Connectivity and patch loss

Analysis identified 259 discrete habitat patches within the search region, 28 of which were at least 18 ha in size (i.e. suitable size for breeding Plains-wanderer) (DoE 2016; Marchant and Higgins 1993). Of these habitat patches, 11 will be impacted. Most of the impacted habitat is from a single patch, where 27.82 ha out of the total patch size of over 9,006 ha is being removed (<1 %). The other habitat impacts are spread across 10 patches, with each patch losing less than 12 % of its total area, except for one patch that is very small (0.012 ha), and is being almost entirely removed. This patch (patch 17) is noted as already being too small (<18 ha) and isolated from other patches (>400 m) to support any breeding territory (DoE 2016; Marchant and Higgins 1993). No patches that are of sufficient size for breeding territories were reduced to such an extent so as to no longer provide sufficient size for a potential breeding patch. No patches were fragmented by impacts creating habitat gaps beyond 400 m.

Table 11-2: Impacts to habitat patches suitable for the Plains-wanderer.

Patch ID	Patch size	Impact extent	Retained hectares (% of patch)
1	**9,006.01** *Likely suitable: 813.37* *Potentially suitable: 8192.64*	**27.82** *Likely suitable: 20.55* *Potentially suitable: 7.27*	8978.19 (99.7 %)
4	**13.24** *Likely suitable: 0.18* *Potentially suitable: 13.05*	**0.02** *Likely suitable: 0.02* *Potentially suitable: 0.00*	13.21 (99.8 %)
5	**0.119** *Potentially suitable only*	**0.02**	0.17 (90.5 %)
6	**0.57** *Likely suitable: 0.07* *Potentially suitable: 0.5*	**0.07** *Likely suitable: 0.07* *Potentially suitable: 0.00*	0.5 (88.2 %)
8	**270.84** *Likely suitable: 175.16* *Potentially suitable: 95.68*	**6.51** *Likely suitable: 6.37* *Potentially suitable: 0.13*	264.33 (97.6 %)
9	**181.78** *Likely suitable: 1.88* *Potentially suitable: 179.91*	**0.33** *Likely suitable: 0.27* *Potentially suitable: 0.05*	181.45 (99.8 %)
11	**352.63** *Likely suitable: 99.88* *Potentially suitable: 252.75*	**1.58** *Likely suitable: 1.53* *Potentially suitable: 0.05*	351.05 (99.6 %)
17	**0.012** *Potentially suitable only*	**0.0108**	0.004 (10.7 %)

Patch ID	Patch size	Impact extent	Retained hectares (% of patch)
19	**109.20** *Likely suitable: 2.66* *Potentially suitable: 106.54*	**0.03** *Likely suitable: 0.03* *Potentially suitable: 0.00*	109.17 (99.9 %)
93	**0.29** *Potentially suitable only*	**0.01**	0.28 (96.4 %)
95	**0.2** *Potentially suitable only*	**0.003**	0.197 (97.4 %)

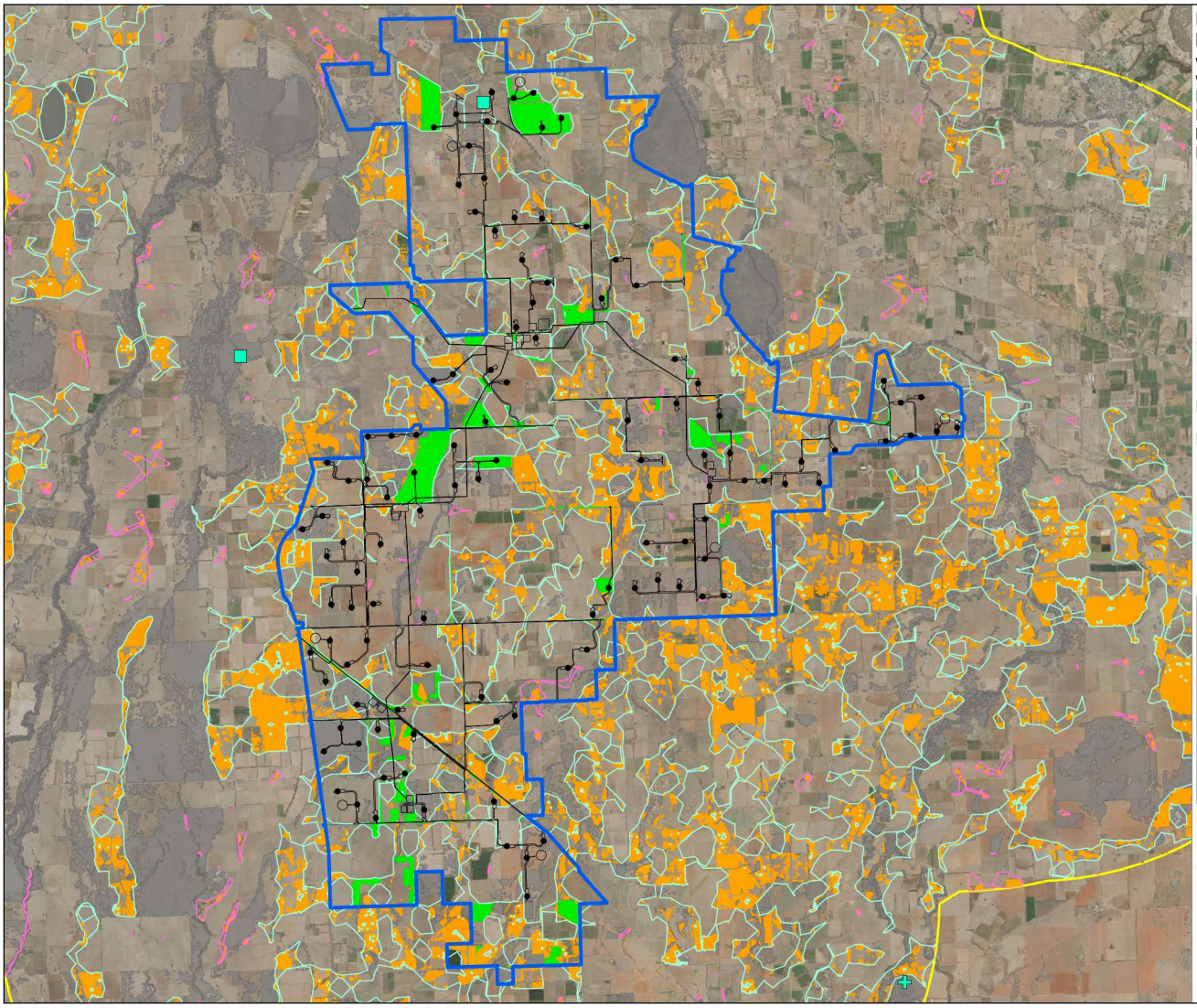


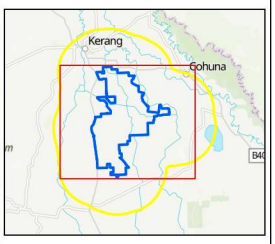
Figure 11-5. Suitable habitat for the Plains-wanderer at Macorna Wind Farm

Project No: 24129.07
Project location: Macorna Wind Farm, VIC
Date: 24/07/2026

Project Area
Search region -10km buffer
Construction footprint
Turbine

Plains-wanderer habitat suitability
Likely suitable
Potentially suitable
Unsuitable

Plains-wanderer record
Victorian Biodiversity Atlas (VBA)
Atlas of Living Australia (ALA)
Connected habitat <18ha
Connected PW habitat >18ha



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11.4. Conclusions

11.4.1. Summary of findings

There is only one known record of Plains-wanderer within the Project Area, dated more than 120 years ago (1905). There are more recent records, but several kilometres outside of the Project Area towards the southeast.

A conservative estimate using habitat hectare assessment data identified approximately 1,101.984 ha of 'likely suitable' Plains-wanderer habitat within the Project Area, with habitat modelling indicating a further 12,579.218 ha of potentially suitable habitat in the wider 10 km area. The MAWF is located between two recognised strongholds for the species, Patho Plains Grassland to the south-east and Lower Avoca Grassland to the northwest (Figure 11-2).

The current project layout has largely avoided impacts to suitable habitat. Under the proposed design, 28.846 ha of likely suitable habitat and 7.549 ha of potentially suitable habitat are proposed to be removed, representing 2.6 % and 0.06 % of the total habitat type within 10 km of the Project Area, respectively. Habitat removal is spread across 11 patches, with most (~28 ha) being from a single large patch. All patches impacted are losing less than 12 % of their total area, apart from one small patch (patch 17, 0.012 ha) that is too small for a breeding territory (DoE 2016; Marchant and Higgins 1993) and is almost entirely being removed. No suitably sized (≥18 ha) patches will be reduced to such an extent so as not to provide sufficient size for the breeding of Plains-wanderer. No impacts result in habitat gaps beyond the 400 m the species is known to disperse, indicating minimal fragmentation.

Notably, the majority of the development footprint (81.92 % of all impacted lands) is located within areas assessed as currently 'unsuitable' for Plains-wanderer. While these 'unsuitable' areas may be used on occasion, such as low agricultural crops, they are not known to persist in these areas (Garnett and Baker 2020). Overall, the project demonstrates a strong application of avoidance within the mitigation hierarchy, with impacts to potentially suitable habitat minimised through siting and design refinement.

11.4.2. Potential impact pathways

Construction impacts

The primary impact pathway associated with the proposed MAWF relates to construction impacts on habitat, including:

- Direct loss of habitat;
- Habitat fragmentation; and
- Habitat degradation.

Within the Project Area, habitat suitable for the Plains-wanderer is relatively limited as a result of extensive historical and ongoing cropping and grazing (DoE 2016). Breeding pairs typically require relatively large, contiguous habitat patches (approximately 18 ha or greater), with pairs likely only dispersing 300-400 m between patches (DoE 2016; Marchant and Higgins 1993). As such, vegetation clearance that increases fragmentation beyond those dispersal distances has the potential to reduce the viability of remaining potential habitat and reduce the capacity of the landscape to support the species, if present (DoE 2016).

In addition, indirect habitat degradation may occur through the establishment or spread of weeds, which can alter vegetation structure and ground cover, reducing the availability of bare ground, a key habitat attribute for the species. This impact is only likely if hygiene measures are not followed during construction/operation or if the project leads to reduced weed management practices. The implementation of standard measures with a CEMP is expected to reduce the potential for this impact pathway to arise.

Operational impacts

Operational impacts may include:

- Direct mortality from collision with turbines, transmission lines, and other infrastructure;
- Avoidance of previously suitable habitat due to tall infrastructure; and
- Barrier effects from birds diverting around turbines.

The flight behaviour of the Plains-wanderer is largely unknown, with observation challenging as flights mostly occur at night. There is some information within the literature that suggests the birds undertake sustained flights up to 40 m in height (Higgins and Davies 1996). Where the minimum RSA is at or below 40 m, it would be expected that there would be a collision risk to the species. The MAWF has a minimum RSA of 60 m, which is above the current understanding of flight heights for the species. Consequently, it is considered unlikely, albeit not impossible, that the Plains-wanderer will experience collision mortality either with operating turbines or other infrastructure (e.g. tower bases, transmission lines, etc).

