

Public Environment Report

## Chapter 7

# Impacts on listed threatened species and ecological communities, and on migratory species



# Chapter 7

## Impacts on listed threatened species and ecological communities, and on migratory species

This chapter responds to Section 2.5.1.1 of the PER Guidelines. It focuses on the matters of national environmental significance (MNES) known to be present or have preferred habitat present within the project boundary, and those outlined in Section 2 of the PER Guidelines that may be significantly impacted by North East Link. MNES assessed in this chapter are:

- Grassy Eucalypt Woodland of the Victoria Volcanic Plain
- Matted Flax-lily *Dianella amoena*
- River Swamp Wallaby-grass *Amphibromus fluitans*
- Clover Glycine *Glycine latrobeana*
- Swift Parrot *Lathamus discolor*
- Australian Painted Snipe *Rostratula australis*
- Australasian Bittern *Botaurus poiciloptilus*
- Grey-headed Flying-fox *Pteropus poliocephalus*
- Growling Grass Frog *Litoria raniformis*
- Macquarie Perch *Macquaria australasica*
- Australian Grayling *Prototroctes maraena*
- Latham's Snipe *Gallinago hardwickii*.

MNES not observed during targeted surveys or outlined in Section 2 of the PER Guidelines, are not discussed further in the main body of this PER. An assessment of these species has been undertaken for PER Technical Appendix A – Flora and fauna technical report.

The impact assessment for North East Link has assumed 100 per cent loss of vegetation within the project boundary, providing a conservative assessment.

## 7.1 Grassy Eucalypt Woodland of the Victorian Volcanic Plain

### 7.1.1 Details of protected matter and its habitat

Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVVP) is listed as a critically endangered ecological community under the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* ('EPBC Act'). A patch of GEWVVP was recorded in a small patch of land (approximately 1.5 hectares) between the M80 Ring Road (also known as the Metropolitan Ring Road) and Enterprise Drive. This patch of GEWVVP is currently managed by the City of Whittlesea. While the patch is not within the project boundary, it has been designated as a no-go zone by North East Link to protect it from potential impacts from the action.

For further information on this GEWVVP community, refer to Section 5.1 of Chapter 5 – Description of the environment.

### 7.1.2 Relevant impacts and mitigation measures

GEWVVP does not occur within the project boundary. As noted above, the patch located between the M80 Ring Road and Enterprise Drive is a designated 'no-go' zone for North East Link. The extent of this ecological community would therefore not be reduced due to the construction of North East Link, and no direct impacts are expected.

While nearby North East Link construction activities have the potential to facilitate weed encroachment onto the GEWVVP 'no-go' zone, understorey composition of the remnant woodland would unlikely be negatively affected, as it is already almost totally dominated by introduced species.

No mitigation measures are required in addition to those outlined in Chapter 10 – Proposed avoidance and mitigation measures. Table 7-1 summarises the assessment of potential impacts to GEWVVP against the EPBC Act Significant impact guidelines 1.1 for a critically endangered community.

**Table 7-1** Assessment of the action against significant impact criteria for Grassy Eucalypt Woodland of the Victorian Volcanic Plain

Criterion	Response
Reduce the extent of an ecological community.	<b>Unlikely</b> GEWVVP does not occur within the project boundary. The site adjacent to the project boundary has been designated as a no-go zone for North East Link. Consequently, the construction of North East Link would not reduce the extent of this ecological community.

Criterion	Response
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.	<b>Unlikely</b> For the reasons outlined in response to the criterion <i>Reduce the extent of an ecological community</i> .
Adversely affect habitat critical to the survival of an ecological community.	<b>Unlikely</b> For the reasons outlined in response to the criterion <i>Reduce the extent of an ecological community</i> .
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.	<b>Unlikely</b> Construction of North East Link adjacent to this ecological community would unlikely influence groundwater levels or alter surface water drainage patterns. The M80 Ring Road is currently located approximately 5–10 m south of the remnant GEVVVP. It is unlikely that North East Link would result in further lowering of the road surface and a change in groundwater levels at this site.
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.	<b>Unlikely</b> Construction of North East Link adjacent to this ecological community would unlikely result in a substantial change in the species composition of the ecological community. The understorey is already almost totally dominated by introduced species.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to: <ul style="list-style-type: none"> <li>Assisting invasive species that are harmful to the listed ecological community, to become established, or</li> <li>Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.</li> </ul>	<b>Unlikely</b> For the reasons outlined in response to the criterion immediately above.
Interfere with the recovery of an ecological community.	<b>Unlikely</b> For the reasons outlined in response to the criterion <i>Reduce the extent of the ecological community</i> .

### 7.1.3 Residual impacts

No residual impacts are expected following the implementation of mitigation measures outlined in Chapter 10 – Proposed avoidance and mitigation measures.

Potential impacts to this community are outlined in Section 7.1.2 of this chapter and are not unknown, unpredictable or irreversible.



## 7.2 Matted Flax-lily *Dianella amoena*

### 7.2.1 Details of protected matter and its habitat

Matted Flax-lily is listed as endangered under the EPBC Act. Matted Flax-lily occurs in Victoria and Tasmania, and multiple populations have been identified in the northern suburbs of Melbourne, typically within remnant vegetation alongside road or rail corridors, conservation reserves and in translocation sites (Carter, 2010). Matted Flax-lily is a small, perennial, tufted lily endemic to south-east Australia, occurring in grassland and grassy woodland habitats. The species rarely germinates from seed (Carter, 2010) but has occasionally been observed to colonise bare earth where it occurs in close proximity to existing plants (PER Technical Appendix A – Flora and fauna technical report).

The National Recovery Plan for the Matted Flax-lily *Dianella amoena* Carter (2010) describes Matted Flax-lily as:

*... in the family Hemerocallidaceae (formerly included in the family Liliaceae) is a tufted, mat-forming perennial lily. Plants are rhizomatous and can form loose clumps up to 5 m wide. Rhizomes are yellow and slender, with shoots arising every 10–30 cm. Leaves are grey-green, dull crimson at the base, narrow and tapering, to 45 cm long by 12 mm wide, and broadly V-shaped, with a prominent abaxial keel along the midrib and loose clasping leaf sheaths. Blades, sheaths and midribs usually have small, irregularly spaced teeth. Leaves are deciduous in summer if plants are water-stressed (Gray & Knight 2001, as cited in (Carter, 2010)). The inflorescence is erect, 20–90 cm long, with a slender, arching scape that bears several bluish, star-shaped, nodding, sweetly fragrant flowers. Perianth segments are pale to deep blue-violet, recurved, elliptic, to 10 mm long by 3 mm, the outer tepals with five veins, the inner tepals with three veins. There are six stamens, to 7 mm long, with pale yellow filaments, orange strumae and pale lime-yellow anthers, while the style is whitish-translucent, to 6 mm long. Fruits are ovoid purple berries to 7 mm long, and seeds are shiny black and smooth, to 3 mm long. Flowering occurs from October to April (description from Carr & Horsfall, 1995 as cited in (Carter, 2010)).*

A number of previous investigations into the populations of Matted Flax-lily present at Simpson Barracks have been undertaken. Jacobs (2016) counted 603 ramets (an individual within a clonal colony) across Simpson Barracks during their survey. This result indicates that Simpson Barracks supports one of the larger sub-populations of Matted Flax-lily in the Melbourne Metropolitan area. Matted Flax-lily was identified on both the eastern and western sides of the base, with the greatest proportion of the population (87% or 60 locations) occurring on the eastern side of the base (Jacobs, 2016). Previous field surveys undertaken by HLA (2007) have also identified Matted Flax-lily on-site. (HLA, 2007) conducted surveys during the recommended spring survey period (between November 1998 and January 1999) and reported at least 72 individuals.

Targeted surveys identified a total of 95 individual Matted Flax-lily plants/patches within the project boundary. Of these, 83 individuals are within Simpson Barracks (including within the publicly accessible section of Commonwealth land).

An additional 200 plants/patches occur at Simpson Barracks outside the project boundary.

Known and potential habitat for this species within the project boundary are discussed in Section 5.1 of Chapter 5 – Description of the environment.

## 7.2.2 Relevant impacts and mitigation measures

The removal of vegetation for North East Link would involve the clearance of 95 individual Matted Flax-lily plants/patches at five discrete sites. This comprises 83 plants/patches at Simpson Barracks/Borlase Reserve, four at the M80 Ring Road interchange, and a patch (15 x two metres) and seven individuals at three discrete locations along the Hurstbridge rail line.

To place the proposed Matted Flax-lily impact in context, an additional 200 plants/patches are known to occur at Simpson Barracks outside of the project boundary, based on additional surveys undertaken during North East Link, and from surveys undertaken by HLA (2007) and Jacobs (2016), indicating that the total population size at Simpson Barracks is at least 283 plants/patches.

This suggests that approximately 30% (83 out of 283 plants/patches) of the Simpson Barracks population are likely to be affected. There are also parts of the Barracks outside of the project boundary that contain suitable grassy woodland habitat that are yet to be surveyed. Consequently, the total population size could be notably larger than the 283 plants/patches identified.

While Simpson Barracks is listed as a 'significant population' in the National Recovery Plan (10 plants recorded at the time of the National Recovery Plan, suggesting that it was the 16<sup>th</sup> largest population listed in the plan), based on the current information, it is now likely to support one of the largest known populations of Matted Flax-lily.

It is likely that North East Link would reduce area of occupancy of Matted Flax-lily through clearance of the habitat that supports the species, however it would not reduce the total range of the species. It is considered unlikely that any of the identified populations would be fragmented, as plants to be removed from Simpson Barracks are from the edge of the population, and other patches would be entirely removed assuming all vegetation within the project boundary would be lost.

Through detailed design, the removal of Matted Flax-lily due to construction activities would be minimised. To avoid inadvertent impacts on retained Matted Flax-lily, weed control measures would be developed and outlined in the Construction Environmental Management Plan (CEMP), to control weeds within Simpson Barracks adjacent to the eastern edge of the project boundary in the area where Matted Flax-lily would be retained. It should also be noted the total number recorded within the project boundary and the actual number of plants to be removed at significant sites (such as at Simpson Barracks) may be reduced with the further refinement of North East Link at the detailed design stage. For general mitigation regarding habitat removal, refer to Chapter 10.

Table 7-2 summarises the assessment of impacts to Matted Flax-lily against the EPBC Act Significant impact guidelines 1.1 for an endangered species.

