vegetation and habitat (FFM-R010)

Potential risk

If construction vehicles and materials are inadvertently transported outside of the project boundary, there is potential for habitat for matters of national environmental significance to be negatively affected through unplanned clearance, smothering by dust, soil compaction, sedimentation, pollution, dust, noise or light.

Mitigation

To manage potential risks to retained vegetation and habitat, measures will be developed and incorporated into a Construction Environmental Management Plan which will incorporate a range of procedures to avoid and minimise indirect impacts (FFM-M003). These include, but are not limited to:

- Establishing project boundaries with particular focus where the project interfaces with conservation reserves (FFM-M005 and FFM-M009)
- Stockpile, sediment and erosion management procedures (FFM-M008)
- Minimise night-time works where practical to do so, to reduce impacts of noise and light on nocturnal animals (FFM-M006).
- Avoiding impacts on Hooded Plover within beach dunes during shore crossing activities (OFF-M05)

Post construction, revegetation for habitats impacted by temporary construction will be implemented to restore habitat connectivity as far as reasonably practicable (FFM-M013).

Residual risk

Following effective implementation of mitigations, residual risks related to retained vegetation and habitat are considered localised and short term and rated as low (refer to Table 18-10).

Table 18-10 Risk of indirect impacts on retained native vegetation and habitat

Potential risk	Receptor group	Receptor sensitivity	Magnitude	Initial risk	Mitigations	Residual risk
Degradation or loss of native vegetation and habitat (inadvertent clearance, smothering by dust, soil compaction, sedimentation, pollution, dust, noise, light)	Native vegetation	High	Negligible	Low	FFM-M002; FFM-M003; FFM-M004; FFM-M005; FFM-M006; FFM-M008; FFM-M009; FFM-M013; OFF-M05	Low

18.6.2.3 Introduction and spread of weeds, pathogens or pest animals (FFM-R011)

Potential risk

Proposed construction activities and methods may result in increased impacts on biodiversity from threats including weeds, pathogens and pest animals leading to the exacerbation of an EPBC Act key threatening processes. The introduction and spread of weeds and pathogens may result in a decline in retained vegetation quality, which then can result in a reduction of native fauna habitat. The introduction of weeds (particularly woody weeds) may also increase the availability of shelter for pest animals. Increases in the presence of pest fauna species may lead to a general decline in habitat and ecosystem structure.

Mitigation

Measures to manage and control impacts on retained vegetation from biosecurity threats (weeds, pathogens, and pest animals) will be outlined in a biosecurity management plan (FFM-M007). Measures in the plan will include, but are not limited to, site hygiene protocols and weed management measures.

Residual risk

Following effective implementation of FFM-M007 (biosecurity management plan), residual risks related to retained vegetation are considered localised and long term and rated as medium (refer to Table 18-11).

Table 18-11 Risk of introduction and spread of weeds, pathogens or pest animals during construction

Potential risk	Receptor group	Receptor sensitivity	Magnitude	Initial risk	Mitigations	Residual risk
Introduction or spread of weeds, pathogens, or pest species leading to the exacerbation of an EPBC Act threatening process	Native vegetation and habitat	High	Low	Medium	FFM-M002; FFM-M003; FFM-M004; FFM-M007	Medium

18.6.2.4 Exacerbating threatening processes (FFM-R014)

Potential risk

Key threatening processes under the EPBC Act relate to a cumulation of impacts to species and habitats. This relates to the initiation or exacerbation of vegetation clearance, habitat fragmentation, loss of habitat, alteration to waterways, degradation to retained vegetation, impacts to water quality and increased incursions of weeds, pathogens and pests.

Mitigation

During detailed design, the project will seek to further reduce impacts to native vegetation as far as reasonably practicable (FFM-M001). The project has also developed 'no-go zones' to further reduce impacts to native vegetation by delineating and preventing specific construction activities within areas of native vegetation (FFM-M005).