The Plains-wanderer is known to avoid areas with tall structures such as trees and shrubs, which is thought to be a defensive strategy to limit risk from predatory birds that use such structures as hunting perches (DoE 2016). Installation of tall infrastructure (e.g. turbines, metmasts, overhead transmission lines) may lead to reduced use of the immediately surrounding habitat.

The Plains-wanderer has strongholds to the south-east (Patho Plains Grasslands) and north-west (Lower Avoca Grasslands). It is currently unknown how the birds move between these areas and if the MAWF could introduce risk or barriers to the birds during such movements.

11.4.3. Assessment of potential Impacts

The primary potential impact pathway of MAWF on Plains-wanderer, if present in the Project Area, is likely to be through construction, causing habitat loss, fragmentation or degradation.

While little is known about the Plains-wanderer's flight behaviour, particularly over longer distances, some evidence suggests that they may undertake flights up to 40 m above ground level (Higgins and Davies 1996). Since the minimum RSA height is 60 m above ground, direct mortality through collision with turbines is considered unlikely as flights are likely to occur well below this height.

Habitat loss and fragmentation have been minimised as the development footprint has largely avoided impacts to suitable habitat through siting and design refinement. The current project design reduced the removal to 2.6 % of the 'likely suitable' habitat in the Project Area (28.846 ha) and 0.06 % of the potentially suitable habitat (7.549 ha) mapped within the wider 10 km area. At the individual patch scale, 11 patches would be reduced up to 12 %. One of these patches (patch 17, 0.012 ha), would be almost entirely removed, however, this patch is well below the size considered capable of supporting the species (18 ha) and is not considered to represent a substantive loss of functional habitat.

Overall, the Project proposes the removal of habitat that represents a small proportion of the likely suitable habitat available within the Project Area (2.6 %), and an even smaller proportion of suitable habitat potentially available in the broader landscape. While the National Recovery Plan adopts a broad definition of critical habitat as "Any regions where the species is likely to occur" as defined within Figure 2 of the Plan (DoE 2016). This definition is high-level and does not dictate that all areas within its distribution are of equivalent ecological importance or that their loss would result in a significant impact on the species. The recovery plan states that species distributions are indicative only and not to be used for local assessment. Local knowledge and information should be sought to confirm the presence of the species, or its habitat (DoE 2016). Overall, impacts to habitat are considered low in the context of the surrounding area. The Proponent is also committed to further design refinement, including micrositing of turbines and tracks, to further avoid identified habitat where practicable.

There is considered a limited risk of collision due to the understanding that the species tends to fly relatively low and the Project has a 60 m minimum RSA. However, little is known of the species' flight behaviour. Moreover, the Plains-wanderer has strongholds to the south-east (Patho Plains Grasslands) and north-west (Lower Avoca Grasslands). It is currently unknown if or how the birds move between these areas and if the Project Area could introduce collision or barrier risk to the birds during such movements. Collision risk would be expected to be limited, however, residual impacts cannot fully be discounted.

11.4.4. Recommended application of mitigation hierarchy

This section provides further recommendations for the application of the mitigation hierarchy to further reduce impacts on the Plains-wanderer.

Habitat loss, fragmentation, and degradation

Habitat loss and fragmentation can be further avoided wherever practicable through the careful micro-siting of all project infrastructure. This includes avoiding direct disturbance to areas mapped as 'likely suitable' and 'potentially suitable' habitat and minimising the fragmentation of habitat patches to the extent that they may function as barriers to movement. Available evidence from mark-recapture studies indicates that the species typically moves less than 400 m (DoE 2016; Marchant and Higgins 1993). Accordingly, project design should seek to avoid creating gaps in habitat that are greater than or equal to 400 m. This will reduce the impacts on the fragmentation of habitats and lower the likelihood that the project may disrupt movement and reduce functional connectivity across the landscape.

Where impacts to habitat or connectivity cannot be fully avoided, restoration and rehabilitation measures should be implemented following construction (see also Section 15). Rehabilitation should aim to re-establish both the structure and connectivity of habitat across disturbed areas. Priority should be given to restoring habitat patches that are, or can be made, sufficiently large to support breeding, with a target patch size greater than 18 ha (DoE 2016). Restoration efforts should focus on improving habitat quality and reinforcing linkages between remnant patches to support long-term persistence of the species within the Project Area.

Where impacts to habitat cannot be avoided or fully mitigated through restoration, and residual impacts remain, appropriate compensation measures should be considered. These may include the protection, enhancement, or management of suitable habitat outside the direct impact footprint to offset project-related impacts. Compensation measures should be developed in accordance with species-specific guidance, relevant policies, and regulatory requirements, and undertaken in consultation with regulators and key stakeholders to ensure they are targeted, effective, and commensurate with the level of impact.

Habitat degradation should be minimised through the implementation of targeted weed prevention and control measures within areas of 'likely suitable' habitat. These measures should aim to prevent the introduction and spread of invasive species while maintaining the vegetation structure and proportion of bare ground that are critical to habitat suitability. Weed control activities must be carefully managed to avoid unintended alteration of habitat characteristics. These measures should be incorporated into a CEMP, which outlines clear procedures, monitoring, and adaptive management approaches to ensure habitat quality is maintained throughout the construction phase.

Deterrence from habitat and preventing barrier effects

Increased predation risk associated with the project should be minimised through the careful siting and design of infrastructure. Tall structures on which raptors could nest, including power poles, met masts and buildings, can provide artificial perching or vantage points for predatory birds and thereby increase predation pressure on ground-dwelling species. Where practicable, such infrastructure should be located away from areas of 'likely suitable' habitat to reduce the likelihood of predators utilising these structures in proximity to sensitive fauna.

The separation distance between tall infrastructure and 'likely suitable' habitat should be informed by the height and prominence of the structure, with greater setbacks applied to taller structures where feasible (Baker-Gabb 2014). This approach is consistent with the National Recovery Plan (DoE 2016) and aims to reduce the potential for increased predation risk resulting from altered landscape features. Where complete avoidance is not practicable, consideration should also be given to design and layout measures that minimise perching opportunities and reduce line-of-sight advantages for predatory species.

Direct mortality

Micrositing infrastructure away from 'likely suitable' habitat is likely to further reduce the potential for direct mortality by decreasing the possibility for interactions between birds and infrastructure.

11.4.5. Conclusions and further investigations

This assessment has been undertaken using a precautionary approach, assuming the presence of the species within the Project Area despite no recent records, and has been informed by a combination of desktop habitat assessment and existing vegetation field survey data. This approach was adopted due to the cryptic nature of the species, which means that a lack of detections during surveys cannot be reliably interpreted as evidence of their absence. Targeted surveys may be undertaken to provide more information on the presence or likely absence of the species.

Areas of 'likely suitable' habitat have been identified across the site, with a greater concentration occurring in the southern portion of the Project Area. The MAWF design has sought to avoid impacts to 'likely suitable' habitat wherever practicable, with the majority of mapped habitat avoided through the micro-siting of infrastructure. The total extent of 'likely suitable' habitat to be impacted is 28.82 ha (3.45 % of that identified within the Project Area). The extent that is impacted is not considered substantial in the context of the Project Area, nor in the broader context of available habitat, where the Project Area represents a minor amount of that available in the region. The two recognised regional strongholds for the species are the Patho Plains to the south-east and the Lower Avoca region to the north-west of the Project Area. As such, the project is unlikely to result in a significant impact on the Plains-wanderer's habitat availability.

It is possible there may be some level of residual impact, which may result in cumulative effects with impacts from other local and regional developments. The species is generally considered sedentary, and therefore, individuals are unlikely to interact frequently with a multitude of developments across the landscape. However, dispersing individuals may be exposed to a range of risks associated with nearby developments, particularly those dispersing between the strongholds to the south-east and north-west. The cumulative risk to the species is inherently difficult to quantify due to the limited availability of site-specific data and broader uncertainties regarding other sources of stressors within the region. Notwithstanding these uncertainties, the relatively small scale of habitat impact associated with the MAWF, combined with the current avoidance of 'likely suitable' habitat, and with the adoption of the above-recommended mitigation measures, supports the conclusion that the project is unlikely to contribute substantially to cumulative impacts on the species or have a significant impact on the population of this species.

12. Growling Grass Frog

This section assesses the potential implications of the Project on Growling Grass Frog (*Litoria raniformis;* GGF), which is listed as *Vulnerable* under the EPBC and FFG Acts. To understand potential impacts on GGF, this assessment sought to identify suitable habitat within the project area, determine if the species was present, and identify impact pathways for GGF and its habitat. This assessment was undertaken with guidance from the *Significant Impact Guidelines for the Vulnerable Growling Grass Frog Litoria raniformis* (DEWHA 2009).

Assessment of the species' presence and suitable habitat onsite, including:

- A review of scientific literature and statutory documents relating to the GGF,
- A review of existing information regarding nearby GGF records, modelled habitat, and modelled wetlands, including the VBA, NatureKit and Atlas of Living Australia,
- A review of existing ecological reporting and data, including wetland data derived from targeted surveys for Brolga and GGF, to derive an understanding of potential wetland habitats, and
- Recommendations to avoid, minimise and mitigate impacts on GGFs and potential or known GGF habitat.

12.1. Background information

12.1.1. Description

The Growling Grass Frog is a large species of frog endemic to Australia. Females are larger than males and may exceed 10 cm in length. The dorsal side appears dull olive to vibrant emerald-green with patches of brown to golden-bronze colouration (Plate 12-1) (Clemann and Swan 2023). There are scattered raised 'warts' in longitudinal rows on the dorsal surface, usually brown- or bronze-coloured. The flanks have white- or cream-coloured blotches that are slightly raised, which usually become lighter towards the ventral surface (Clemann and Swan 2023).

Plate 12-1: Growling Grass Frog (source: Nature Advisory).

The GGF is generally more active at night than during the day (i.e., calling, foraging). Calling commences in early spring and peaks in late spring and summer. Males call from emergent vegetation or from floating mats of vegetation. They shelter in vegetation at the water's edge, beneath ground debris, rocks and logs, and inside hollow logs, where they may form large aggregations (Clemann and Swan 2023).

12.1.2. Habitat

GGF tend to occur in and around aquatic habitats in open woodland, grassland, shrubland and highly disturbed areas such as farms and urban fringes. Breeding occurs in permanent and ephemeral waterbodies such as ponds, dams, lakes, swamps, drainage lines, streams and creeks with chains of ponds, and flooded quarries (Clemann and Swan 2023). The GGF utilises a range of habitat resources, including emergent and riparian vegetation (*Typha spp.*, *Eleocharis spp.)* and debris (rocks, logs) and soil cracks for shelter (DEWHA 2009).

The GGF is a highly mobile amphibian that relies on movement between wetlands to maintain metapopulation persistence across the landscape (DCCEEW 2024b). Individuals commonly disperse several hundred metres between habitat patches and are capable of movements exceeding 1 km, particularly during periods of rainfall or flooding when temporary habitats become available (Heard et al. 2012; Heard and Scroggie 2010). Consequently, the persistence of the species is strongly influenced by habitat connectivity, with barriers such as roads and urban development reducing dispersal and increasing the risk of local population decline (Heard et al. 2012; Heard and Scroggie 2010). Maintaining networks of suitable wetlands and terrestrial habitat within dispersal distance is therefore considered a key requirement for the long-term conservation of the species (DCCEEW 2024b).