Table 7-2 Assessment of the action against significant impact criteria for Matted Flax-lily

Criterion	Response
Lead to a long-term decrease in the size of a population	<p><b>Likely (without translocation)</b>  <b>Unlikely (with translocation)</b> – for context, see discussion after table on ‘proposed mitigation measures’, ‘translocation’ and ‘residual impact’.</p> <p>Works would require removal of up to 95 Matted Flax-lily plants/patches. It should be noted that this is the total number recorded within the project boundary and the actual number of plants to be removed in significant sites (such as Simpson Barracks) may be reduced following detailed design. An additional 200 plants/patches occur nearby at Simpson Barracks outside of the project boundary, suggesting approximately 30% (83 out of 283 plants/patches) of the Simpson Barracks population would be removed. Based on this level of impact to the Simpson Barracks population, in the absence of mitigation or translocation, it is likely that North East Link would result in a long-term decrease in the size of the population at Simpson Barracks in particular. However, with implementation of the mitigation measures and Salvage and Translocation Plan discussed below it is considered unlikely that North East Link would result in a long-term decrease in the size of a population.</p>
Reduce the area of occupancy of the species	<p><b>Likely</b>  <b>Unlikely (with translocation)</b> – for context, see discussion after table on ‘proposed mitigation measures’, ‘translocation’ and ‘residual impact’.</p> <p>North East Link would likely result in the loss of Matted Flax-lily at five discrete sites, totalling up to 95 discrete patches/individuals separated by at least 1 m. In the absence of mitigation measures, North East Link would reduce the area of occupancy of the species through the direct removal of: a) 83 plants/patches of Matted Flax-lily in Plains Grassy Woodland at Simpson Barracks, and b) four plants/patches in Grassy Dry Forest at the M80 Ring Road interchange. In addition, three small locations in a patch of Grassy Dry Forest along the Hurstbridge rail line would potentially be removed. While the area of occupancy of the species would be reduced (in the absence of mitigation), the total geographical range of the species would not be reduced. However, with implementation of the translocation measures proposed below, it is considered unlikely that the overall area of occupancy of the species would be reduced, as occupancy would be reduced in some areas but increased in others via translocation.</p>
Fragment an existing population into two or more populations	<p><b>Unlikely</b></p> <p>While plants are expected to be removed for the construction of North East Link, it is unlikely the works would fragment existing populations at any of the identified sites into two or more populations. For example, while impacts in terms of total numbers at Simpson Barracks are expected to be significant, the population of Matted Flax-lily would not be fragmented, as plants that would be removed are on the edge of the population.</p>

Criterion	Response
Adversely affect habitat critical to the survival of a species	<p><b>Possible (with translocation)</b></p> <p>No habitats within the study area are identified on the Register of Critical Habitat (however, it should be noted the Register of Critical Habitat currently does not include any listing for the Matted Flax-lily). In addition, information regarding habitat critical to the survival of the species is not available in the <i>National Recovery Plan for the Matted Flax-lily Dianella amoena</i> (Carter, 2010).</p> <p>While Simpson Barracks is listed as a ‘significant population’ in the Recovery Plan (10 plants recorded at the time of the Recovery Plan, suggesting that it was the 16<sup>th</sup> largest population listed in the plan), the surveys associated with North East Link, and other historical surveys by HLA (2007) and Jacobs (2016) indicate the total population size at Simpson Barracks is at least 283 plants/patches (83 of which fall within the project boundary). The total population size at Simpson Barracks suggests that it is likely to be one of the largest known populations of Matted Flax-lily. Although habitat critical to the survival of the species has not been formally recognised or documented, given the significance of the population it is possible that North East Link may adversely affect habitat critical to the survival of the species, even with the implementation of mitigation or translocation measures.</p>
Disrupt the breeding cycle of a population	<p><b>Unlikely</b></p> <p>Native bees are the natural pollinator of Matted Flax-lily, with translocated plants observed to have been successfully pollinated (Ecology Australia, 2014). However, little evidence exists to indicate whether pollinated flowers translate to successful seed germination and recruitment. Matted Flax-lily apparently does not readily regenerate from seed <i>in situ</i>, and no seedlings have been seen at any site, indicating that at least some processes upon which the species relies have probably been disrupted (Carter, 2010). However, it has been noted at other sites that Matted Flax-lily can occasionally colonise disturbed substrates such as embankments via clonal growth. Measures would be implemented as part of the CEMP to minimise impacts on native vegetation and Matted Flax-lily to be retained, including minimising the areas of vegetation to be disturbed, no-go zones, weed management and hygiene measures. Consequently, while individuals would be removed, works are unlikely to disrupt the breeding cycle of a population.</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><b>Likely (without translocation)</b></p> <p><b>Unlikely (with translocation)</b> Quality habitat for Matted Flax-lily would be removed for North East Link. For further information, see the response to the above criterion <i>Lead to a long-term decrease in the size of a population and Reduce the area of occupancy of the species</i>.</p> <p>In the absence of mitigation and translocation measures, habitat for Matted Flax-lily would be removed to the extent that the species is likely to decline. Reasons are outlined above under the criteria, <i>Lead to a long-term decrease in the size of a population and Reduce the area of occupancy of the species</i>. However, with implementation of the mitigation and translocation measures proposed below, it is considered unlikely that the species would decline.</p>



Criterion	Response
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	<p><b>Possible (without mitigation)</b>  <b>Unlikely (with mitigation)</b></p> <p>In the absence of mitigation measures, it is possible that invasive species may become established in the retained habitat for Matted Flax-lily (that is, east of the project boundary) at Simpson Barracks, owing to ground disturbance in the immediately adjacent construction area facilitating weed invasion or encroachment.</p> <p>However, management requirements for noxious weed species and best practice hygiene measures would be incorporated into the CEMP and implemented during construction. With the implementation of mitigation and avoidance measures outlined in Chapter 10 – Proposed avoidance and mitigation measures, it is considered unlikely that invasive species would become established in the retained habitat for Matted Flax-lily as a result of North East Link.</p>
Introduce disease that may cause the species to decline	<p><b>Unlikely</b></p> <p>No diseases known to affect Matted Flax-lily would likely be activated or exacerbated by the construction of North East Link. Consequently, it is unlikely that any disease would be introduced to the retained Matted Flax-lily habitat at Simpson Barracks.</p>
Interfere substantially with the recovery of the species	<p><b>Likely (without translocation)</b>  <b>Unlikely (with translocation)</b> – for context, see discussion after table on 'proposed mitigation measures', 'translocation' and 'residual impact'.</p> <p>Threats to the survival of the Matted Flax-lily as identified in the <i>National Recovery Plan for the Matted Flax-lily Dianella amoena</i> include weed invasion/competition, habitat destruction and disturbance, and population fragmentation (Carter, 2010). In the absence of mitigation and translocation measures, North East Link would reduce the area of occupancy for the species and exacerbate identified threatening processes such as weed invasion. Vegetation clearance would also result in the loss of up to 95 plants/patches, which in the absence of mitigation and translocation measures, is likely to interfere with the recovery of the species. However, with implementation of the mitigation and translocation measures proposed below, it is considered unlikely that North East Link would interfere substantially with the recovery of the species.</p>

## Salvage and Translocation Plan

To minimise unavoidable residual impacts on the Matted Flax-lily, removed plants are proposed to be translocated to suitable alternative sites. Currently, the North East Link Project (NELP) is investigating potential recipient sites within the City of Whittlesea, City of Darebin and City of Banyule, as well as in the eastern section of Simpson Barracks.

In the National Recovery Plan for Matted Flax-lily (Carter, 2010) translocation to bolster existing populations or establish new populations, is listed as one of eight specific objectives for the recovery of Matted Flax-lily. The EPBC Act Policy Statement Translocation of Listed Threatened Species (DSEWPAC 2013) notes that a key issue when considering translocation is the probability of long-term success.

A Salvage and Translocation plan has been developed (presented in PER Technical Appendix A – Flora and fauna technical report), which includes methods to maximise the success of the translocations including:

- Multiple clones would be taken for each plant removed from the ground to support persistence of the plants
- Stock would be maintained in an approved nursery with experience in the management and handling of Matted Flax-lily
- Recipient sites would be selected based on an approved process, with key elements being suitability of habitat, and commitment to ongoing maintenance required for the species to establish successfully
- Implementation of a detailed 10-year monitoring plan to determine progress over time. The plan would incorporate thresholds of plant condition and survivorship for which additional management action would be required.

Translocation of Matted Flax-lily has been successfully completed for other major projects, with (Carter, 2010) indicating a success rate of 80 to 90 per cent (over a period of five years) for salvage undertaken in 2004 from grasslands in Craigieburn and translocated into reserves in Craigieburn, Fawkner, Somerton and Whittlesea. In recent years, a number of large-scale Matted Flax-lily translocation projects have been undertaken in the greater Melbourne area, including the Sugarloaf Pipeline Project (Yarra Glen), South Morang Rail Extension and the Level Crossings Removal Project (Mernda). As an example of the success of previous translocation efforts, the Sugarloaf Pipeline Project established a post-translocation 5-year monitoring program (Ecology Australia, 2014), with the results summarised below:

- *Dianella amoena* was easily translocated and as a robust, rhizomatous herb it readily established and soon became reproductive
- Survivorship amongst the cohorts was high over the 5-year monitoring period, ranging from 70–100% at each translocation subplot/site
- Positive trends in vegetative performance (growth) were evident in the number of shoots per plant, basal diameter of plants and leaf length, which confirmed the ease of establishment and excellent growth under good conditions
- Weed invasion presented a severe problem, with weed control the only significant management issue.

## 7.2.3 Residual impacts

With the implementation of a salvage and translocation program, significant impacts on Matted Flax-lily are expected to be unlikely for eight of the nine significant impact criteria, while significant impacts are possible for one criterion: 'Adversely affect habitat critical to the survival of a species'. However, the residual impact of the action on Matted Flax-lily is expected to be non-significant for the following reasons:

- Salvage and translocation is a specific action identified under the National Recovery Plan for Matted Flax-lily (Carter, 2010 )
- There is a documented successful track record of Matted Flax-lily salvage and translocation in the greater Melbourne area over the past decade (eg Carter, 2010; Ecology Australia, 2014)
- The evidence suggests that there are solid prospects of long-term survivorship of translocated individuals
- The translocation risk is proposed to be spread across a number of potential receptor sites in the local area, minimising the risk of failure
- Multiple ramets would be harvested (and grown on) from each plant/patch to be salvaged; therefore, it is likely that the overall population size in the local area would increase following implementation of the translocation program.

In addition, given that multiple ramets would be harvested (and grown on) from each plant/patch to be removed, it is likely the overall population size in the local area would increase.

Noting that the residual impacts on Matted Flax-lily are expected to be non-significant, no offsetting of Matted Flax-lily is proposed. Any loss of the native vegetation that provides habitat would be offset in accordance with the DELWP *Guidelines for the removal destruction and lopping of native vegetation* (2017a).

## 7.3 River Swamp Wallaby-grass *Amphibromus fluitans*

### 7.3.1 Details of protected matter and its habitat

River Swamp Wallaby-grass is listed as vulnerable under the EPBC Act. River Swamp Wallaby-grass was not observed during field assessments. An assessment of VBA data found a high likelihood of its presence, with nine recent records within the study area. The field assessment identified potentially suitable areas of habitat such as Banyule Swamp, Trinity Grammar School Sporting Complex wetlands and Bolin Bolin Billabong.

The quality of the potential habitat within the project boundary is relatively poor, while known records occur nearby in better quality habitat on the Yarra Flats, Banyule Flats and Bolin Bolin Billabong outside the project boundary. These areas outside the project boundary are more likely to be considered as habitat critical to the survival of the species due to their size, number of records and management regime.