For the remaining threatening processes, the primary means of managing and mitigating impacts is through the development of detailed measures stipulated in a Construction Environmental Management Plan (FFM-M003), flora and fauna management plan (FFM-M005) and biosecurity management plan (FFM-M007).

Residual risk

Exacerbation of key threatening processes associated with native vegetation loss, hollow-bearing tree removal and habitat fragmentation are outlined in section 18.6.1.1 and 18.6.2.1 respectively. Implementation of mitigations will minimise exacerbation of threatening processes but not completely avoid exacerbation.

Other threatening processes including the introduction or spread of weeds, pathogens and pest animals, and degradation of riparian vegetation (vegetation located along the waterways and wetlands) should be able to be managed through implementation of measures to be defined in the Construction Environmental Management Plan and relevant sub-plans (FFM-M003, FFM-M005 and FFM-M007). No residual impacts are anticipated.

Following effective implementation of mitigations, residual risks related to retained vegetation are considered localised and short term and rated as low (refer to Table 18-12).

Table 18-12 Risk of exacerbating threatening processes

Potential risk	Receptor group	Receptor sensitivity	Magnitude	Initial risk	Mitigations	Residual risk
Initiation and /or exacerbation of other listed potentially threatening processes under the EPBC Act	Native vegetation and habitat	High	Low	Low	FFM-M002; FFM-M003; FFM-M005; FFM-M007	Low

18.6.2.5 Waterway crossing affecting Corner Inlet Ramsar site (FFM-R015)

Potential risk

The risks of impact are associated with the temporary causeway proposed during construction at the unnamed waterway UFI 4282679 in the shore crossing area. This waterway forms a connection between Freshwater Swamp, approximately 1.2 kilometres north of the site, and the Corner Inlet Ramsar Site located approximately 3 kilometres to the south of the site. The waterway may also be affected by groundwater drawdown that may occur if the transition joint bays are located within approximately 160 m of the waterway. The waterway is likely to be in connection with groundwater given the shallow depth to water table in this area.

Mitigation

A Designated Waterway Crossing Management Plan (FFM-M010) will be prepared to allow site-specific mitigations to be developed and implemented including measures at the unnamed waterway UFI 4282679 located at the shore crossing area to retain the waterways' hydrology and flow regime and measures to maintain bank stability.

Following micro-siting of the transition joint bays, a Dewatering Plan (FFM-M014) will be developed as a sub-plan to the CEMP that will include baseline groundwater and surface water monitoring in the shore crossing area.

Residual risk

With implementation of mitigation measures (FFM-M010) to prevent any significant impact on water quality and flow volumes in unnamed waterway UFI 4282679 at the shore crossing area and implementation of a Dewatering Plan (FFM-M014) for the transition joint bays, the residual risks related to the Corner Inlet Ramsar site are considered localised and short term and rated as low (refer to Table 18-13).

Table 18-13 Risk of waterway crossing affecting Corner Inlet Ramsar site

Potential risk	Receptor group	Receptor sensitivity	Magnitude	Initial risk	Mitigations	Residual risk
Construction across waterways and/or groundwater change affecting the Corner Inlet Ramsar Site	Corner Inlet Ramsar Site	High	Negligible	Low	FFM-M002; FFM-M003; FFM-M004; FFM-M008; FFM-M010; FFM-M011; FFM-M012; FFM-M014	Low

18.7 Operation impact assessment

This section discusses the impacts and risks associated with the operation of the project that relate to onshore ecology receptor groups.

18.7.1 Key impacts

The operation impact assessment identified no impacts on onshore ecology receptor groups with an impact rating of moderate or higher once mitigation measures have been implemented.