12.1.3. Distribution and threats

The GGF was once common and abundant in Victoria. A rapid decline commenced in the 1980s, resulting in the loss of much of the species' range (Clemann and Gillespie 2012; Clemann and Swan 2023). Several causes of this decline have been proposed (DELWP 2017c; Clemann and Swan 2023), including:

- Habitat destruction, degradation and fragmentation due to infrastructure (roads, housing estates, industrial complexes), wetland drainage and the filling of quarry pits;
- Changed hydrological regimes (timing, frequency, flow volume and speed, lowering of groundwater through pumping of aquifers);
- Poor water quality due to nutrients, turbidity, pesticides, detergents and heavy metals. This particularly affects tadpole survival;
- Aquatic vegetation changes relating to the structure of vegetation; including overgrowth of reeds due to increased nutrient levels in the water (e.g., from fertilisers) or a lack of vegetation due to unsuitable or toxic water characteristics;
- Disease and death caused by the chytrid fungus *Batrachochytrium dendrobatidis;*
- Predation by introduced fish and yabbies;
- Loss of habitat connectivity due to roads or other infrastructure;
- Overshadowing of pools and overly dense terrestrial vegetation adjacent to wetlands; and
- Grazing of wetland margins, removing vegetation and shelter and reducing water quality.

12.1.4. Legislative protection

Victoria: Listed as Vulnerable under the FFG Act.

Commonwealth: Listed as Vulnerable under the EPBC Act.

12.2. Methodology

12.2.1. Sources of existing information

Database searches for existing records of GGF and potential wetland habitat within 10 km of the study area were undertaken on the 22nd of October 2025. The following sources of information were reviewed to collate existing information:

- Victorian Biodiversity Atlas, VBA (DEECA 2026e);
- *NatureKit* (DEECA 2026a);
- Atlas of Living Australia, ALA (ALA 2026);
- Victorian Wetland Inventory, VWI (DEECA 2026b); and
- Brolga Breeding Habitat suitability Model, BBHSM (DEECA 2025i).

12.2.2. Desktop habitat assessment

Broad-scale habitat availability

Broad-scale habitat availability and landscape connectivity were assessed using the DEECA Habitat Importance Model (HIM) and Habitat Distribution Model (HDM) available through *NatureKit* (DEECA 2026a). These models were used to identify areas of predicted suitable habitat, assess the relative importance of habitat within the surrounding landscape, and provide context for understanding potential site use and inform further assessments. A review of GGF records from the VBA and ALA was also undertaken to identify known occurrences in the vicinity of the Project and understand the potential utilisation trends.

Potential habitat within the Project Area

A desktop habitat assessment was initially conducted to identify potentially suitable GGF habitat within 300 m of the construction footprint (v2). The suitability of wetlands mapped through the Victorian Wetland Index (VWI, DEECA 2023b) and the Brolga Breeding Habitat Suitability Model (BBHSM, DEECA 2025h) for GGF were reviewed through:

- Review of aerial imagery (Nearmap 2026);
- Review of available information within the VWI, including:
    - Wetland system type – lake, marsh/swamp, marine, estuarine, etc.
    - Salinity regime – fresh, saline, hypersaline, etc.
    - Water regime – permanent, periodically inundated, etc./
    - Water source – groundwater, river, etc.
    - Dominant vegetation
    - Wetland origin – naturally occurring or human-made.

Due to the limitations of desktop habitat suitability assessments for GGF (see limitations below), a precautionary approach was adopted when assessing wetland suitability. Each wetland was classified into the following three categories:

- *Low likelihood of suitability* – Isolated farm dams, generally in cropped land, or irrigation channels with no emergent vegetation and steep banks, providing little to no habitat value relative to other potential habitats in the assessment area.
- *Medium likelihood of suitability* – Wetlands (including farm dams) exhibiting some GGF-selected habitat features, such as emergent, fringing or floating vegetation, rocks/logs along edges or surrounding area, but generally small or isolated, and lacking connectivity to other waterways. This category also includes wetlands that were dry or lacking visible habitat features but had some connectivity to other waterbodies, generally located within larger floodplain or swampy areas in proximity to creeks.
- *High likelihood of suitability* – Wetlands that were large, natural, or otherwise well-connected to other waterbodies (e.g., creeks, swamps) and exhibited GGF habitat features, such as emergent, fringing or floating vegetation, and rocks/logs along edges or in the surrounding terrestrial habitat.

Where certain habitat features could not be reliably determined from remote imagery, wetlands were precautionarily classified as medium or high to ensure these areas are visited and verified during field surveys. All wetlands categorised as high or medium likelihood of containing suitable habitat were selected for field validation. Mapped wetlands (VWI/BBHSM) that appeared to be fully transformed into crops or other land uses, leaving no wetland footprint and with no associated vegetation indicative of wetlands, were excluded from further assessment.

12.2.3. Field habitat assessment

Field surveys to verify wetland habitat suitability and identify unmapped habitat were undertaken on 8–11 December 2025 and 23–26 February 2026. Field surveys involved trained field staff visiting a representative sample of those assessed in the desktop assessment, with a focus on

those deemed to have the highest potential to contain habitat suitable for the GGF, as well as nearby connecting waterways.

Field assessment collected the following data for each wetland, which are known to significantly influence the distribution of the GGF (DEWHA 2009):

- Size and type of water body (e.g. large farm dam),
- Percentage surface water cover,
- Presence of drains,
- Percentage cover of floating, emergent, and fringing vegetation,
- Description of terrestrial habitat within 30 m of the wetland,
- Identification (where present) of terrestrial refuge sites surrounding aquatic habitats (e.g., rocks, fallen logs, ground debris),
- Presence and overall abundance of aquatic predators (Mosquito Fish *Gambusia holbrooki* and other fish) and/or terrestrial predators (foxes, cats, birds),
- Distance from other waterbodies/waterways,
- Presence of fencing,
- Evidence of grazing or other disturbance,
- General land use of the wetland and immediate surrounds, and
- Connectivity to other waterbodies (e.g. creeks, dams, and swamps).

12.2.4. Limitations

The GGF wetland assessment was conducted on wetlands within 300 m of a version of the project footprint that has since been updated. This has resulted in some wetlands that may now be within 300 m of the project layout not being assessed. However, the layout change was minor, with a small number of turbines and associated infrastructure being relocated or removed, including to avoid wetlands. The majority of the wetland assessment is still relevant, as the assessment covers the majority of potentially impacted GGF wetland habitats and gives an indication of potential impacts across the Project Area.

The remote imagery used in desktop assessments may not capture all small or ephemeral wetlands, and some habitat features (e.g., emergent vegetation, rocks, logs, or surrounding terrestrial habitat) were difficult to determine remotely. When habitat features could not be discerned from aerial imagery, wetlands were precautionarily classified as medium or high during the desktop assessment.

Field surveys were conducted over the 2025/26 summer, when many wetlands were dry or partially dry. Consequently, some habitat features may not have been visible at the time of the survey. Wetlands that were dry at the time of surveys were assessed for wetland connectivity, surrounding terrestrial habitat, and their potential to support GGF-selected habitat features when inundated. This approach sought to ensure that areas likely to provide suitable habitat during wetter periods or flooding events were not overlooked or misclassified as low-quality habitat.

12.3. Results

12.3.1. Existing information

There were nine historical records of GGF within the 10 km search region corresponding to six general locations, all of which were obtained from the VBA (Figure 12-1). All of the records are over 40 years old and most have generally poor location accuracy (Table 12-1). None of these records are located within the Project Area, with the closest records associated with wetlands or watercourses adjacent to the Project boundary, in Johnson and Hird Swamps (minimum 2 km from current proposed layout).

Table 12-1: Summary of existing records of Growling Grass Frog within 10 km of Macorna Wind Farm.

General location	Location accuracy (km)	Number of inviduals	Source of records	Date of record
Tragowel Swamp	0.9	10	VBA	18/08/1982
	4.5	10	VBA	18/08/1982
Hird Swamp	1.8	10	VBA	25/08/1982
Johnson Swamp	1.8	10	VBA	25/08/1982
	4.5	10	VBA	25/08/1982
Pyramid Hill	4.5	-	VBA	Between 1788 and 1982
Kow Swamp	4.5	-	VBA	Between 1788 and 1982
Kerang Agricultural Research Station	4.5	-	VBA	Between 1788 and 1982
	4.5	-	VBA	Between 1788 and 1982

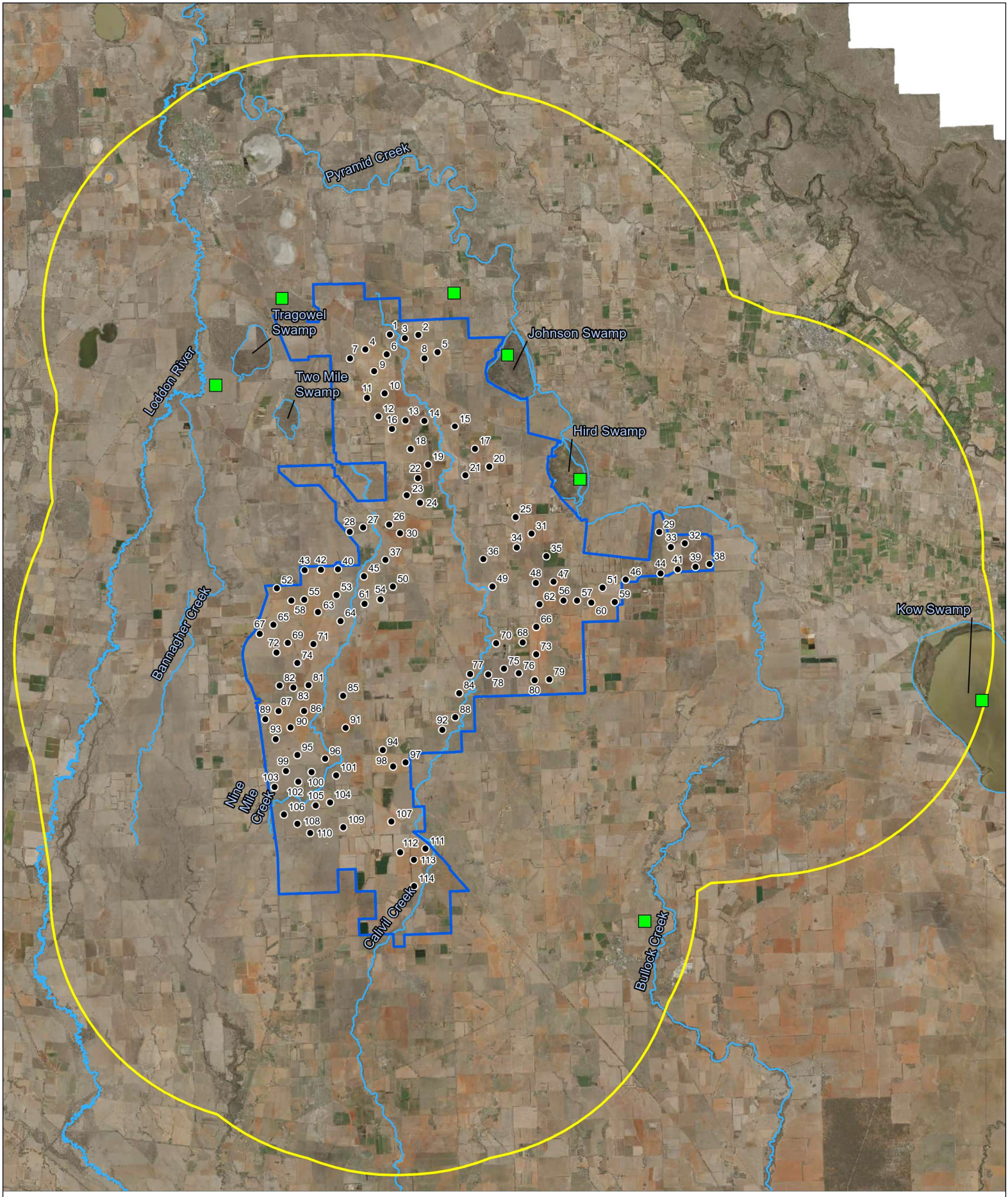

Figure 12-1. Growling Grass Frog VBA records within 10-km of Macorna Wind Farm

Project No: 24129.07 **Project location**: Macorna Wind Farm, VIC **Date**: 14/04/2026