Wetland B at Trinity Grammar is the only historical location within the project boundary where River Swamp Wallaby-grass has been recorded (Australian Ecosystems, 2007). Despite this record, a targeted search for the species during its flowering time in December 2018 failed to locate any individuals.

Based on the quality of habitat within the project boundary, the existence of recent nearby records and the results of targeted surveys, it is assumed that River Swamp Wallaby-grass occurs within the project boundary at the Trinity Grammar wetlands.

For further information on River Swamp Wallaby-grass and its potential habitat, refer to Section 5.1 of Chapter 5 – Description of the environment.

## 7.3.2 Relevant impacts and mitigation measures

### Relevant impacts

Despite its assumed presence within the project boundary at Trinity Grammar Wetland B, River Swamp Wallaby-grass is not expected to be significantly impacted as the majority of potentially suitable habitat falls within areas that would not be directly impacted by surface works. However, potential groundwater drawdown (0.1 to 0.5 metres) in the vicinity of the southern portal due to tunnelling activities beneath the Yarra River could reduce water available to wetlands reliant on groundwater to some degree, and subsequently potentially affect population viability.

The extent of drawdown at sensitive receptor sites outside the project boundary where the species has been previously recorded (Bolin Bolin Billabong, Yarra Flats, Banyule Flats, Trinity Grammar Wetland D) is modelled to be relatively minor, particularly in the context of natural seasonal and year-to-year variation in water levels. The drawdown is estimated to be 0.1 to 0.5 metres at Bolin Bolin Billabong, with mounding of 0.1 to 0.5 metres at Trinity Grammar Wetland D.

In the absence of mitigation measures, it is unlikely (but possible) that invasive species could become established in the retained habitat for River Swamp Wallaby-grass immediately adjacent to the project boundary (that is, east of the project boundary at Trinity Grammar Wetland D and west of the project boundary at Bolin Bolin Billabong), owing to ground disturbance associated with North East Link in the immediately adjacent construction area. These nearby areas are subject to a range of urban pressures including weed invasion and are already managed for conservation purposes. Consequently, it is considered unlikely that North East Link would result in invasive species becoming established in River Swamp Wallaby-grass habitat.

Table 7-3 summarises the assessment of impacts to River Swamp Wallaby-grass against the EPBC Act Significant impact guidelines 1.1 for a vulnerable species.

Table 7-3 Assessment of the action against significant impact criteria for River Swamp Wallaby-grass

Criterion	Response
Lead to a long-term decrease in the size of an important population of a species	<p><b>Unlikely</b></p> <p>The conservation advice for the species does not outline the location of any important populations in Australia. Furthermore, it is unlikely the Trinity Grammar population (if still present) constitutes an important population.</p> <p>River Swamp Wallaby-grass has been historically recorded within the project boundary at Trinity Grammar School Sporting Complex wetland B (Australian Ecosystems, 2007). Despite targeted survey during the flowering season of this species, it was unable to be located at this wetland. In addition, it has been recorded in close proximity to the project boundary at four locations: a) Bolin Bolin Billabong, b) Yarra Flats north of Bolin Bolin, c) Banyule Flats and d) Trinity Grammar wetland D, however these locations fall outside of the impacted area. Consequently, it is unlikely that North East Link would lead to a long-term decrease in the size of an important population of River Swamp Wallaby-grass.</p>
Reduce the area of occupancy of an important population	<p><b>Unlikely</b></p> <p>For the reasons outlined in the above response to the criterion <i>Lead to a long-term decrease in the size of an important population of a species</i>, which indicates the project boundary unlikely supports an important population of the species, it is unlikely that North East Link would reduce the area of occupancy of an important population.</p>
Fragment an existing important population into two or more populations	<p><b>Unlikely</b></p> <p>For the reasons outlined in response to the criterion <i>Lead to a long-term decrease in the size of an important population of a species</i>, which indicates the project boundary unlikely supports an important population of the species, it is considered unlikely that North East Link would fragment an existing important population into two or more populations.</p>
Adversely affect habitat critical to the survival of a species	<p><b>Unlikely</b></p> <p>No habitats within the project boundary are identified on the Register of Critical Habitat (however, it should be noted the Register of Critical Habitat currently does not include any listing for River Swamp Wallaby-grass). The quality of the potential habitat within the project boundary is relatively poor, and areas outside the project boundary are more likely to be considered as habitat critical to the survival of the species due to their size, number of records and management regime. In summary, although habitat critical to the survival of the species has not been formally recognised or documented, it is considered unlikely that North East Link would adversely affect habitat critical to the survival of the species.</p>



Criterion	Response
Disrupt the breeding cycle of an important population	<p><b>Unlikely</b></p> <p>For the reasons outlined in response to the criterion <i>Lead to a long-term decrease in the size of an important population of a species</i>, which indicates the project boundary unlikely supports an important population of the species, it is considered unlikely that North East Link would disrupt the breeding cycle of an important population.</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><b>Unlikely</b></p> <p>Wetland B at Trinity Grammar is the only historical location within the project boundary where River Swamp Wallaby-grass has been recorded (Australian Ecosystems, 2007). If still present at this wetland, the potential direct removal of habitat would unlikely be of an extent that would cause the species to decline. North East Link also has the potential to indirectly modify available habitat through groundwater drawdown. However, the extent of the drawdown is modelled to be relatively minor, and the quality or availability of habitat for the species would unlikely be modified or removed to the extent the species would likely decline.</p>
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	<p><b>Unlikely</b></p> <p>In the absence of mitigation measures, it is unlikely (but possible) that invasive species would become established in the retained habitat for River Swamp Wallaby-grass outside the project boundary. These areas are already subject to weed invasion and are managed for conservation purposes. It is considered unlikely that North East Link would result in invasive species that are harmful to a vulnerable species becoming established in the habitat of vulnerable species. Nevertheless, construction methods would be implemented through the CEMP so it would be unlikely that invasive species would be introduced.</p>
Introduce disease that may cause the species to decline	<p><b>Unlikely</b></p> <p>No diseases known to affect River Swamp Wallaby-grass are likely to be activated or exacerbated by construction of North East Link. It is therefore unlikely that any disease would be introduced to the retained River Swamp Wallaby-grass habitat in floodplain areas near to the project boundary.</p>
Interfere substantially with the recovery of the species	<p><b>Unlikely</b></p> <p>Threats to the survival of River Swamp Wallaby-grass as identified in the Conservation Advice for the species include grazing and trampling by livestock, hydrological changes, and invasion of remnant habitats by exotic grasses and weeds. As outlined above, minor hydrological (groundwater) changes as a result of tunnelling are likely in nearby wetlands where the species is known to occur (Bolin Bolin Billabong). However, based on detailed groundwater modelling, these impacts would likely be relatively minor in the context of natural seasonal and annual variation in water depth (drawdown of 0.1-0.5 m at Bolin Bolin Billabong, and mounding of 0.1 to 0.5 m at Trinity Grammar wetland D). Any removal of habitat at Trinity Grammar wetland B would likely have a minor effect on the species, if indeed it still persists at this wetland (note – targeted surveys failed to locate the species). On the available evidence, it is therefore unlikely that construction of North East Link would interfere substantially with the recovery of the species.</p>

## Mitigation measures

Given the relatively minor ecological impact of changes to surface water levels, and the uncertainty of the degree of change expected, the recommended method for protecting the aquatic ecosystem of Bolin Bolin Billabong, and by inference, River Swamp Wallaby-grass, would be to undertake water level monitoring in the deep pool to confirm the actual changes to surface water. Water level monitoring would be recommended as part of a groundwater dependant ecosystem (GDE) monitoring and mitigation plan, which would include the surface expression of groundwater at Bolin Bolin Billabong. This monitoring could inform the need for mitigation measures to maintain water depth in the deep pool. Therefore, a groundwater and surface water monitoring program would be required to determine the level of change in this ecosystem during the construction of North East Link.

Melbourne Water are actively managing the hydrological regime of the billabong. To avoid ecosystem changes in the groundwater dependent deep pool in Bolin Bolin Billabong, groundwater levels in this area should be maintained to the extent practicable. This would also serve to avoid the potential for activation of acid sulfate soils. If monitoring of groundwater and surface water levels indicated changes to water levels that may impact ecosystem conditions at Bolin Bolin billabong, measures to mitigate the impact of these changes would be identified. Measures to maintain supply to identified groundwater users and protect groundwater quality recharged to the environment would be developed and implemented. In particular, the protection of groundwater quality would need to consider any use or recharge activities used to maintain water levels in GDEs that support listed species such as River Swamp Wallaby-grass (such as Bolin Bolin Billabong) to prevent impacts to groundwater or surface water quality and protect environmental conditions of the GDEs.

Finally, weed control measures would be developed and outlined in the CEMP to control weeds in the area immediately adjacent to the project boundary at the Trinity Grammar wetlands.

### 7.3.3 Residual impacts

Following implementation of mitigation measures, the residual impacts on River Swamp Wallaby-grass are anticipated to be low. Any direct loss of habitat would be offset in accordance with the *Victorian Guidelines for the removal destruction and lopping of native vegetation* (DELWP, 2017).

## 7.4 Clover Glycine *Glycine latobeana*

### 7.4.1 Details of protected matter and its habitat

Clover Glycine is listed as vulnerable under the EPBC Act. Clover Glycine was not recorded in the project boundary during targeted surveys, although eight records have been documented in the VBA within a five-kilometre radius of the project boundary.

Better quality remnant patches of Plains Grassy Woodland and Riparian Woodland such as Simpson Barracks, Banyule Reserve and some elevated flats along Koonung Creek were considered to have a higher potential to support the species because of their archetypal indigenous grassland structure.

Based on the presence of potentially suitable habitat it is considered to have a moderate likelihood of occurrence within the project boundary.

For further information on Clover Glycine, refer to Section 5.1 of Chapter 5 – Description of the environment.

## 7.4.2 Relevant impacts and mitigation measures

North East Link has the potential to reduce available habitat suitable for Clover Glycine.

While no individuals of Clover Glycine are known within the project boundary, attempts would be made to minimise loss of potential Plains Grassy Woodland habitat, particularly at Simpson Barracks, which contains the most likely habitat for the species within the project boundary.

Table 7-4 summarises the assessment of impacts to Clover Glycine against the EPBC Act Significant impact guidelines 1.1 for a vulnerable species.