18.7.2 Potential risks

18.7.2.1 Indirect impacts on retained native vegetation and habitat (FFM-R016)

Potential risk

Operation of the project has the potential to impact on retained vegetation and habitat by:

- Weed or pathogen spread through regular vehicular traffic and associated personnel and equipment
- Loss of native vegetation by incursions of maintenance activity beyond the operation easement
- Ongoing ‘edge effects’ (the change in the composition of ecological communities at the border where two different habitats meet) which, in turn, may allow for increased opportunity for predation and weed or pathogen incursion
- Noise during maintenance activities along the easement that may result in temporary disturbance to local fauna species
- Dust generated during maintenance settling on, and impacting the health of, vegetation
- Surface water run off carrying pollution and/or sediment into waterways
- Removal of regenerating native vegetation if emergency works are required in the operational transmission easement.

Mitigation

To manage potential risks to retained native vegetation and habitat an Operation Environmental Management Plan will be prepared and implemented by the project (FFM-M011). The plan will contain measures to protect retained biodiversity values during operation, such as:

- Inductions to ensure awareness of values and measures to be implemented to protect those values
- Defining the extent of permitted maintenance and inspection works such as periodic slashing including no-go zones to protect retained native vegetation and threatened flora and fauna habitat
- Weed and pathogen hygiene measures and control.

Residual risk

The frequency of vehicle movement and maintenance activities during the project operation phase is not expected to lead to excessive or extensive risks of inadvertent impacts on retained native vegetation or disturbance to wildlife. Following implementation of mitigation FFM-M011 (Operation Environmental Management Plan), residual risks related to retained vegetation are considered localised and short term and rated as low (refer to Table 18-14).

Table 18-14 Risk to retained native vegetation and habitat

Potential risk	Receptor group	Receptor sensitivity	Magnitude	Initial risk	Mitigations	Residual risk
Indirect impacts leading to degradation or loss of retained native vegetation and habitat	Native vegetation and habitat	High	Negligible	Low	FFM-M002; FFM-M004; FFM-M005; FFM-M007; FFM-M008; FFM-M011; FFM-M013	Low

18.7.2.2 Introduction or spread of weeds, pathogens and pest animals (FFM-R017)

Potential risk

There is a potential risk for the spread of weeds, pathogens and pest animals during operation. The frequency of access required to maintain the asset will be low, which will reduce the potential for the risk to occur.

Mitigation

Weed, pathogen and pest control protocols outlined in the Operation Environmental Management Plan (FFM-M011) will ensure the risk is minimised as far as reasonably practicable.

Residual risk

Following effective implementation of mitigation FFM-M011 (Operation Environmental Management Plan), residual risks related to retained vegetation are considered localised and short term and rated as low (refer to Table 18-15).

Table 18-15 Risk of introduction or spread of weeds, pathogens and pest animals during operation

Potential risk	Receptor group	Receptor sensitivity	Magnitude	Initial risk	Mitigations	Residual risk
Introduction and/or spread of weeds and pathogens	Native vegetation and habitat	High	Negligible	Low	FFM-M002; FFM-M004; FFM-M007; FFM-M011	Low

18.7.2.3 Habitat fragmentation (FFM-R018)

Potential risk

The operational transmission easement will maintain clearances, meaning fragmentation impacts from the construction phase will remain throughout the operational phase. Given the duration to which this risk applies, the consequence is rated higher than in the initial construction phase.

Mitigation

Measures to minimise the risk are limited, due to the requirements to maintain safety clearances throughout the operational period. Compliance with measures outlined in the Operation Environmental Management Plan (FFM-M011) will ensure the risk is not exacerbated further.

Residual risk

Following effective implementation of mitigation FFM-M011 (Operation Environmental Management Plan, residual risks related to retained vegetation are considered localised and long term and rated as medium (refer to Table 18-16).

Table 18-16 Risk of habitat fragmentation

Potential risk	Receptor group	Receptor sensitivity	Magnitude	Initial risk	Mitigations	Residual risk
Prevention of regrowth of native vegetation contributing to ongoing habitat fragmentation	Protected wildlife (threatened and non-threatened)	Medium	Medium	Medium	FFM-M011	Medium

18.8 Decommissioning assessment

18.8.1 Impact assessment

Impacts associated with decommissioning relate to the potential removal of native vegetation to remove link and fibre pits and typical construction related impacts such as sedimentation, noise and dust, affecting matters of national environmental significance.