- Project Area
- Search region (10km buffer of Project Area boundary)
- Turbine
- Waterway
- Growling Grass Frog record - VBA

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12.3.2. Habitat suitability

Broad-scale habitat availability

Both the HDM and HIM (DEECA 2026a) for the GGF intersected with the study area (Figure 12-2 and Figure 12-3, respectively). The HDM and HIM indicate relatively low habitat suitability and importance for the GGF within the Project Area when compared with surrounding landscapes such as the Loddon River to the east and Murray River to the north. These adjacent areas support larger, more contiguous, and higher-quality habitat, including extensive wetland complexes (mainly swamps approximately 250 – 500 ha) such as Johnson Swamp, Hird Swamp, Two Mile Swamp, Tragowel Swamp, Bannagher Creek, Pyramid Creek, Bullock Creek and the Loddon River.

The large wetlands in the landscape surrounding the Project (i.e. Hird Swamp, Johnson Swamp, Tragowel Swamp and Two Mile Swamp) are modelled to consist of Lignum Swampy Woodland (EVC 823). The size of these individual wetlands varies from approximately 121 ha (Two Mile Swamp) to 411 ha (Johnson Swamp), and whilst large, they are either ephemeral in nature, periodically flooding after large rainfall events or managed by environmental water flows.

- **Hird Swamp:** Hird Swamp has large areas of lignum, reeds, and floating vegetation, with large areas of open water and occasional stags as well (Plate 12-2). This wetland is known to be slightly brackish (2,600 and 3,100 EC) (Lugg 1989), which can provide a protective effect against chytrid fungus for GGF, and is not saline enough to exclude GGF (i.e. <5000 EC) (DELWP 2017d). This combination of features clearly identifies it as a potential key GGF habitat in the region. There are 10 historical records of GGF at this site, with the most recent from 1982. A 2 km turbine-free buffer has been placed around this swamp.
- **Johnson Swamp:** Johnson Swamp was dry when visited over summer 2025 but inundated in July 2026, with grassy growth in some parts indicating semi-regular protracted dry periods. It also had large areas covered by lignum and could provide important GGF breeding habitat in such parts when flooded, particularly since it is a freshwater wetland (400 to 1,500 EC, Plate 12-3) (Lugg 1989). There are 20 historical records of GGF at this site, with the most recent from 1982. A 2 km turbine-free buffer has been placed around this swamp.
- **Tragowel Swamp:** Tragowel Swamp is modelled as a hyposaline wetland (DEECA 2026b), with no exact figure available to confirm if it is beyond the >5000 EC tolerable by the species (Plate 12-4 and Plate 12-5). However, the swamp has 20 historical GGF records from 1982. The salinity of the wetland is therefore assumed to be within the range that GGF can persist. The Swamp is considered a potential GGF habitat until such a time that salinity can be verified. This wetland is outside of the Project Area and is not impacted by any Project-related activities.
- **Two Mile Swamp** is modelled as a freshwater wetland, and was dry during the 2025 surveys. The swamp was visited in the July 2026 Brolga survey, and it is considered a potential key GGF habitat due to proximity to Tragowel and the abundance of suitable habitat. This wetland is outside of the Project Area and is not impacted by any Project-related activities.

All of these habitats with historical GGF records are well over 350 m from any infrastructure associated with the Project, and as such, any populations present there are not expected to be impacted (DEWHA 2009).

Plate 12-2: Hird Swamp during drier conditions (left, October 2025) and wetter conditions (right; July 2026).

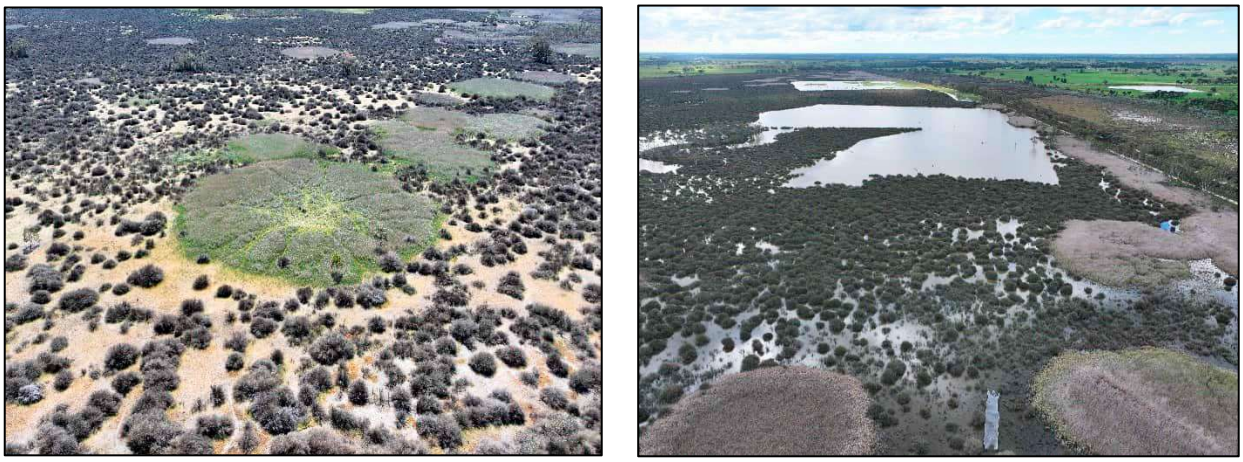

Plate 12-3: Johnson Swamp during drier conditions (left, October 2025) and wetter conditions (right; July 2026).

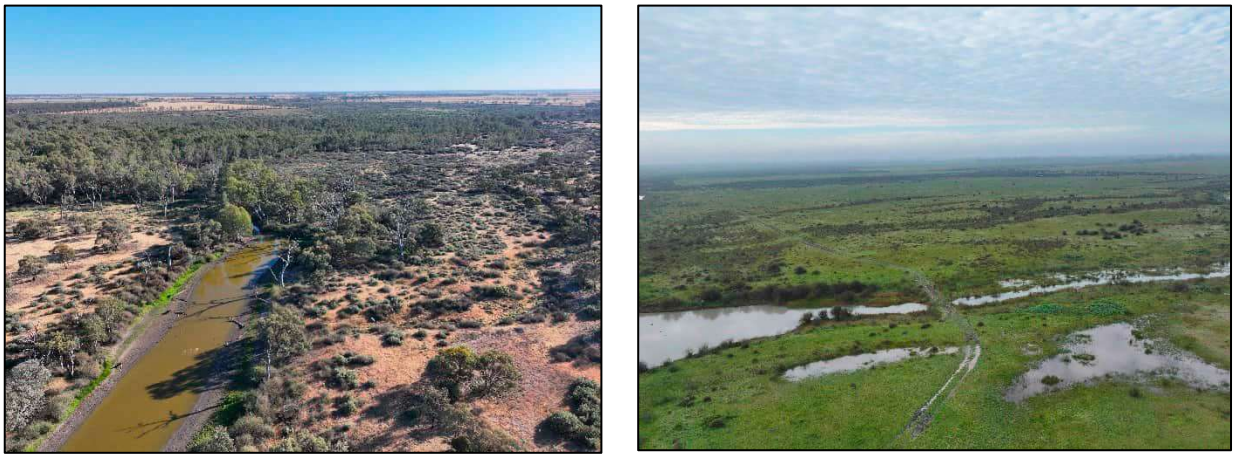

Plate 12-4: Tragowel Swamp during drier conditions (left, October 2025) and wetter conditions (right; July 2026).

Plate 12-5: Two Mile Swamp during wet conditions (July 2026).

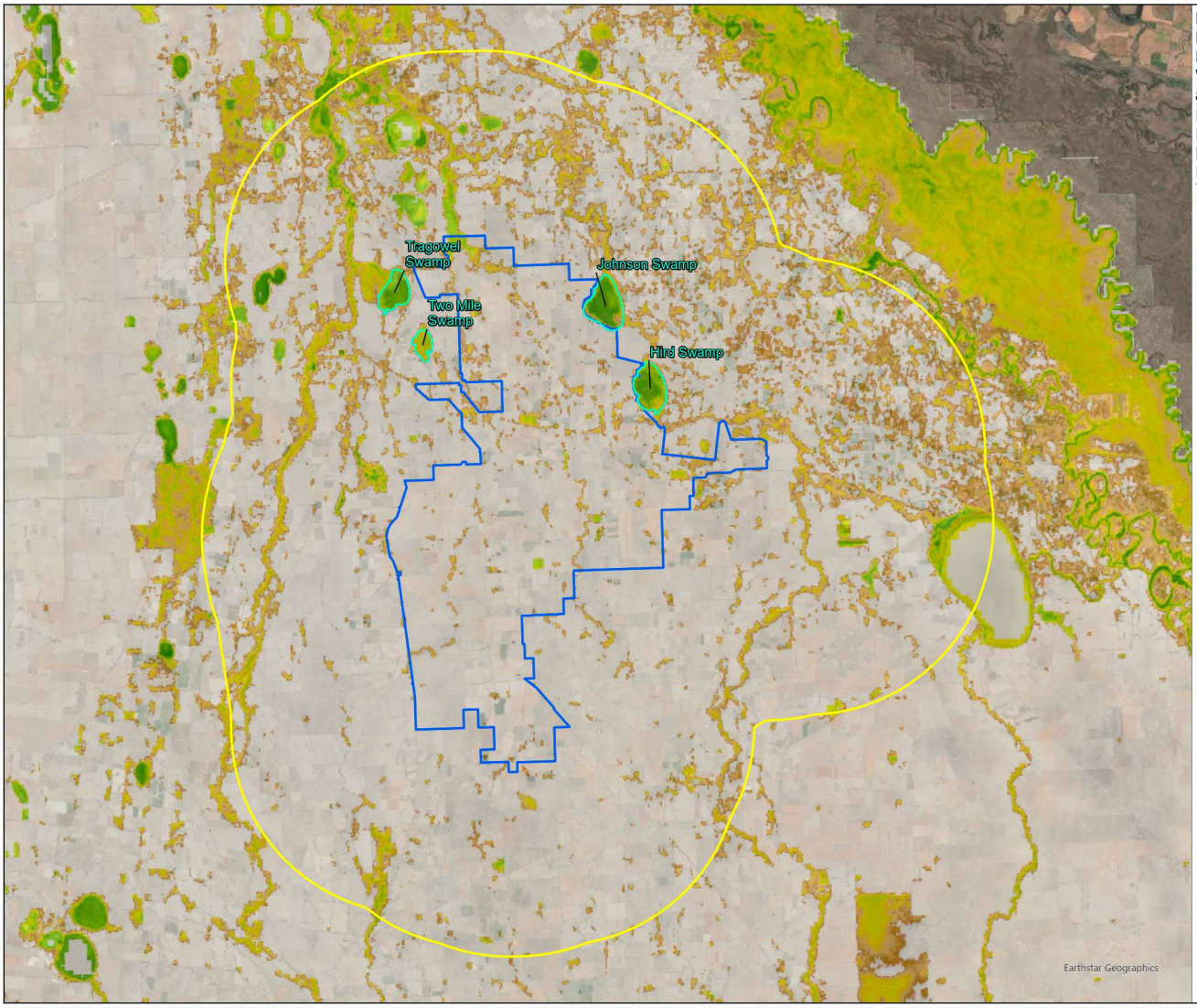

Figure 12-2. Growling Grass Frog Habitat Distribution Model (HDM) for the Macorna Wind Farm and surrounding area