**Table 7-4** Assessment of the action against significant impact criteria for Clover Glycine

Criterion	Response
Lead to a long-term decrease in the size of an important population of a species	<b>Unlikely</b> Populations important to the survival of Clover Glycine have not been identified within the project boundary. However, significant populations based on size, geographic spread and land tenure have been identified in the <i>National Recovery Plan for the Clover Glycine (Glycine latrobeana)</i> (Carter , O; Sutter, G, 2010). None of these populations occur within the project boundary. While targeted surveys during the flowering season in areas of potential habitat identified no plants within the project boundary, eight sites have been documented on the VBA within a five-kilometre radius of the project boundary. Consequently, there remains a possibility, albeit low, that the species may occur within the project boundary. Given the available evidence, it is unlikely that North East Link would lead to a long-term decrease in the size of an important population of the species.
Reduce the area of occupancy of an important population	<b>Unlikely</b> While North East Link has the potential to impact habitat suitable for Clover Glycine, the species was not recorded within the project boundary during targeted surveys for the species. As outlined above, it is unlikely that an important population occurs within the project boundary. While it is possible the area of occupancy of the species may be reduced through clearance of the habitat that supports the species (if it actually occurs within the project boundary), this would unlikely reduce the area of occupancy for an important population.

Criterion	Response
Fragment an existing important population into two or more populations	<b>Unlikely</b> For the reasons outlined in response to the criterion <i>Lead to a long-term decrease in the size of an important population of a species</i> , an important population is unlikely present within the project boundary, and so fragmentation of an important population is regarded as unlikely.
Adversely affect habitat critical to the survival of a species	<b>Unlikely</b> No habitats within the study area are identified on the Register of Critical Habitat (however, it should be noted the Register of Critical Habitat currently does not include any listing for Clover Glycine). In addition, information regarding habitat critical to the survival of the species is not available in the National Recovery Plan for the Clover Glycine ( <i>Glycine latrobeana</i> ) (Carter , O; Sutter, G, 2010). Given the above, and that the species has not been recorded within the project boundary during targeted surveys, it is unlikely that habitat critical to the survival of the species would be adversely affected.
Disrupt the breeding cycle of an important population	<b>Unlikely</b> For the reasons outlined in response to the criterion <i>Lead to a long-term decrease in the size of an important population of a species</i> , an important population is unlikely to be present within the study area, and consequently, the breeding cycle of an important population is unlikely to be disrupted.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<b>Unlikely</b> While the availability and quality of habitat would be reduced by North East Link, it is unlikely the species would decline as a result, as the species has not been recorded following targeted surveys in suitable habitat during the flowering time for this species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	<b>Unlikely</b> Construction methods would be implemented through the CEMP so it is unlikely that invasive species would be introduced.
Introduce disease that may cause the species to decline	<b>Unlikely</b> No diseases known to affect Clover Glycine would likely be activated or exacerbated by the construction of North East Link. Consequently, it is unlikely that any disease would be introduced to the retained Clover Glycine habitat in grassy woodland areas near the project boundary.
Interfere substantially with the recovery of the species	<b>Unlikely</b> Threats to the survival of Clover Glycine as identified in the <i>National Recovery Plan for the Clover Glycine (Glycine latrobeana)</i> include weed invasion/competition, inappropriate fire regimes, grazing and human disturbance (Carter , O; Sutter, G, 2010). Given the species has not been recorded historically within the project boundary, and following targeted surveys in suitable habitat during the flowering time for this species, North East Link would unlikely interfere substantially with the recovery of the species.

### 7.4.3 Residual impacts

Following implementation of mitigation measures, the residual impacts on Clover Glycine are anticipated to be minimal, if any. Any direct loss of potential habitat would be offset in accordance with the Victorian Guidelines for the removal, destruction and lopping of native vegetation (DELWP, 2017).

## 7.5 Swift Parrot *Lathamus discolor*

### 7.5.1 Details of protected matter and its habitat

The Swift Parrot is listed as critically endangered under the EPBC Act. In Victoria, the Swift Parrot prefers dry, open eucalypt forests and woodlands, especially Box Ironbark Forest in north-central Victoria. Swift parrots turn up in the suburbs of Melbourne nearly every year, but the location varies and depends on the supply of nectar during their migration. VBA data identifies a total of 87 Swift Parrot records within a five-kilometre radius of the project boundary, the most recent in 2009. The BLA database has 90 records, most recently in April 2018.

For further details on the Swift Parrot and its habitat refer to Section 5.1 of Chapter 5 – Description of the environment.

### 7.5.2 Relevant impacts and mitigation measures

The main potential impact of North East Link on the Swift Parrot is localised loss of occasional foraging habitat. Other potential impacts such as disturbance or death of individuals are expected to be very rare, if they occur at all. Swift Parrots that visit Melbourne already tolerate various disturbances and dangers associated with a large city. North East Link would not add any significant disturbance or threat to the Swift Parrot that is not already present.

While Swift Parrots may forage in trees within the project boundary occasionally and opportunistically, there is no evidence to suggest they rely on these trees or use them regularly or frequently to the point the birds would be displaced by removal of the trees.

The trees beside Macleod Station may be an exception to this. Up to 40 Swift Parrots were observed between May and July 2015 in the trees surrounding Macleod Station (BLA, e-Bird), and those trees may be categorised as priority habitat. Every effort would be made to avoid these trees by confining works to the base of the rail trench, or designing works around these trees.

Species that are known to be potentially detrimental to the Swift Parrot are already abundant in the study area. These species include aggressive bird species such as the Noisy Miner and Rainbow Lorikeet, which may harass or out-compete foraging Swift Parrots.



Removal of native vegetation, fauna habitat and reduction of habitat connectivity would be minimised to the extent practicable in the detailed design phase of North East Link. The footprint of works and disturbance of potential foraging habitat for the Swift Parrot would be taken into consideration.

By tunnelling beneath the Yarra River and its associated floodplain habitats, North East Link greatly reduces its potential for impact on most terrestrial and aquatic fauna species across the Melbourne area. Those floodplain areas provide the largest and highest quality areas of habitat for many of the species that use the inner eastern Melbourne area. In areas where surface impacts of North East Link were unavoidable, particularly in locations where habitats are identified as being of high value, the smallest practicable project boundary would be adopted to avoid unnecessary loss of habitat, as far as possible utilising areas that are already disturbed or have been previously disturbed.

Table 7-5 summarises the assessment of impacts to Swift Parrot against the EPBC Act Significant impact guidelines 1.1 for a critically endangered species.

**Table 7-5** Assessment of the action against significant impact criteria for Swift Parrot

Criterion	Response
Lead to a long-term decrease in the size of a population	<p><b>Unlikely</b></p> <p>North East Link would unlikely lead to a long-term decrease in the size of the Swift Parrot population. There is little evidence to suggest they rely on trees within the project boundary, or use them regularly or frequently to the point the birds would be displaced by removal of those trees. However, up to 40 Swift Parrots were observed between May and July 2015 in the trees surrounding Macleod Station (BLA, e-Bird), and those trees may be categorised as priority habitat. Most of the trees that the Swift Parrots used lie outside the project boundary, but some trees within the project boundary do or may form part of the habitat patch. Every effort would be made to avoid all impacts on the trees within the project boundary at this location, by confining works to the base of the rail trench, or designing works around these trees. Minor impacts (such as pruning) may be necessary to allow safe access to signal boxes, but the effect is considered unlikely to discourage Swift Parrots from foraging in those trees in future.</p> <p>The total area of priority habitat to be removed may be reduced following further refinement of the North East Link design at the detailed design stage, and with the implementation of avoidance and mitigation measures outlined in Chapter 10 – Proposed avoidance and mitigation measures. By adhering to mitigation measures, it is considered unlikely that North East Link would lead to a long-term decrease in the size of a population.</p>

Criterion	Response
Reduce the area of occupancy of the species	<p><b>Unlikely</b></p> <p>North East Link would not reduce the area of occupancy of the Swift Parrot. Each year, small numbers of Swift Parrots are reported sporadically across a wide area of the Melbourne metropolitan area as the birds migrate north and south. Removal of potentially suitable trees from the project boundary would not stop Swift Parrots from foraging in trees across the Melbourne area, and the parrots would continue to select trees that are suitable at the time of migration. No trees or patches of trees within the project boundary appear to be regularly visited by this species, and all tree species within the area are also well represented within the study area.</p> <p>Although some priority habitat at Macleod Station (BLA, e-Bird) lies within the project boundary, every effort would be made to avoid these trees by confining works to the base of the rail trench, or designing works around these trees. Following the implementation of avoidance and mitigation measures outlined in Chapter 10 – Proposed avoidance and mitigation measures, the total area of priority habitat to be removed may be reduced following further refinement of the North East Link design at the detailed design stage.</p>
Fragment an existing population into two or more populations	<p><b>Unlikely</b></p> <p>For the reasons outlined in response to the criterion <i>Reduce the area of occupancy of the species</i> above, North East Link would not fragment the existing Swift Parrot population into two or more populations.</p>
Adversely affect habitat critical to the survival of a species	<p><b>Unlikely</b></p> <p>North East Link would unlikely adversely affect habitat critical to the survival of the Swift Parrot. No habitats within the study area are identified on the Register of Critical Habitat (note the Register of Critical Habitat currently does not include any listing for the Swift Parrot). In terms of priority Swift Parrot habitats in Victoria, as identified by the Swift Parrot Recovery Plan (Saunders &amp; Tzaros, 2011) the trees at Macleod Station may be categorised as priority habitat. Every effort would be made to avoid these trees by confining works to the base of the rail trench, or designing works around these trees.</p> <p>Following the implementation of avoidance and mitigation measures outlined in Chapter 10 – Proposed avoidance and mitigation measures, the total area of priority habitat to be removed may be reduced following further refinement of the North East Link design at the detailed design stage. Swift Parrots may visit trees in and around the study area occasionally and opportunistically, but the project boundary does not appear to offer Swift Parrots a particular foraging resource that is not also present and widely available in the suburbs surrounding the sites.</p>
Disrupt the breeding cycle of a population	<p><b>Unlikely</b></p> <p>North East Link would not disrupt the breeding cycle of the Swift Parrot population. The species breeds entirely in Tasmania and only uses trees in Victoria for foraging during the non-breeding season.</p>

Criterion	Response
<p>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</p>	<p><b>Unlikely</b></p> <p>North East Link would unlikely modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the Swift Parrot is likely to decline. Swift Parrots may visit trees in and around the project boundary to forage, but their use of those trees appears to be occasional and opportunistic. Given the relatively wide range of eucalypt species that Swift Parrots are known to visit in Victoria, and the relative commonness of those trees in areas surrounding the project boundary, impacts on trees in the study area are not expected to change the numbers of Swift Parrot.</p>
<p>Result in invasive species that are harmful to a critically endangered species becoming established in the critically endangered species' habitat</p>	<p><b>Unlikely</b></p> <p>North East Link would unlikely result in invasive species that are harmful to the Swift Parrot becoming established in the Swift Parrot's habitat. Known species that are potentially harmful or detrimental to the Swift Parrot are already abundant within the study area.</p>
<p>Introduce disease that may cause the species to decline</p>	<p><b>Unlikely</b></p> <p>North East Link would unlikely introduce disease that may cause the Swift Parrot to decline.</p>
<p>Interfere substantially with the recovery of the species</p>	<p><b>Unlikely</b></p> <p>North East Link would unlikely impact the Swift Parrot nor interfere with the recovery of the species.</p> <p>Threats to the recovery of the species as identified in the <i>National Recovery Plan for the Swift Parrot Lathamus discolor</i> include habitat loss, alteration and fragmentation, climate change, collision mortality, disease, invasion or competition from other species and predation from cats <i>Felis catus</i> (Saunders &amp; Tzaros, 2011). Habitat within the study area is only likely utilised by the species for occasional and opportunistic foraging. Other than the trees at Macleod Station, there is no evidence to suggest that Swift Parrots rely on other particular trees in the study area, or use them regularly or frequently. Following the implementation of avoidance and mitigation measures outlined in Chapter 10 – Proposed avoidance and mitigation measures, the total area of priority habitat to be removed may be reduced during further refinement of the North East Link design at the detailed design stage.</p> <p>While North East Link would increase traffic volumes in some areas, these are already areas with high traffic. Traffic would not be introduced into regional areas or areas of low traffic volumes. It is therefore unlikely that North East Link would increase the mortality of Swift Parrots due to collisions with vehicles.</p> <p>By adhering to mitigation measures outlined in Chapter 10 – Proposed avoidance and mitigation measures, it is considered unlikely that North East Link would interfere with the recovery of the species.</p>

### 7.5.3 Residual impacts

The residual impact of North East Link on the Swift Parrot is expected to be minor and non-significant. With a non-significant residual impact, offsets would not be required.