A decommissioning environmental management plan (FFM-M012) will be prepared in accordance with the future regulatory requirements. Native vegetation and fauna habitats affected by the project will ultimately regenerate and most species recolonise those restored areas.

Residual impacts are limited to the 40 metre wide transmission easement until all vegetation has grown to its full height. Hollow tree availability is expected to be constrained for decades given the time taken for hollow formation in eucalypts.

18.9 Cumulative impacts

This section provides an assessment of the potential for cumulative impacts of the project with other proposed developments in the region. The method to consider cumulative impacts is described in *Chapter 6 – Assessment Framework*.

Potential cumulative impacts arise when the effects of a single project on a receptor are considered along with the effects of other projects on the same receptor. Projects that are operational are part of the baseline environment, and the cumulative impact assessment focuses on future developments following a tiered assessment methodology.

The project identified in the cumulative assessment for onshore ecology is summarised in Table 18-17.

Table 18-17 Summary of cumulative impact assessment for onshore ecology

Project	Project Description	Findings of Assessment
Golden Beach Gas Project	Golden Beach Gas Project involves the development of the Golden Beach gas field in the Gippsland Basin to provide gas supply and storage infrastructure. The project comprises the construction, operation and eventual decommissioning of two offshore wells (approximately 3.8 km offshore), a 3.8 km subsea and shore crossing pipeline, an 18.8 km buried onshore pipeline, and pipeline facilities including a compressor station.	Spatial relevance: The Golden Beach Gas Project 18.8 km buried onshore pipeline, and pipeline facilities including a compressor station within approximately 30 km of the onshore transmission alignment for the Star of the South Offshore Wind Farm. The offshore component of the Golden Beach Gas Project is approximately 50 km from the offshore wind farm at the nearest point.
Marinus Link	Marinus Link is a proposed undersea electricity connection between Victoria and Tasmania. Marinus Link requires the construction of a high voltage direct current electricity interconnector between Tasmania and Victoria including a subsea cable and onshore cable and converter facilities. The shore crossing is proposed to be located at Waratah Bay. The onshore cable extends underground for approximately 90 km to the converter station adjacent to the existing terminal station at either Driffield or Hazelwood.	Spatial relevance: The project is of similar scale to Star of the South and in the same bioregion. There is overlap in the habitats to be impacted (coastal and near-coastal habitat).
Gippsland Offshore Wind Transmission 2GW Project (VicGrid)	The proposed Gippsland Offshore Wind Transmission 2GW Project is a new overhead transmission line from the Latrobe Valley to a new onshore connection hub in Giffard. The proposed VicGrid connection hub will comprise a high-voltage substation plant and equipment, including transformers, synchronous condensers and switchgear. The construction period is indicated as 2027 to 2030.	Spatial relevance: the Star of the South onshore transmission system is proposed to connect in with the VicGrid connection hub in Giffard, therefore the projects will be directly adjacent. The projects may impact on common flora and fauna values. Temporal relevance: based on the project timeframes, it is possible that construction periods could overlap. Operational periods will overlap. Potential cumulative risk pathway: construction and operation of the VicGrid connection hub could impact on threatened fauna and native vegetation within the Gippsland Plains bioregion.

Project	Project Description	Findings of Assessment
Great Eastern Offshore Windfarm	The proposed Great Eastern Offshore Windfarm, proposed by developer Corio is a fixed-bottom offshore wind farm approximately 22 km off the central Gippsland coast. The project is proposed to generate up to 2.5GW once operational. The onshore component of the project is proposed to connect to the same VicGrid connection hub as SOTS via an approximately 10km long transmission system.	Spatial relevance: the projects will connect to the same connection hub. Temporal relevance: based on the project timeframes, it is possible that construction periods could overlap. Operational periods will overlap. Potential cumulative risk pathway: construction and operation of the Corio project could impact on threatened fauna and native vegetation within the Gippsland Plains bioregion.