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 22/07/2026

Project Area

Search area (10km buffer of Project Area boundary)

Key GFF wetland

Growling Grass From Habitat Distribution Model (HDM)

High suitability

Low suitability

Note: transparent white of the Habitat Distribution Model has a value of 0, no suitability

N

Kilometers

0 2.5 5 7.5 10

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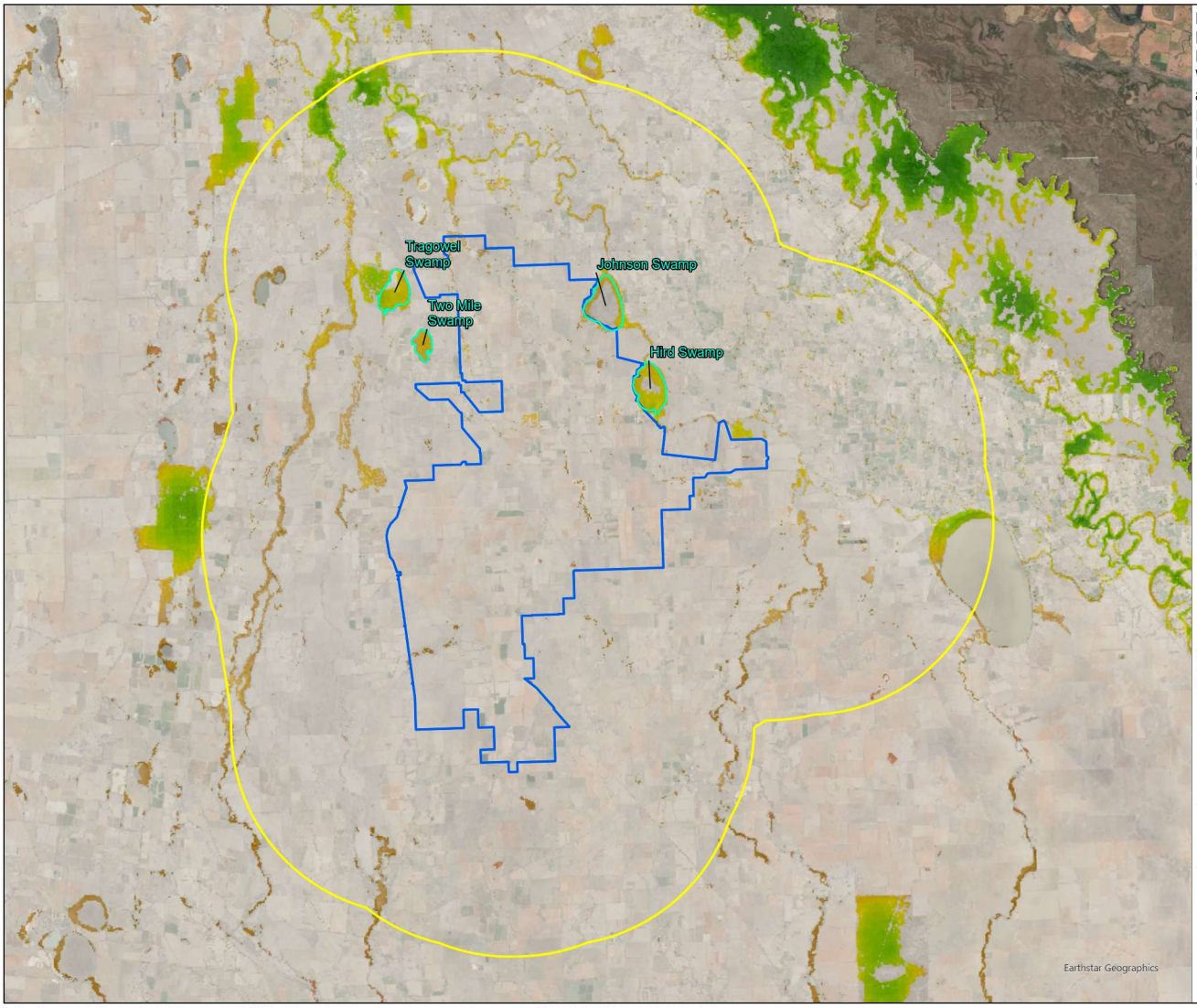

Figure 12-3. Growling Grass Frog Habitat Importance Model (HIM) for the Macorna Wind Farm and surrounding area

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 22/07/2026

Project Area
Search area (10km buffer of Project Area boundary)
Key GGF wetland

Value

High importance
Low importance

Note: transparent white of the Habitat Importance Model has a value of 0, no importance

N
Kilometers
0 2.5 5 7.5 10
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Desktop assessment

A total of 159 wetlands were mapped to occur within 300 m of the project footprint (v2) (Table 12-2), and so were addressed in the desktop assessment (Appendix 22). Following desktop review:

- Six wetlands were assessed as high likelihood of containing suitable habitat;
- 61 wetlands were assessed as medium likelihood of containing suitable habitat;
- 57 wetlands were assessed as low likelihood of containing suitable habitat; and
- 35 wetlands were excluded from further assessment based on aerial imagery, as the 'wetlands' were either transformed into cropped land or otherwise had no indications of functioning as a wetland (e.g. no footprint on aerials, no vegetation, water, etc.)

Field assessment

Sixty-one wetlands assessed in the desktop assessment were visited during field assessment, in addition to a further four unmapped wetlands that were identified during the field survey. All 'high' quality wetlands were assessed in the field, 48 of 61 'medium' wetlands, and 3 of 57 'low' quality wetlands.

After field survey, all six 'high' quality wetlands were downgraded to either 'medium' or 'low', whilst all but nine of the 'medium' quality wetlands assessed in the field were downgraded to either 'low' or 'not a wetland'. Two of 'low' wetlands were downgraded to 'not a wetland', whilst the third was upgraded to 'medium'. Of the 61 wetlands assessed in the field, 16 were ultimately assessed as 'medium', 36 as 'low' and nine as 'not a wetland'. Of the four previously unmapped wetlands (and therefore not assessed in the desktop assessment), all of which were farm dams, one was assessed as 'medium' and three as 'low' (see Appendix 22 for details). The results are summarised in Table 12-2 and Figure 12-4.

The sites downgraded to non-wetlands comprised cropped areas with no signs of wetland habitat (no wetland footprint or depression and lack of vegetation associated with wetlands) or former farm dams now used as rubbish pits. Thirteen wetlands assessed as 'medium' were not assessed in the field assessment due to access constraints. No changes were made to their classification; however, based on observations from comparable sites, it is considered likely that some, and potentially most, would be of low habitat quality if assessed in the field.

Overall, the outcomes of the field survey confirm that the desktop assessment effectively adopted a precautionary approach, with on-ground verification resulting in the downward reclassification of potential GGF wetland habitat quality, with the one exception of a single wetland being upgraded from low to medium.

The field assessment did not identify any high-rated wetlands, which currently support the complete set of habitat features typically associated with GGF breeding habitat. The most suitable wetlands (those rated as medium) were generally associated with creeks and swampy or flood-prone areas within the project site, although most were dry at the time of the field assessment. Notably, only 17 wetlands (all farm dams) were observed to hold water during the November 2025 survey, indicating there is likely a limited supply of permanent habitat for the species near impact areas.

No aquatic or terrestrial predators were detected, except the White-faced Herons observed at one farm dam, which is a widespread native bird and a natural component of wetland ecosystems.

Table 12-2: The results of the GGF desktop and field habitat assessment.

Wetland suitability	Desktop assessment only	Field assessed and desktop assessed wetlands	All wetlands
Not a wetland	35 (34%)	9 (15%)	44 (27%)
Low	54 (53%)	36 (59%)	90 (55%)
Medium	13 (12%)	16 (26%)	29 (18%)
High	0 (0%)	0 (0%)	0 (0%)
TOTAL	**102**	**61**	**163**