## 7.6 Australian Painted Snipe *Rostratula australis*

### 7.6.1 Details of protected matter and its habitat

The Australian Painted Snipe is listed as endangered under the EPBC Act. The Australian Painted Snipe is a rare, nomadic species that may turn up at any suitably large freshwater wetland across Australia, when conditions are favourable. This species is widespread but rare throughout most of eastern Australia.

According to the desktop assessment (VBA, BLA and e-Bird records) and habitat assessment of the alignment, the most suitable habitat for this species is in and around Banyule Swamp.

For further information on the Australian Painted Snipe and its habitat refer to Section 5.1 of Chapter 5 – Description of the environment.

### 7.6.2 Relevant impacts and mitigation measures

According to the desktop assessment (VBA and e-Bird records), the most suitable habitat for the Australian Painted Snipe is in and around Banyule Swamp. North East Link is proposed to be in tunnels beneath this area, so it would not be reduced. Other locations where this species has a small chance of occurring (such as Koonung Creek) are typically degraded, disturbed (particularly by people walking dogs) and within urbanised areas. Combined with the few VBA/e-Bird records, this suggests those areas are very unlikely to support the Australian Painted Snipe.

There is a cluster of 16 BLA records of this species (maximum two birds) at and around Banyule Swamp, all from October/November 2001. The VBA also contains two of those records. The Australian Painted Snipe has not been recorded within the project boundary since then, and there is only one previous record, in 1970.

By tunnelling beneath the Yarra River and its associated floodplain habitats, North East Link greatly reduces its potential for impacting most terrestrial and aquatic fauna species across the Melbourne area. Those floodplain areas provide the largest and highest quality areas of habitat for many of the species that use the inner eastern Melbourne area, including the Australian Painted Snipe. In areas where surface impacts were unavoidable, including waterway and wetland habitats that are potentially used, although rarely, by the Australian Painted Snipe, the smallest practicable project boundary would be adopted for North East Link to avoid unnecessary loss of habitat, as far as possible utilising areas that are already disturbed or have been previously disturbed.

Appropriate surface water and site management through design and construction would reduce the potential for deleterious impacts on wetlands and waterways that may be visited by the Australian Painted Snipe.

North East Link would be designed to minimise impacts to waterways in the Yarra River catchment by avoiding works in waterways where possible, and including drainage features designed in accordance with water sensitive urban design (WSUD) principles to prevent runoff impacts to urban streams. In the long term, the addition of drainage features such as wetlands may increase habitat opportunities for species such as the Australian Painted Snipe, by creating more beneficial ecological habitats in the urban environment using stormwater runoff.

Table 7-6 summarises the assessment of impacts to Australian Painted Snipe against the EPBC Act Significant impact guidelines 1.1 for an endangered species.

**Table 7-6** Assessment of the action against significant impact criteria for Australian Painted Snipe

Criterion	Response
Lead to a long-term decrease in the size of a population	<p><b>Unlikely</b></p> <p>North East Link would unlikely lead to a long-term decrease in the size of the Australian Painted Snipe population. The most suitable habitat for this species at Banyule Swamp would be avoided by tunnelling, so would not be affected. Other locations where this species may occur are typically degraded, disturbed and within urbanised areas. This, combined with the few VBA/e-Bird records, suggests those areas are very unlikely to support the Australian Painted Snipe. The species has not been recorded within the project boundary since 2001, and there is only one previous record, in 1970.</p>
Reduce the area of occupancy of the species	<p><b>Unlikely</b></p> <p>North East Link would not reduce the area of occupancy of the Australian Painted Snipe. The species has a widespread habitat but is rare throughout most of eastern Australia. Its most suitable habitat in the study area is in and around Banyule Swamp, which would be avoided by tunnelling, so would not be impacted. Even this area is not used frequently: this species has not been recorded within the project boundary since 2001, and there is only one previous record, in 1970. No other parts of the study area are considered likely to attract the Australian Painted Snipe, so North East Link is not expected to influence the area the species occupies.</p>



Criterion	Response
Fragment an existing population into two or more populations	<b>Unlikely</b> North East Link would not fragment the existing Australian Painted Snipe population into two or more populations, for the reasons outlined in response to the criterion <i>Reducing the area of occupancy</i> .
Adversely affect habitat critical to the survival of a species	<b>Unlikely</b> North East Link would unlikely adversely affect habitat critical to the survival of the Australian Painted Snipe for the reasons outlined in response to the criterion <i>Reducing the area of occupancy</i> .
Disrupt the breeding cycle of a population	<b>Unlikely</b> North East Link would unlikely disrupt the breeding cycle of the Australian Painted Snipe for the reasons outlined in the response to the criterion <i>Reducing the area of occupancy</i> .
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<b>Unlikely</b> North East Link would unlikely modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the Australian Painted Snipe would likely decline for the reasons outlined in response to the criterion <i>Reducing the area of occupancy</i> .
Result in invasive species that are harmful to a critically endangered species becoming established in the critically endangered species' habitat	<b>Unlikely</b> North East Link would unlikely result in invasive species that are harmful to the Australian Painted Snipe becoming established in the species habitat. Known terrestrial species that are potentially harmful or detrimental to the species (such as Red Fox, Cat, Black Rat) are already present within the study area.
Introduce disease that may cause the species to decline	<b>Unlikely</b> North East Link would unlikely introduce disease that may cause the Australian Painted Snipe to decline.
Interfere substantially with the recovery of the species	<b>Unlikely</b> There is no adopted Recovery Plan for the Australian Painted Snipe. Identified threats are loss and degradation of habitat, and predation by non-native predators such as foxes and cats. North East Link would unlikely impact the Australian Painted Snipe, so would unlikely interfere with the recovery of the species. Its most suitable habitat in the study area is in and around Banyule Swamp, which would be avoided by tunnelling, so would not be reduced. Even this area is not used frequently: this species has not been recorded in the project boundary since 2001 and there is only one previous record, in 1970.

### 7.6.3 Residual impacts

The residual impact of North East Link on the Australian Painted Snipe is expected to be negligible and non-significant. The species is very rarely recorded in the Melbourne area, and the areas where it has the greatest potential to turn up would be avoided by tunnelling.

With a non-significant residual impact, offsets would not be required for the Australian Painted Snipe.

## 7.7 Australasian Bittern *Botaurus poiciloptilus*

### 7.7.1 Details of protected matter and its habitat

The Australasian Bittern is listed as endangered under the EPBC Act. The Australasian Bittern is a cryptic species and rarely seen or reported. It prefers dense tall vegetation in permanent freshwater swamps and wetlands, particularly those dominated by sedges, rushes and reeds. According to the desktop assessment (VBA and e-Bird records) and habitat assessment, the most suitable habitat for the Australasian Bittern in the study area is associated with the Yarra River and its associated floodplain in the Banyule/Bulleen area.

The Australasian Bittern was not heard or observed during general field surveys. As outlined in Section 5.1.4 of Chapter 5 – Description of the environment, targeted surveys were not undertaken for this species as it is difficult to detect and the most suitable habitat would be avoided by tunnelling.

For further information on the Australasian Bittern and its habitat refer to Section 5.1 of Chapter 5 – Description of the environment.

### 7.7.2 Relevant impacts and mitigation measures

Tunnelling beneath the Yarra River and its associated floodplain habitats would significantly reduce the potential for North East Link to impact most terrestrial and aquatic fauna species across the Melbourne area. Those floodplain areas provide the largest and highest quality areas of habitat for many of the species that use the inner eastern Melbourne area, including the Australasian Bittern.

In areas where surface impacts were unavoidable, including waterway and wetland habitats that are potentially used by the Australasian Bittern, the smallest practicable project boundary for North East Link would be adopted to avoid unnecessary loss of habitat, as far as possible utilising areas that are already disturbed or have been previously disturbed. Other locations where this species may occur (such as Koonung Creek) are degraded and disturbed, and unlikely to support this species.

Appropriate surface water and site management through design and construction would reduce the potential for negative effects on wetlands and waterways that may be used by the Australasian Bittern.

North East Link would be designed to minimise impacts to waterways in the Yarra catchment by avoiding works in waterways where possible, and including drainage features designed in accordance with WSUD principles to prevent runoff impacts to urban streams. In the long term, the addition of drainage features such as wetlands may increase habitat opportunities for species such as the Australasian Bittern.

Table 7-7 summarises the assessment of impacts to Australasian Bittern against the EPBC Act Significant impact guidelines 1.1 for an endangered species.

**Table 7-7** Assessment of the action against significant impact criteria for Australasian Bittern

Criterion	Response
Lead to a long-term decrease in the size of a population	<b>Unlikely</b> North East Link would unlikely lead to a long-term decrease in the size of the Australasian Bittern population. The species is widespread in small numbers throughout south-western and south-eastern Australia, including Tasmania. According to the desktop assessment (VBA and e-Bird records), the most suitable habitat for this species within the study area is associated with the Yarra River and its associated floodplain in the Banyule/Bulleen area. North East Link is proposed to be in tunnels in this area, so would not be impacted. Field assessments determined the location where the Yarra River is crossed by the Eastern Freeway does not support habitats suitable for Australasian Bittern. Other locations where this species may occur (such as Koonung Creek) are typically degraded, disturbed (particularly by people walking dogs) and within urbanised areas. Those areas are very unlikely to support this species.
Reduce the area of occupancy of the species	<b>Unlikely</b> North East Link would not reduce the area of occupancy of the Australasian Bittern. This species is widespread in small numbers throughout south-western and south-eastern Australia, including Tasmania. The most suitable habitat for this species within the study area would be avoided by tunnelling, so would not be impacted. Other locations where this species may occur (such as Koonung Creek) are degraded and disturbed, and unlikely to support this species. North East Link would be extremely unlikely to change the area of occupancy of this species.
Fragment an existing population into two or more populations	<b>Unlikely</b> North East Link would not fragment the existing Australasian Bittern population into two or more populations for the reasons outlined in the response to the criterion <i>Reduce the area of occupancy</i> .