The cumulative assessment considered un-mitigated scenarios of the scoped cumulative projects to provide a conservative cumulative assessment. The assessment found the project has the potential to contribute to cumulative impacts on native vegetation and specific EPBC threatened flora and fauna species habitat when considered with the projects in the zone of influence. The potential for cumulative impacts does not alter the identified impact ratings or proposed mitigations within sections 18.6, 18.7 and 18.8. It is expected that as each project within the zone of influence will also be subject to the employment of avoidance and minimise principles as a condition of their respective approvals. The effective implementation of approval conditions for each project will minimise the potential for cumulative impacts from the conservative unmitigated scenarios assessed.

18.10 Summary of mitigation, monitoring and contingency measures

18.10.1 Mitigation measures

The following section outlines the mitigation measures developed to avoid and minimise impacts on onshore ecology within the study area. The focus of these mitigation measures is:

1 Avoiding impacts where possible; and

2 Developing, preparing and implementing project-specific measures to minimise impacts.

Detailed descriptions of each measure can be found in *Chapter 23 – Commonwealth Environmental Management Framework*, but the simplified mitigation measures are as follows:

Table 18-18 Mitigation measures relevant to Commonwealth legislated onshore ecology

ID	Mitigation measure and description
FFM-M001	Avoidance of impacts to ecological values during the design phase
FFM-M002	Prepare an Environmental Line List
FFM-M003	Prepare and implement a Construction Environmental Management Plan and sub-plans
FFM-M004	Contractor inductions and awareness
FFM-M005	Prevent construction impacting on retained vegetation and habitat not approved for removal
FFM-M006	Minimise disturbance, injury, or death of wildlife
FFM-M007	Control spread and/or introduction of weeds, pathogens and/or pest animals
FFM-M008	Reduce erosion, sedimentation and contamination risk to retained vegetation and habitat (including waterways)
FFM-M009	Protect values within conservation reserves
FFM-M010	Manage impacts on waterways
FFM-M011	Prepare and implement an Operation Environmental Management Plan
FFM-M012	Prepare and implement a Decommissioning Environmental Management Plan.
FFM-M013	Site reinstatement and rehabilitation

18.10.2 Monitoring and contingency measures

Monitoring requirements and contingency measures will be defined by the project in the relevant plans to be prepared in consultation with relevant authorities.

18.11 Offsets

As no significant impacts to matters of national environmental significance under the EPBC Act are proposed, EPBC Act offsets are not required.

18.12 Conclusion

The project area encompasses diverse landforms such as coastal and near-coastal areas, lowland plains and historically cleared and fragmented habitats primarily comprising grazing paddocks and plantations. Patches of forest and woodlands are found along roadsides, conservation reserves, and private land, while numerous ephemeral waterways occur along the transmission alignment. No native vegetation was assessed as meeting EPBC Act threatened ecological communities.

There are several threatened species recorded or with potential to occur within the project area. While efforts to avoid impacting these species have been significant, some unavoidable losses will occur. Direct pathways of impact include the removal of native vegetation and impacts to habitat of threatened species. While impact pathways are unavoidable, with the implementation of mitigation measures, the residual impacts to EPBC Act species are not considered to be significant.

Implementation of trenchless construction methods and a refined project transmission alignment will ensure minimal disruption to sensitive ecological areas. Well-defined management plans and protocols will protect ecological values during construction, operation, and decommissioning.

The project has been evaluated to balance development goals with the conservation of ecological values. This is demonstrated through the commitment to avoid and minimise impacts, together with robust mitigation and management plans.

It is considered that the matters outlined in the EIS guidelines have been adequately addressed as part of the onshore ecology impact assessment.