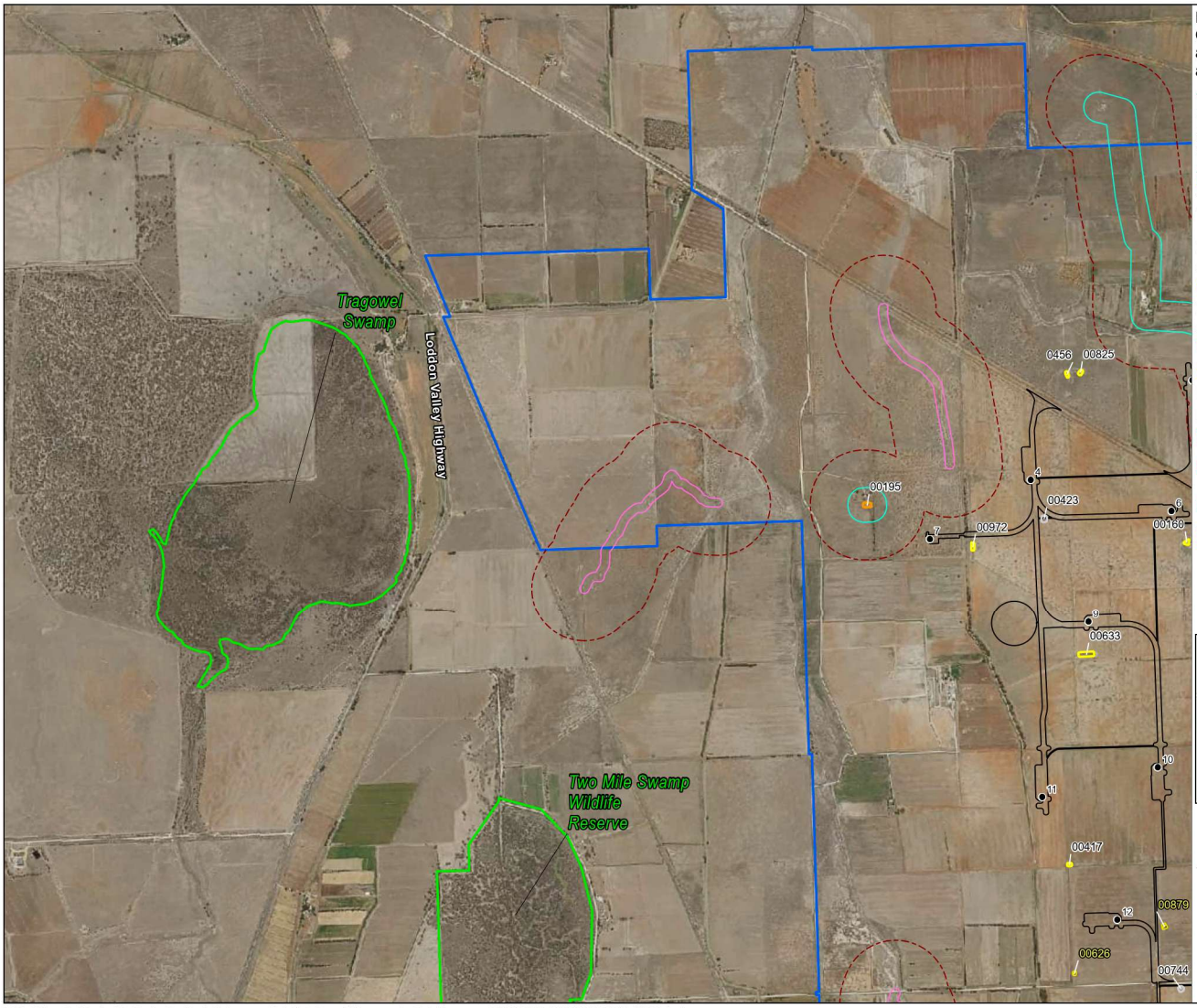

Figure 12-4-1. Results of the Growling Grass Frog habitat assessment for both desktop and field assessments

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 10/08/2026

- Project Area
- Construction footprint - v03
- Turbine

Habitat quality - Field Assessment

- Low

Habitat quality - Desktop Assessment

- Medium
- Low
- No habitat

Habitat buffers

- Artificial drain buffer - 30m
- Creek line/Medium quality GGF wetland buffer - 100m
- GGF relocation and frog fence buffer - 350m
- Key GGF wetland

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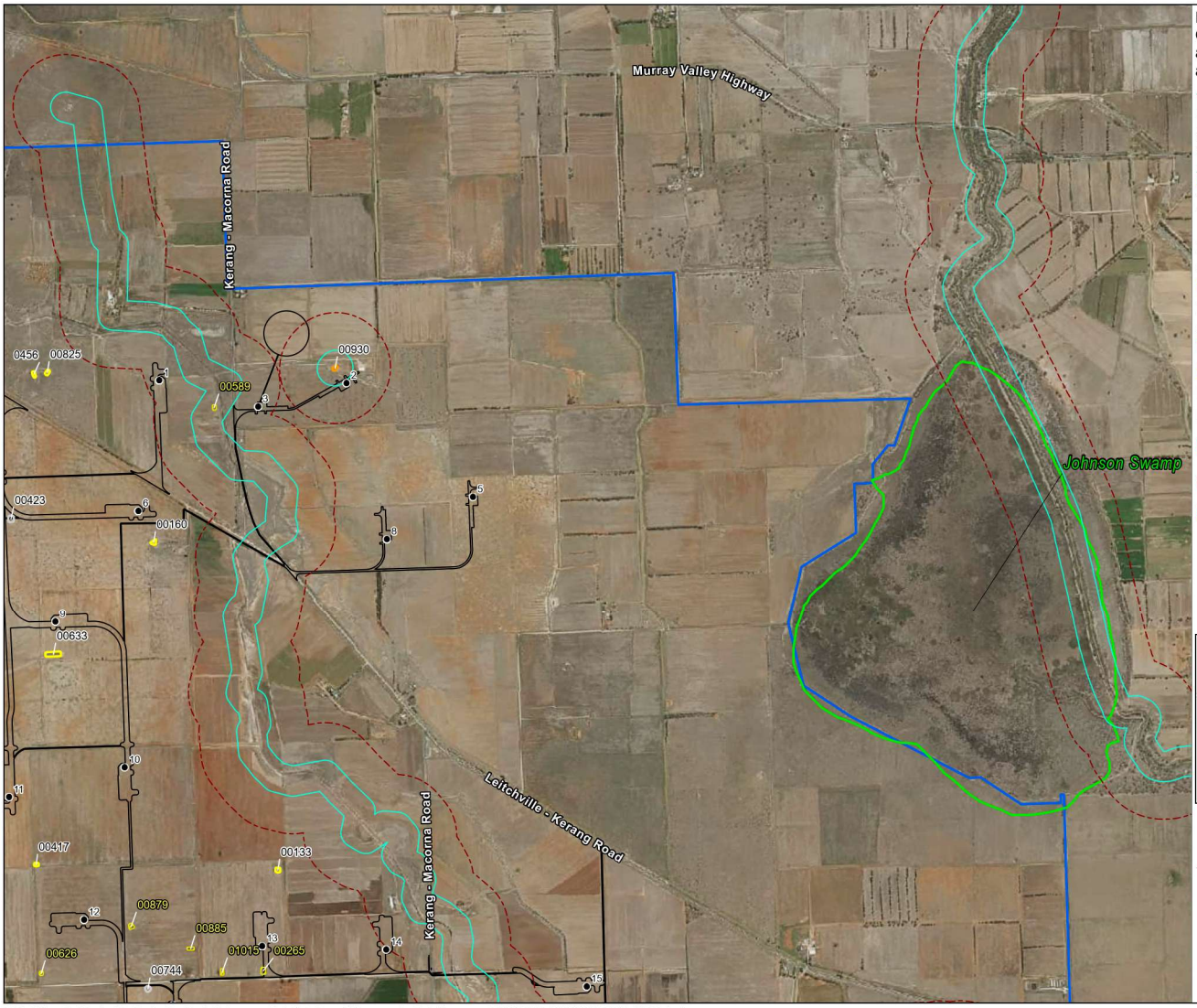


Figure 12-4-2. Results of the Growling Grass Frog habitat assessment for both desktop and field assessments

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 10/08/2026

- Project Area
- Construction footprint - v03
- Turbine

Habitat quality - Field Assessment

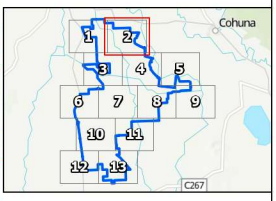
- Low

Habitat quality - Desktop Assessment

- Medium
- Low
- No habitat

Habitat buffers

- Creek line/Medium quality GGF wetland buffer - 100m
- GGF relocation and frog fence buffer - 350m
- Key GGF wetland



N

Kilometers
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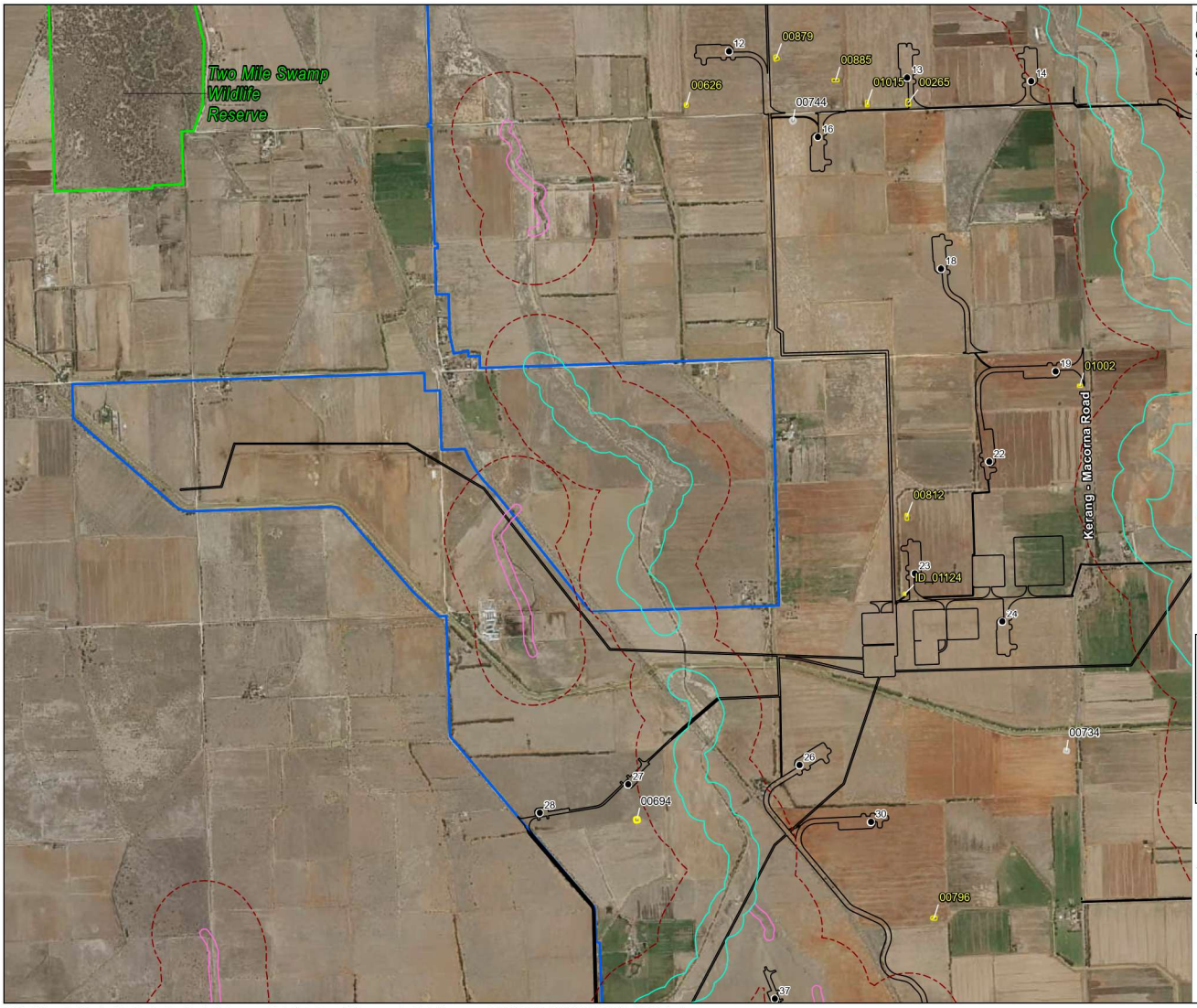


Figure 12-4-3. Results of the Growling Grass Frog habitat assessment for both desktop and field assessments

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 10/08/2026

- Project Area
- Construction footprint - v03
- Turbine

Habitat quality - Field Assessment

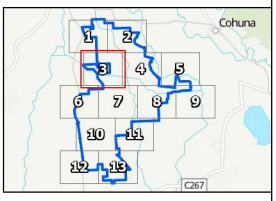
- Low

Habitat quality - Desktop Assessment

- Low
- No habitat

Habitat buffers

- Artificial drain buffer - 30m
- Creek line/Medium quality GGF wetland buffer - 100m
- GGF relocation and frog fence buffer - 350m
- Key GGF wetland