Criterion	Response
Adversely affect habitat critical to the survival of a species	<b>Unlikely</b> North East Link would unlikely adversely affect habitat critical to the survival of the Australasian Bittern for the reasons outlined in the response to the criterion <i>Reduce the area of occupancy</i> .
Disrupt the breeding cycle of a population	<b>Unlikely</b> North East Link would not disrupt the breeding cycle of the Australasian Bittern population for the reasons outlined in the response to the criterion <i>Reduce the area of occupancy</i> .
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<b>Unlikely</b> North East Link would unlikely modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the Australasian Bittern is likely to decline, for the reasons outlined in the response to the criterion <i>Reduce the area of occupancy</i> .
Result in invasive species that are harmful to a critically endangered species becoming established in the critically endangered species' habitat	<b>Unlikely</b> North East Link would unlikely result in invasive species that are harmful to the Australasian Bittern becoming established in the bittern's habitat. Known terrestrial species that are potentially harmful or detrimental to the species (such as Red Fox, Cat, Black Rat) are already present within the study area.
Introduce disease that may cause the species to decline	<b>Unlikely</b> North East Link would unlikely introduce disease that may cause the Australasian Bittern to decline.
Interfere substantially with the recovery of the species	<b>Unlikely</b> There is no adopted Recovery Plan for the Australasian Bittern. Identified threats are loss and degradation of habitat. North East Link would unlikely impact on the Australasian Bittern, so would unlikely interfere with the recovery of the species. The most suitable habitat for this species within the study area would be avoided by tunnelling, so would not be impacted. Other locations where this species may occur (such as Koonung Creek) are degraded and disturbed, and unlikely to support this species.

### 7.7.3 Residual impacts

The residual impact of North East Link on the Australasian Bittern is expected to be negligible and non-significant. The species is rarely recorded in the Melbourne area, and the areas where it has the greatest potential to turn up would be avoided by tunnelling.

With a non-significant residual impact, offsets would not be required for the Australasian Bittern.

## 7.8 Grey-headed Flying-fox *Pteropus poliocephalus*

### 7.8.1 Details of protected matter and its habitat

The Grey-headed Flying-fox is listed as vulnerable under the EPBC Act. The Grey-headed Flying-fox uses a wide range of habitats in Victoria, from lowland rainforest and coastal Stringybark forests to agricultural land and suburban gardens.

The Grey-headed Flying-fox is common across Melbourne, and was observed in small numbers flying overhead during nocturnal field assessments at several locations across the project boundary. A Nationally Important Flying-fox Camp is present at Yarra Bend, Fairfield.

For further information on the Grey-headed Flying-fox and its habitat refer to Section 5.1 of Chapter 5 – Description of the environment.

### 7.8.2 Relevant impacts and mitigation measures

The Grey-headed Flying-fox is considered to occur in one continuous population across south-east Australia, which must be considered an important population. This species forages widely across a broad area that includes the project boundary. North East Link is expected to remove small areas of foraging habitat. However, similar quality habitat is abundant in the surrounding areas and the *Draft National Recovery Plan for the Grey-headed Flying-fox (Pteropus poliocephalus)* indicates the proposed vegetation losses are not expected to interfere with the recovery of the species (DoEE, 2017d).

The Yarra Bend Flying-fox Camp includes habitat critical to the survival of this species. However, this area is a designated no-go zone for North East Link works, and the vegetation occupied by the camp would not be reduced.

A small section of habitat within the management area (under the Management Plan for the Yarra Bend Flying-fox colony (DSE, 2005a) extending approximately 10 metres into the management area is within the project boundary and would be removed. This section of the Eastern Freeway is already very noisy and well-lit, so the construction of North East Link is not expected to markedly increase noise or light levels and disturb the camp.

Other threats identified by the *Draft National Recovery Plan for the Grey-headed Flying-fox (Pteropus poliocephalus)* include camp disturbance, mortality in commercial fruit crops, heat stress, electrocution on power lines, climate change and disease (DoEE, 2017d). These threats would unlikely be exacerbated by the construction and operation of North East Link.

Table 7-8 summarises the assessment of impacts to Grey-headed Flying-fox against the EPBC Act Significant impact guidelines 1.1 for a vulnerable species.

Table 7-8 Assessment of the action against significant impact criteria for Grey-headed Flying-fox

Criterion	Response
Lead to a long-term decrease in the size of an important population of a species	<p><b>Unlikely</b></p> <p>The Grey-headed Flying-fox is considered to occur in one continuous population across south-east Australia, which must be considered an important population. A Nationally Important Flying-fox Camp is present at Yarra Bend, Fairfield. Works along the Eastern Freeway in the vicinity of the camp are expected to be restricted to within 10 m of the existing road and entirely avoid the camp. The flying-fox management area has been designated a no-go zone beyond that 10 m section. This section of the Eastern Freeway is already very noisy and well-lit and so the construction of North East Link is not expected to markedly increase noise or light levels and disturb the camp. North East Link is not expected to decrease the size of this colony.</p>
Reduce the area of occupancy of an important population	<p><b>Unlikely</b></p> <p>The Grey-headed Flying-fox is considered to occur in one continuous population across south-east Australia.</p> <p>This species forages widely across a broad area and its area of occupancy is unlikely to change with changes to the vegetation present along the proposed alignment. Works along the Eastern Freeway in the vicinity of the Nationally Important Flying-fox Camp are expected to be restricted to a 10 m section beside the existing road and the camp itself is not expected to be impacted. The detailed design of North East Link would attempt to minimise the removal of native vegetation and fauna habitat, including by minimising the footprint of works and the disturbance of populations of EPBC Act-listed threatened species, including potential foraging habitat for the Grey-headed Flying-fox.</p>
Fragment an existing important population into two or more populations	<p><b>Unlikely</b></p> <p>The Grey-headed Flying-fox is considered to occur in one continuous population across south-east Australia. North East Link is not expected to result in the fragmentation of the population. The project boundary for the most part follows existing roads and this species is fully capable of crossing large roads including the existing Eastern Freeway.</p>



Criterion	Response
Adversely affect habitat critical to the survival of a species	<p><b>Unlikely</b></p> <p>Habitat critical to the survival of this species is present within the Yarra Bend Flying-fox Camp. However much of this area is outside the project boundary and is a designated no-go zone. A small section of habitat within the management area (approximately 10 m into the management area) is within the project boundary and would be removed. However, this area is only used for foraging, and is not considered important breeding habitat for the species. Therefore, it is unlikely the removal of this area of habitat would be critical to the survival of the species.</p> <p>No habitats within the study area are identified on the Register of Critical Habitat (note the Register of Critical Habitat currently does not include any listing for the Grey-headed Flying-fox).</p>
Disrupt the breeding cycle of an important population	<p><b>Unlikely</b></p> <p>The Grey-headed Flying-fox is considered to occur in one continuous population across south-east Australia.</p> <p>This species has a large breeding colony at Yarra Bend, Fairfield. A small section of habitat within the management area (approximately 10 m into the management area) is within the project boundary and would be removed. However, this area is only used for foraging and is not expected to be important breeding habitat for the species. A disruption to the breeding cycle at the camp is not expected.</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><b>Unlikely</b></p> <p>The Grey-headed Flying-fox forages widely across the Melbourne suburbs. North East Link is expected to result in the loss of small amounts of foraging resources (flowering/fruited trees and shrubs), including approximately 10 m of vegetation removal within the management area.</p> <p>However, vegetation of similar quality is present in the surrounding area and the decrease in available foraging resources is expected to have a negligible impact on the species and not result in the decline of the species.</p>
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	<p><b>Unlikely</b></p> <p>North East Link is not expected to result in the introduction of invasive species harmful to the Grey-headed Flying-fox.</p> <p>A CEMP would be implemented to minimise the likelihood of the introduction and establishment of invasive species.</p>
Introduce disease that may cause the species to decline	<p><b>Unlikely</b></p> <p>North East Link is not expected to result in the introduction of disease that causing decline in this species.</p>

Criterion	Response
Interfere substantially with the recovery of the species	<p><b>Unlikely</b></p> <p>The Draft National Recovery Plan for the Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>) was released in 2017. Loss of foraging habitat has been identified as the primary threat to the species. North East Link is expected to remove small areas of foraging habitat for Grey-headed Flying-Fox. However, similar quality habitat is abundant in the surrounding areas and the proposed vegetation losses are not expected to interfere with the recovery of the species (DoEE, 2017d). Other threats identified include camp disturbance, mortality in commercial fruit crops, heat stress, electrocution on power lines, climate change and disease. These threats would unlikely be exacerbated by North East Link.</p> <p>According to historical reports of colony size, the Grey-headed Flying-fox population in Melbourne does not appear to be declining (DSE, 2005a) (DSE, 2009). North East Link would avoid impacts on the roosting/ breeding camp and is therefore not expected to interfere with the recovery of the species.</p>

### 7.8.3 Residual impacts

The residual impact of North East Link on the Grey-headed Flying-fox is expected to be minor and non-significant. Grey-headed Flying-foxes reside in the Melbourne area and forage widely and variably on flowering and fruiting trees in parks, gardens and along waterways. The trees that are proposed to be removed by North East Link are likely to be used occasionally for foraging by the Grey-headed Flying-fox, but do not provide a particular resource not readily available in alternative locations nearby.

With a non-significant residual impact, offsets would not be required for the Grey-headed Flying-fox.

## 7.9 Growling Grass Frog *Litoria raniformis*

### 7.9.1 Details of protected matter and its habitat

The Growling Grass Frog is listed as vulnerable under the EPBC Act. The Growling Grass Frog is distributed across a large portion of south-east Australia. The species is found mostly amongst non-shaded emergent vegetation, including rushes, reeds and sedges, in or at the edge of still or slow-flowing water bodies. Historically, the Growling Grass Frog was widespread and common across the study area, but its populations declined in recent decades, possibly as a result of the Amphibian Chytrid Fungus and it has not been seen at many locations since the early 1990s.

No individuals were detected during targeted surveys. Important populations are not expected to occur within the study area.

For further information on the Growling Grass Frog and its habitat refer to Section 5.1 of Chapter 5 – Description of the environment.

## 7.9.2 Relevant impacts and mitigation measures

As identified in the *National Recovery Plan for the Southern Bell Frog *Litoria raniformis** (Southern Bell Frog = Growling Grass Frog), primary threats facing the species include loss and degradation of habitat, barriers to movement, disease, predation, biocides and ultra-violet B radiation. It is not anticipated that North East Link would exacerbate these threats or substantially interfere with the recovery of the species.

The existing presence of the Common Froglet *Crinia signifera* at most if not all sites of potential habitat for Growling Grass Frog suggest that chytrid fungus is likely already widespread across the region (the Common Froglet is a likely reservoir host; (Brannelly, et al., 2018).