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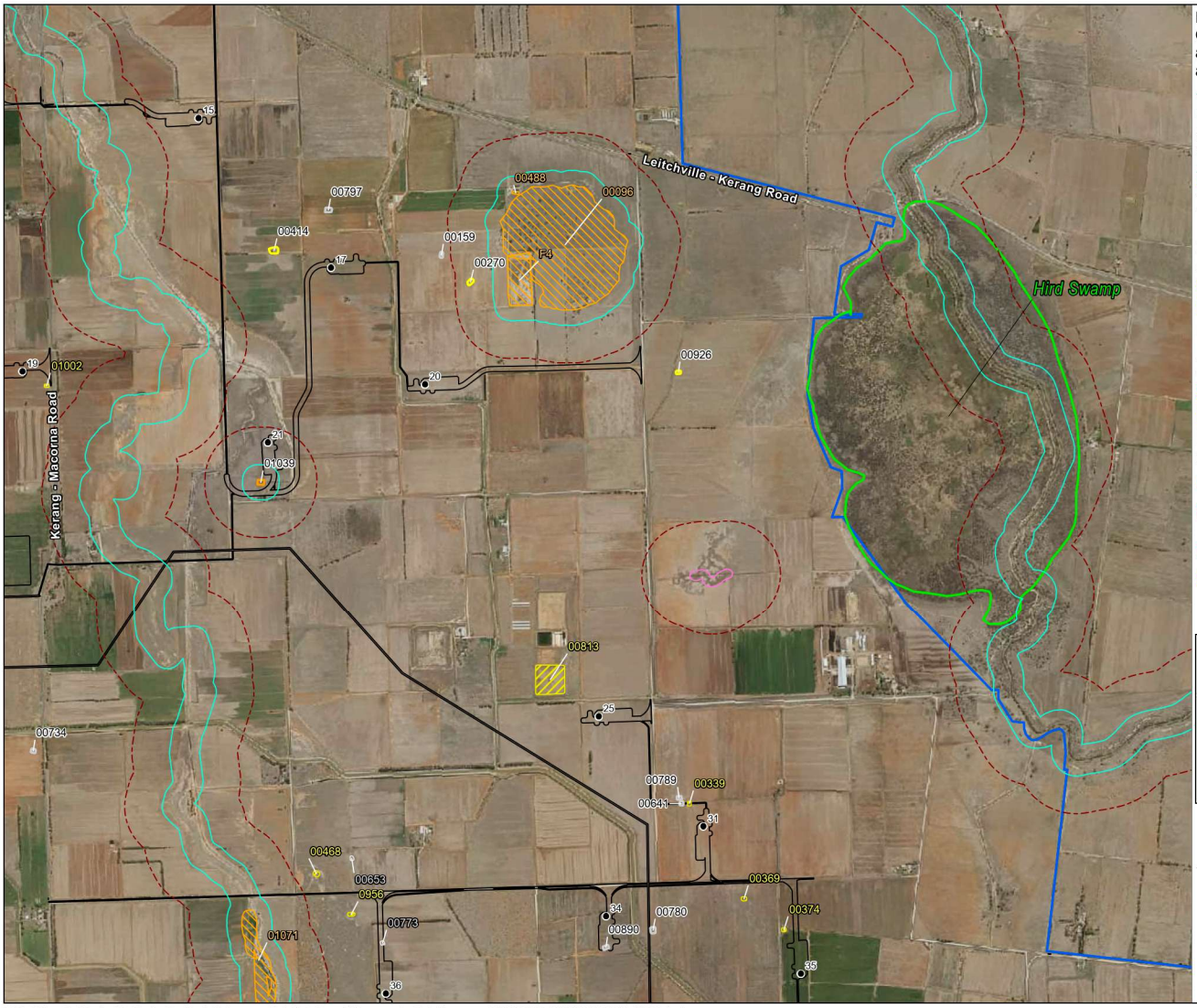


Figure 12-4-4. Results of the Growling Grass Frog habitat assessment for both desktop and field assessments

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 10/08/2026

- Project Area
- Construction footprint - v03
- Turbine

Habitat quality - Field Assessment

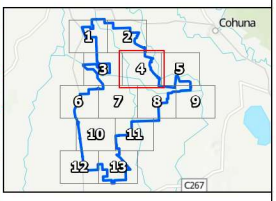
- Medium
- Low
- No habitat

Habitat quality - Desktop Assessment

- Medium
- Low
- No habitat

Habitat buffers

- Artificial drain buffer - 30m
- Creek line/Medium quality GGF wetland buffer - 100m
- GGF relocation and frog fence buffer - 350m
- Key GGF wetland



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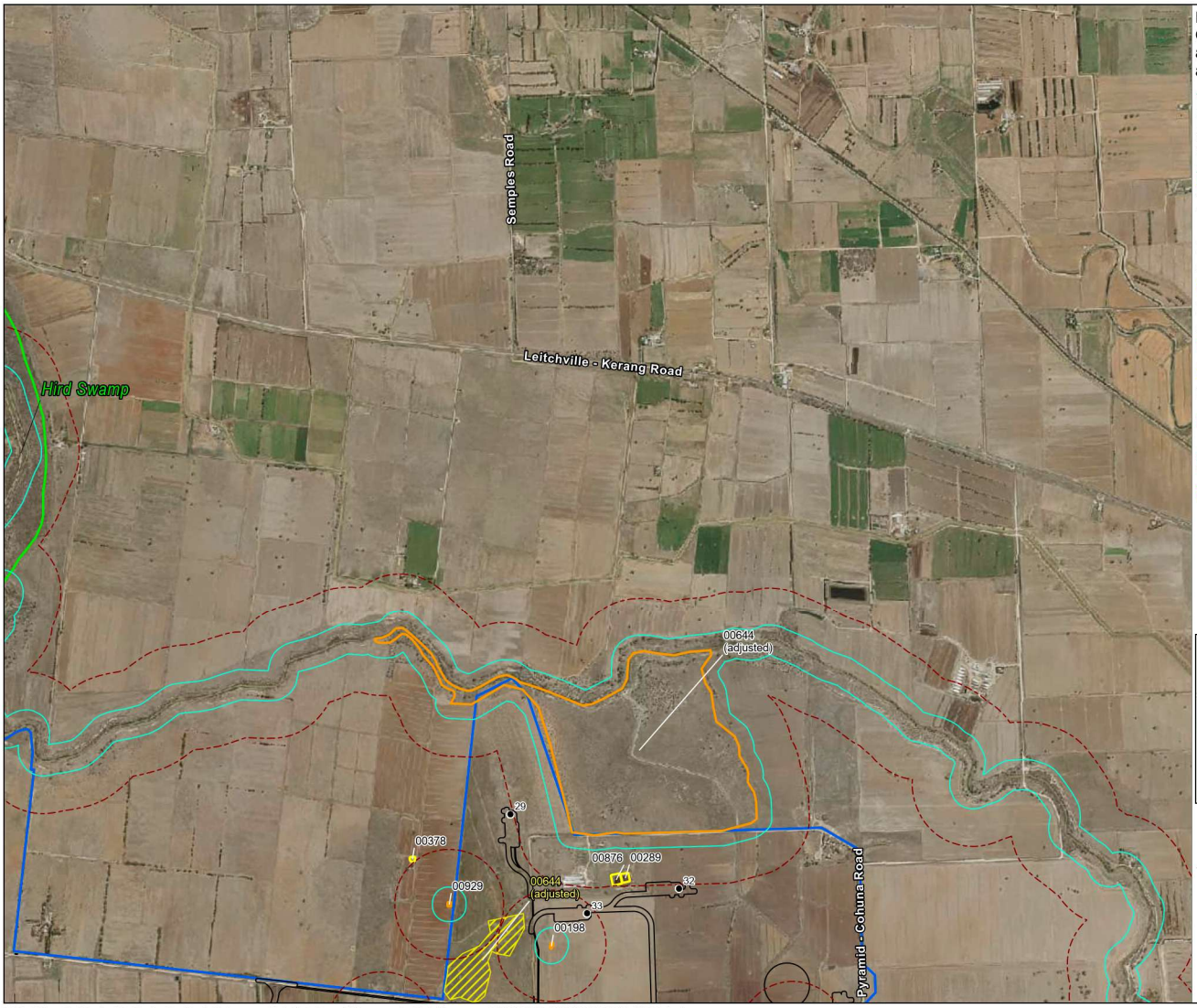


Figure 12-4-5. Results of the Growling Grass Frog habitat assessment for both desktop and field assessments

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 10/08/2026

- Project Area
- Construction footprint - v03
- Turbine

Habitat quality - Field Assessment

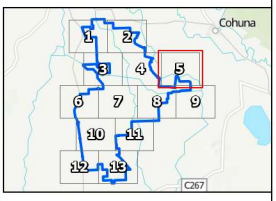
- Low

Habitat quality - Desktop Assessment

- Medium
- Low

Habitat buffers

- Creek line/Medium quality GGF wetland buffer - 100m
- GGF relocation and frog fence buffer - 350m
- Key GGF wetland



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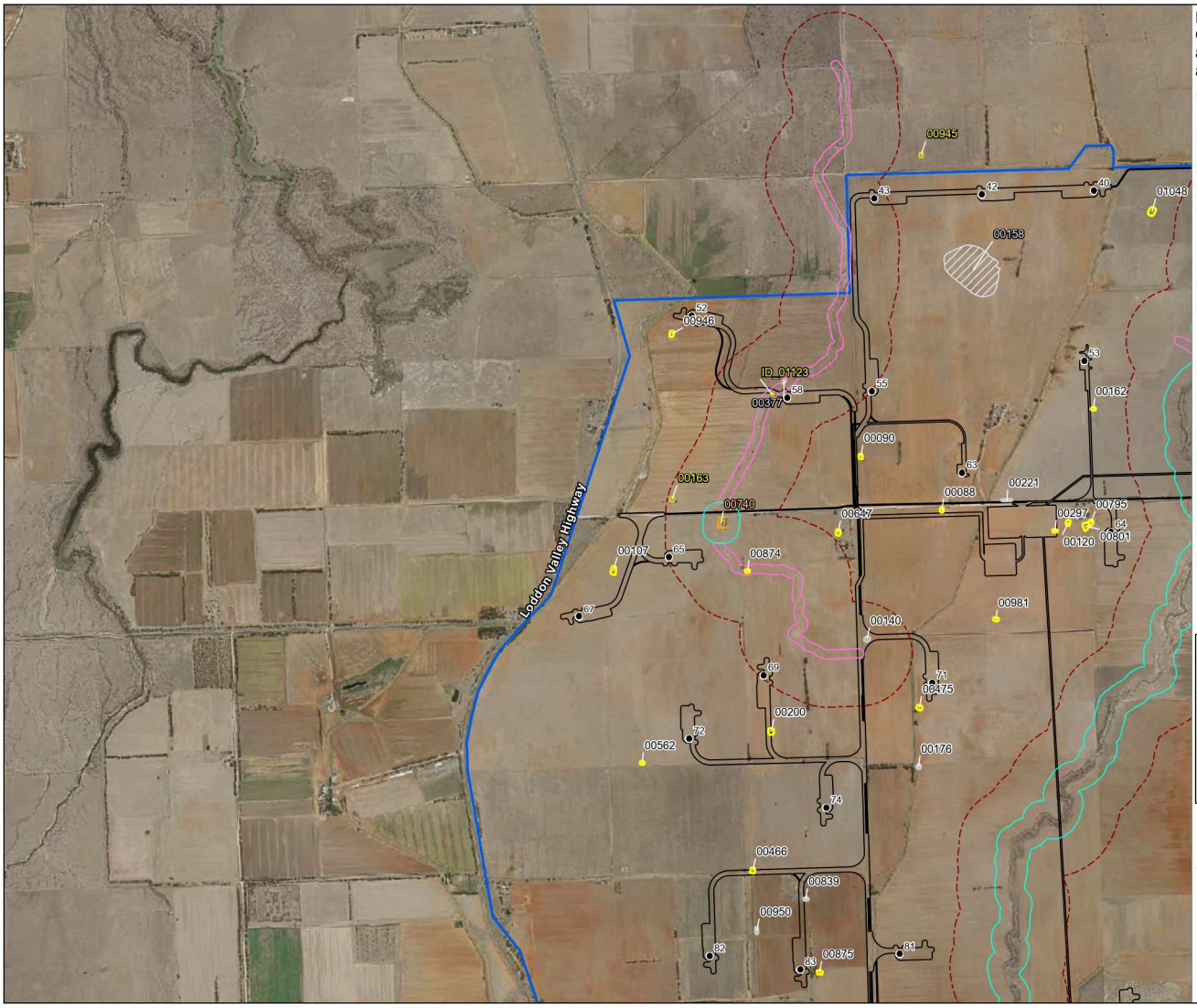