Tunnelling beneath the Yarra River and its associated floodplain habitats would greatly reduce the potential of North East Link to impact most terrestrial and aquatic fauna species across the Melbourne area. Those floodplain areas provide the largest and highest quality areas of habitat for many of the species that use, or might use, the inner eastern Melbourne area, including the Growling Grass Frog. In areas where surface impacts were unavoidable, including waterway, billabong and wetland habitats that provide potential habitat for the Growling Grass Frog, the smallest practicable project boundary for North East Link would be adopted to avoid unnecessary loss of habitat, as far as possible utilising areas that are already disturbed or have been previously disturbed.

Appropriate surface water and site management through design and construction would reduce the potential for negative effects on wetlands, billabong and waterways that provide potential habitat for the Growling Grass Frog.

North East Link would be designed to minimise impacts to waterways in the Yarra catchment by avoiding works in waterways where possible, and including drainage features designed in accordance with WSUD principles to prevent runoff impacts to urban streams. In the long term, the addition of drainage features such as wetlands may increase habitat opportunities for species such as the Growling Grass Frog.

Table 7-9 summarises the assessment of impacts to Growling Grass Frog against the EPBC Act Significant impact guidelines 1.1 for a vulnerable species.

Table 7-9 Assessment of the action against significant impact criteria for Growling Grass Frog

Criterion	Response
Lead to a long-term decrease in the size of an important population of a species	<b>Unlikely</b> No individuals were detected during targeted surveys. Important populations are not expected to occur within the study area.
Reduce the area of occupancy of an important population	<b>Unlikely</b> No individuals were detected during targeted surveys. Important populations are not expected to occur within the study area.
Fragment an existing important population into two or more populations	<b>Unlikely</b> No individuals were detected during targeted surveys. No populations were observed. An important population is not expected to be fragmented.
Adversely affect habitat critical to the survival of a species	<b>Unlikely</b> No habitat that is expected to be critical to the survival of the species was observed during habitat assessments. No populations or individuals of the species were detected within the study area.  No habitats within the study area are identified on the Register of Critical Habitat (note the Register of Critical Habitat currently does not include any listing for the Growling Grass Frog).  With the implementation of the mitigation measures described in Chapter 10 – Proposed avoidance and mitigation measures, it is considered unlikely that North East Link would adversely affect habitat critical to the survival of this species.
Disrupt the breeding cycle of an important population	<b>Unlikely</b> No individuals were detected during targeted surveys. Important populations are not expected to occur within the study area.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<b>Unlikely</b> Potentially suitable habitat within the study area is minimal. No populations or individuals were detected during targeted surveys. The species is considered to be currently absent from the project boundary, and North East Link is not expected to result in the decline of the species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	<b>Unlikely</b> Most of the waterways in the study area already support invasive fish species. North East Link is not expected to result in the spread or increase in invasive fish species within the study area.  North East Link would unlikely result in other invasive species that are harmful to the Growling Grass Frog becoming established in its habitat. Known terrestrial species that are potentially harmful or detrimental to the frog (such as Red Fox) are already present within the study area.

Criterion	Response
Introduce disease that may cause the species to decline	<p><b>Unlikely</b></p> <p>No individuals or populations were detected within the study area. Regardless, appropriate mitigation would be employed to minimise the risk of project works introducing or spreading Chytrid Fungus within the study area. This includes minimising the work required within frog habitats, cleaning potentially infected materials (such as mud, soil) from equipment and vehicles before they are used at a wetland or waterway/waterbody site, and strict hygiene protocols (Murray, et al., 2011) if frogs are required to be handled for any reason.</p> <p>The existing presence of the Common Froglet <i>Crinia signifera</i> at most if not all sites of potential habitat for Growling Grass Frog suggests that chytrid fungus is likely already widespread across the region (the Common Froglet is a likely reservoir host; (Brannelly, et al., 2018)). Management measures to reduce the risk of spreading the Amphibian Chytrid Fungus into, out of or within the project boundary would be employed by the implementation of a CEMP which would detail and raise awareness of, and compliance with, pathogen management and include a Spoil Management Plan to regulate the movement of spoil to reduce the risk of chytrid-infected soil or water leaving or entering the site.</p>
Interfere substantially with the recovery of the species	<p><b>Unlikely</b></p> <p>North East Link is not expected to interfere with the recovery of the species. There is a low likelihood the species is present in small numbers within the study area and proposed impacts would not hinder movement/dispersal of the species across the landscape, if present.</p> <p>As identified in the <i>National Recovery Plan for the Southern Bell Frog Litoria raniformis</i>, primary threats facing the species include loss and degradation of habitat, barriers to movement, disease, predation, biocides and ultra-violet B radiation. It is not anticipated that North East Link would exacerbate these threats and substantially interfere with the recovery of the Growling Grass Frog.</p>

### 7.9.3 Residual impacts

The residual impact of North East Link on the Growling Grass Frog is expected to be negligible and non-significant. Due to historical population declines, the species is not thought to occur within the project boundary, but it has the potential to re-colonise areas where it once occurred. The Yarra River floodplain area, where the Growling Grass Frog has the greatest potential to turn up, would be avoided by tunnelling.

With a non-significant residual impact, offsets would not be required for the Growling Grass Frog.

## 7.10 Macquarie Perch

### *Macquaria australasica*

#### 7.10.1 Details of protected matter and its habitat

The Macquarie Perch is listed as endangered under the EPBC Act. Macquarie Perch are a native freshwater fish species whose populations have declined in Victoria (DoEE, 2017c). A self-sustaining population exists in the Yarra River from fish translocated in the 1920s.

For further detail on the Macquarie Perch and its habitat, refer to Section 5.1 of Chapter 5 – Description of the environment.

#### 7.10.2 Relevant impacts and mitigation measures

Impacts to Macquarie Perch habitat would be avoided by tunnelling beneath the Yarra River, which is the only waterway in the region that supports this species. North East Link would be designed to minimise impacts to other waterways in the Yarra catchment by avoiding works in waterways where possible, and including drainage features designed in accordance with WSUD principles to prevent runoff impacts to urban streams.

There is potential that North East Link may result in some drawdown of groundwater in the alluvial aquifer of the Yarra River floodplain. Groundwater contributions to the hydrology of the Yarra River in the areas of potential impact are insignificant. The potential for groundwater levels to decrease is thus unlikely to disrupt the breeding cycle of the population of Macquarie Perch.

The study area is close to the most downstream extent of the isolated population in the Yarra River. Any impacts are not expected to fragment this population.

Potential indirect impacts of construction that could affect aquatic habitat quality for this species would be mitigated by the implementation of a CEMP, which would include measures to prevent sedimentation, contamination and runoff from entering the drainage network.

Table 7-10 summarises the assessment of impacts to Macquarie Perch against the EPBC Act Significant impact guidelines 1.1 for an endangered species.



**Table 7-10** Assessment of the action against significant impact criteria for Macquarie Perch

Criterion	Response
Lead to a long-term decrease in the size of a population	<p><b>Unlikely</b></p> <p>North East Link would unlikely impact the important population in the Yarra River as the study area is close to the most downstream extent of the population distribution and there are no works planned within the Yarra River.</p> <p>There is potential that North East Link may result in some drawdown of groundwater. However, groundwater contributions to the hydrology of the Yarra River in the areas of potential impact are insignificant. Groundwater drawdown would not result in hydrological changes that could affect habitat or passage in the Yarra River.</p> <p>North East Link is thus not anticipated to lead to a long-term decrease in the size of the Macquarie Perch population.</p>
Reduce the area of occupancy of an important population	<p><b>Unlikely</b></p> <p>The proposed tunnel avoids works that would affect the Yarra River. North East Link is not expected to impact the area available for the Macquarie Perch.</p> <p>There is potential that North East Link may result in some drawdown of groundwater. However, any drawdown would not result in hydrological changes that could affect habitat or passage in the Yarra River and this is not anticipated to reduce the area of occupancy for the Macquarie Perch.</p>
Fragment an existing important population into two or more populations	<p><b>Unlikely</b></p> <p>The study area is close to the most downstream extent of the isolated population in the Yarra River. There are no works planned within the Yarra River, or impacts that would fragment aquatic habitat for this population. Any impacts are not expected to fragment this population.</p>
Adversely affect habitat critical to the survival of a species	<p><b>Unlikely</b></p> <p>It is unlikely that Macquarie Perth relies on waterways that would be affected by North East Link.</p> <p>There is potential that North East Link may result in some drawdown of groundwater. However, any drawdown would not result in hydrological changes that could affect habitat or passage in the Yarra River. North East Link is thus not anticipated to adversely affect the habitat of the Macquarie Perch.</p>
Disrupt the breeding cycle of an important population	<p><b>Unlikely</b></p> <p>The spawning of this species is unlikely to occur in waterways that would be affected by North East Link due to existing unsuitable waterway conditions, and cues for spawning are not expected to be impacted.</p> <p>The potential for groundwater drawdown would unlikely disrupt the breeding cycle of the population of Macquarie Perch.</p>

Criterion	Response
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p><b>Unlikely</b></p> <p>Impacts to Macquarie Perch habitat would be avoided by tunnelling beneath the Yarra River, which is the only waterway in the region that supports this species.</p> <p>There is potential that North East Link may result in some drawdown of groundwater. However, groundwater contributions to the hydrology of the Yarra River in the areas of potential impact are insignificant. Groundwater drawdown would not result in hydrological changes that could affect habitat or passage in the Yarra River.</p> <p>It is unlikely that North East Link would reduce the availability or quality of habitat that would decline the Yarra River population of this species.</p>
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	<p><b>Unlikely</b></p> <p>Fish surveys indicate that exotic species are already dominant at several locations surveyed for potential fish habitat. North East Link would not provide connections between waterways that could enable invasive aquatic species to colonise Macquarie Perch habitat.</p> <p>Tunnelling would avoid impacts to the Yarra River and other waterways in the Yarra catchment would be minimised by avoiding works in waterways where possible.</p> <p>With the implementation of mitigation measures outlined above and further in Chapter 10 – Proposed avoidance and mitigation measures, North East Link would unlikely result in invasive species becoming established in the habitat of vulnerable species.</p>
Introduce disease that may cause the species to decline	<p><b>Unlikely</b></p> <p>Tunnelling would avoid impacts to the Yarra River and other waterways in the Yarra catchment would be minimised by avoiding works in waterways where possible, and including drainage features designed in accordance with WSUD principles to prevent runoff impacts to urban streams.</p> <p>With the implementation of mitigation measures outlined above and further in Chapter 10 – Proposed avoidance and mitigation measures, it is unlikely that North East Link would result in new disease introduction.</p>
Interfere substantially with the recovery of the species	<p><b>Unlikely</b></p> <p>It is unlikely that recovery of Macquarie Perch is reliant on aquatic habitat in this location. The study area is located at the most downstream extent of the Yarra River population, with greatest opportunity for recovery of this species in upstream reaches of the Yarra River beyond the study area.</p>

### 7.10.3 Residual impacts

The residual impact of North East Link on the Macquarie Perch is expected to be negligible and non-significant. The species is known to exist in the Yarra River but not in other waterways that would be affected by North East Link. Tunnelling would avoid important aquatic habitat.

With a non-significant residual impact, offsets would not be required for Macquarie Perch.

## 7.11 Australian Grayling *Prototroctes maraena*

### 7.11.1 Details of protected matter and its habitat

The Australian Grayling is listed as vulnerable under the EPBC Act. The Australian Grayling occurs in coastal rivers and streams in south-eastern Australia from the Shoalhaven River in NSW through to the Hopkins River in Victoria (Backhouse, G; Jackson, J; O'Connor, J, 2008a). They usually prefer cool, clear waters with a gravel substrate and alternating pool and riffle habitats (Bishop & Bell, 1978); (Berra, 1982) but can also occur in turbid water (Jackson & Keohn, 1988). Australian Grayling are diadromous, which means they have an annual migration to estuarine waters for spawning, and offspring drift to marine waters as larvae, subsequently returning to freshwater as juveniles.

Australian Grayling are known to occur in the Yarra River between Mullum Mullum Creek and Dights Falls (Sinclair Knight Merz, 2012) and eggs and larvae have been retrieved at Fairfield (Koster, Amtstaetter, Dawson, Reich, & Morrongiello, 2017). The habitat assessment of all other waterways in the study area concluded that the presence of Australian Grayling was unlikely.

For further information on the Australian Grayling and its habitat refer to Section 5.1 of Chapter 5 – Description of the environment.

### 7.11.2 Relevant impacts and mitigation measures

Impacts to Australian Grayling habitat and its migration passage route would be avoided by tunnelling beneath the Yarra River, which is the only waterway in the region that supports this species. It is unlikely that North East Link would affect fish passage, which is critical for breeding in this diadromous species. The spawning of this species is likely to occur in the lower Yarra River near the location of North East Link. However, North East Link works in the Yarra River that could affect cues for spawning or inhibit migratory passage would be avoided.

Disturbance from intense noise or vibration during impact-generating construction activities (such as pile driving) would be avoided to the extent practicable through the use of alternative construction methods that minimise noise and vibration (bored piles), and the avoidance of intense vibration-generating construction activities during critical periods of migration as defined within the National Recovery Plan (Backhouse, G; Jackson, J; O'Connor, J, 2008a). Noise and vibration would be monitored and managed as part of the Construction Noise and Vibration Management Plan.

North East Link would be designed to minimise impacts to other waterways in the Yarra catchment by avoiding works in waterways where possible, and including drainage features designed in accordance with WSUD principles to prevent runoff impacts to urban streams. Works that have planned waterway modification affecting aquatic habitat do not provide habitat or migratory passage for the Australian Grayling. There is potential that North East Link may result in some drawdown of groundwater. However these impacts would not result in hydrological changes that could affect the habitat or passage of Australian Grayling in the Yarra River. The potential for groundwater levels to decrease is unlikely to disrupt the breeding cycle of the population of Australian Grayling.

Potential indirect impacts of construction that could affect aquatic habitat quality for this species would be mitigated with the implementation of a CEMP, which would include measures to prevent sedimentation, contamination and runoff from entering the drainage network.

Table 7-11 summarises the assessment of impacts to Australian Grayling against the EPBC Act Significant impact guidelines 1.1 for a vulnerable species.

**Table 7-11** Assessment of the action against significant impact criteria for Australian Grayling

Criterion	Response
Lead to a long-term decrease in the size of an important population of a species	<p><b>Unlikely</b></p> <p>It is unlikely the important Australian Grayling population in the Yarra River would be impacted as North East Link would unlikely change conditions in the Yarra River that would affect migration of the species by tunnelling under the Yarra River and avoiding works that would increase threatening processes for the species.</p> <p>Specifically, North East Link would not involve works that would create barriers to fish migration or lead to degradation of habitat in the Yarra River.</p> <p>There is potential that North East Link may result in some drawdown of groundwater. However, groundwater contributions to the hydrology of the Yarra River in the areas of potential impact are insignificant. Groundwater drawdown would not result in hydrological changes that could affect the habitat or passage of Australian Grayling in the Yarra River. North East Link is not anticipated to lead to a long-term decrease in the size of the Australian Grayling population.</p>
Reduce the area of occupancy of an important population	<p><b>Unlikely</b></p> <p>North East Link is not expected to impact the area available for Australian Grayling.</p> <p>There is potential that North East Link may result in some drawdown of groundwater. However, any drawdown is not anticipated to reduce the area of occupancy for the Australian Grayling.</p>

Criterion	Response
Fragment an existing important population into two or more populations	<p><b>Unlikely</b></p> <p>The Yarra River population is likely to remain connected to adjacent populations during the marine phase of the Australian Grayling lifecycle. As no changes to upstream or downstream migration are expected, any impacts are not expected to fragment this population.</p> <p>There is potential that North East Link may result in some drawdown of groundwater. However, any groundwater changes are not anticipated to fragment the population.</p>
Adversely affect habitat critical to the survival of a species	<p><b>Unlikely</b></p> <p>It is unlikely that North East Link would affect fish passage, which is the primary habitat attribute of waterways the Australian Grayling relies on in this location.</p> <p>There is potential that North East Link may result in some drawdown of groundwater. However, any groundwater changes are not anticipated to affect habitat critical to the survival of the species.</p>
Disrupt the breeding cycle of an important population	<p><b>Unlikely</b></p> <p>It is unlikely that North East Link would affect fish passage, which is critical for breeding in this diadromous species. The spawning of Australian Grayling is likely to occur downstream of the study area. However, tunnelling beneath the Yarra River would avoid works that would affect fish passage and so North East Link is not expected to affect cues for spawning. Potential vibration disturbance during migratory periods would be avoided with low impact construction methods and by avoiding high intensity vibration-generating construction methods during critical migratory periods.</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><b>Unlikely</b></p> <p>It is unlikely that North East Link would impact availability or quality of habitat that would impact the Yarra population of the Australian Grayling.</p> <p>There is potential that North East Link may result in some drawdown of groundwater. However, any groundwater changes are not anticipated to reduce the availability of habitat.</p>
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	<p><b>Unlikely</b></p> <p>Fish surveys indicate that exotic species are already dominant at several locations surveyed for potential fish habitat.</p> <p>With the implementation of mitigation measures in Chapter 10 – Proposed avoidance and mitigation measures, North East Link would unlikely result in invasive species becoming established in vulnerable species habitat.</p>
Introduce disease that may cause the species to decline	<p><b>Unlikely</b></p> <p>It is unlikely that North East Link would result in new disease introduction.</p>

Criterion	Response
Interfere substantially with the recovery of the species	<p><b>Unlikely</b></p> <p>It is unlikely that North East Link would introduce or increase threatening processes listed for Australian Grayling in this location.</p> <p>An increase in paved surface is planned as part of the new roads, with a consequential increase in stormwater drainage that needs to be discharged to urban waterways in and around the project boundary. Urban stormwater is regarded as one of the two most threatening processes to aquatic ecosystems in the urban environment (Walsh &amp; Webb, 2016 ) with the major mechanisms of impact from flow velocity and scouring of aquatic habitats.</p> <p>North East Link would be designed to minimise impacts to waterways in the Yarra catchment by avoiding works in waterways where possible, and including drainage features designed in accordance with WSUD principles to prevent runoff impacts to urban streams.</p>

### 7.11.3 Residual impacts

The residual impact of North East Link on Australian Grayling is expected to be negligible and non-significant. The species is known from the Yarra River, but not other waterways affected by North East Link. Tunnelling would avoid the important aquatic habitat for Australian Grayling.

With a non-significant residual impact, offsets would not be required for Australian Grayling.



## 7.12 Latham's Snipe

### *Gallinago hardwickii*

#### 7.12.1 Details of protected matter and its habitat

Latham's Snipe is listed as Migratory under the EPBC Act. Latham's Snipe is a summer migrant/visitor to south-eastern Australia, returning each year to Japan and eastern Russia to breed during the northern summer. The BLA database has 187 sightings of Latham's Snipe in the five-kilometre search buffer (VBA) area, until as recently as 2015. The VBA has 104 records up to 2013. This suggests that Latham's Snipe is a regular visitor to the study area, and the Banyule Flats and Banyule Swamp area may provide important habitat for this migratory species.

For further information on Latham's Snipe and its habitat refer to Section 5.1 of Chapter 5 – Description of the environment.

#### 7.12.2 Relevant impacts and mitigation measures

Tunnelling beneath the Yarra River and its associated floodplain habitats greatly reduces the potential for North East Link to impact most terrestrial and aquatic fauna species across the Melbourne area. Those floodplain areas provide the largest and highest quality areas of habitat for many of the species that use the inner eastern Melbourne area, including Latham's Snipe. In areas where surface impacts were unavoidable, including waterway and wetland habitats that are potentially used occasionally by Latham's Snipe, the smallest practicable project boundary for North East Link would be adopted to avoid unnecessary loss of habitat, as far as possible utilising areas that are already disturbed or have been previously disturbed.

Appropriate surface water, groundwater and site management through design and construction would reduce the potential for deleterious impacts on wetlands and waterways that may be visited by Latham's Snipe.

North East Link would be designed to minimise impacts to waterways in the Yarra catchment by avoiding works in waterways where possible, and including drainage features designed in accordance with WSUD principles to prevent runoff impacts to urban streams. In the long term, the addition of drainage features such as wetlands may increase habitat opportunities for species such as Latham's Snipe.

Table 7-12 summarises the assessment of impacts to Latham's Snipe against the significant impact guidelines 1.1 for Migratory species.

Table 7-12 Assessment of the action against significant impact criteria for Latham's Snipe

Criterion	Response
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	<b>Unlikely</b> While important habitat for Latham’s Snipe is thought to exist within the project boundary, North East Link would not impact this habitat. The most suitable habitat for Latham’s Snipe occurs in the vicinity of the Yarra River and associated floodplain in the Banyule/Bulleen area. This area would be avoided by tunnelling, so would not be affected. Other areas that may provide suitable habitat within the project boundary are generally degraded and disturbed and are unlikely to constitute important habitat.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	<b>Unlikely</b> Known terrestrial species that are potentially harmful or detrimental to Latham’s Snipe (such as cat, Red Fox) are already present within the study area. North East Link would unlikely result in the introduction of an additional invasive species. Impacted areas are unlikely to constitute important habitat for Latham’s Snipe.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	<b>Unlikely</b> While important habitat for Latham’s Snipe is thought to exist within the project boundary, it would not be impacted by North East Link due to the reasons in response to the criteria above. There is no indication that any site within the project boundary supports or attracts an ecologically significant proportion of the Latham’s Snipe population. Latham’s Snipe does not breed in Australia, so North East Link would unlikely disrupt the breeding cycle.

### 7.12.3 Residual impacts

The residual impact of North East Link on Latham’s Snipe is expected to be negligible and non-significant. The species is recorded occasionally in the Melbourne area and within the project boundary, mainly in the Banyule Flats and Banyule Swamp area, which would be avoided by tunnelling.

With a non-significant residual impact, offsets would not be required for Latham’s Snipe.