Figure 12-4-6. Results of the Growling Grass Frog habitat assessment for both desktop and field assessments

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 10/08/2026

- Project Area
- Construction footprint - v03
- Turbine

Habitat quality - Field Assessment

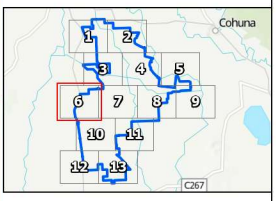
- Medium
- Low
- No habitat

Habitat quality - Desktop Assessment

- Low
- No habitat

Habitat buffers

- Artificial drain buffer - 30m
- Creek line/Medium quality GGF wetland buffer - 100m
- GGF relocation and frog fence buffer - 350m
- Key GGF wetland



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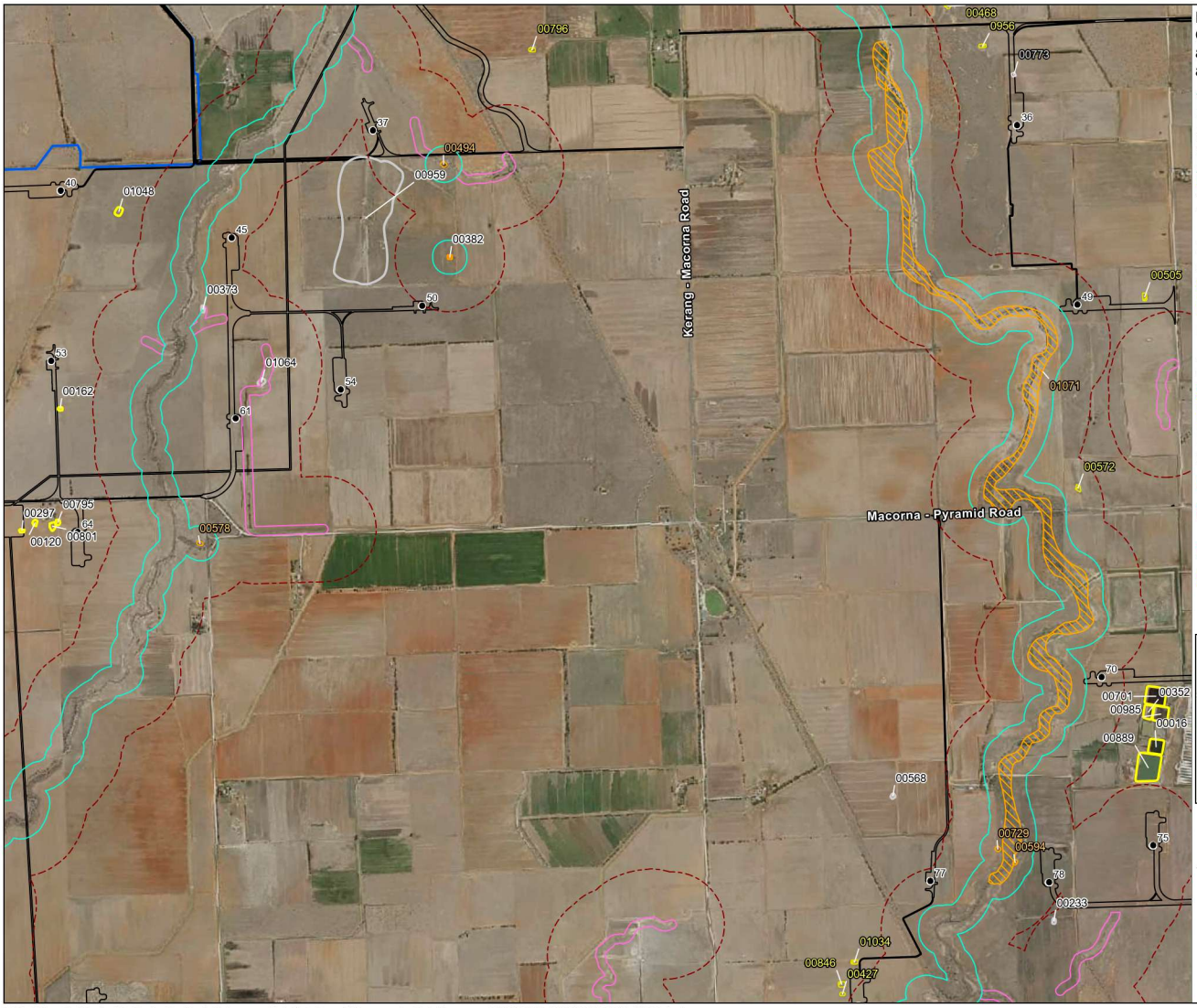


Figure 12-4-7. Results of the Growling Grass Frog habitat assessment for both desktop and field assessments

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 10/08/2026

- Project Area
- Construction footprint - v03
- Turbine

Habitat quality - Field Assessment

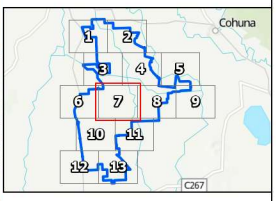
- Medium
- Low
- No habitat

Habitat quality - Desktop Assessment

- Medium
- Low
- No habitat

Habitat buffers

- Artificial drain buffer - 30m
- Creek line/Medium quality GGF wetland buffer - 100m
- GGF relocation and frog fence buffer - 350m
- Key GGF wetland



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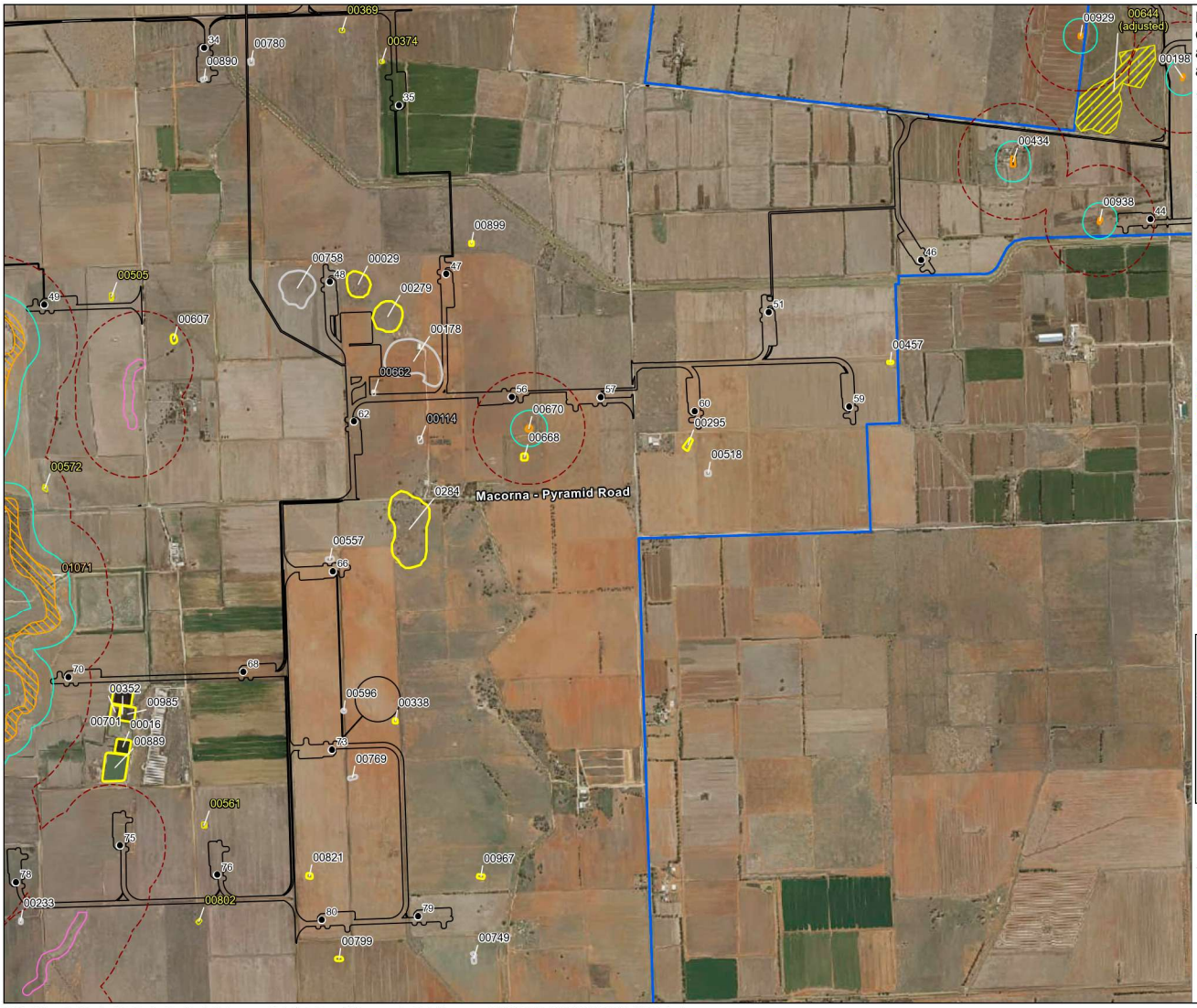


Figure 12-4-8. Results of the Growling Grass Frog habitat assessment for both desktop and field assessments

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 10/08/2026

- Project Area
- Construction footprint - v03
- Turbine

Habitat quality - Field Assessment

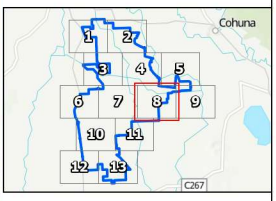
- Medium
- Low
- No habitat

Habitat quality - Desktop Assessment

- Medium
- Low
- No habitat

Habitat buffers

- Artificial drain buffer - 30m
- Creek line/Medium quality GGF wetland buffer - 100m
- GGF relocation and frog fence buffer - 350m
- Key GGF wetland



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Kilometers
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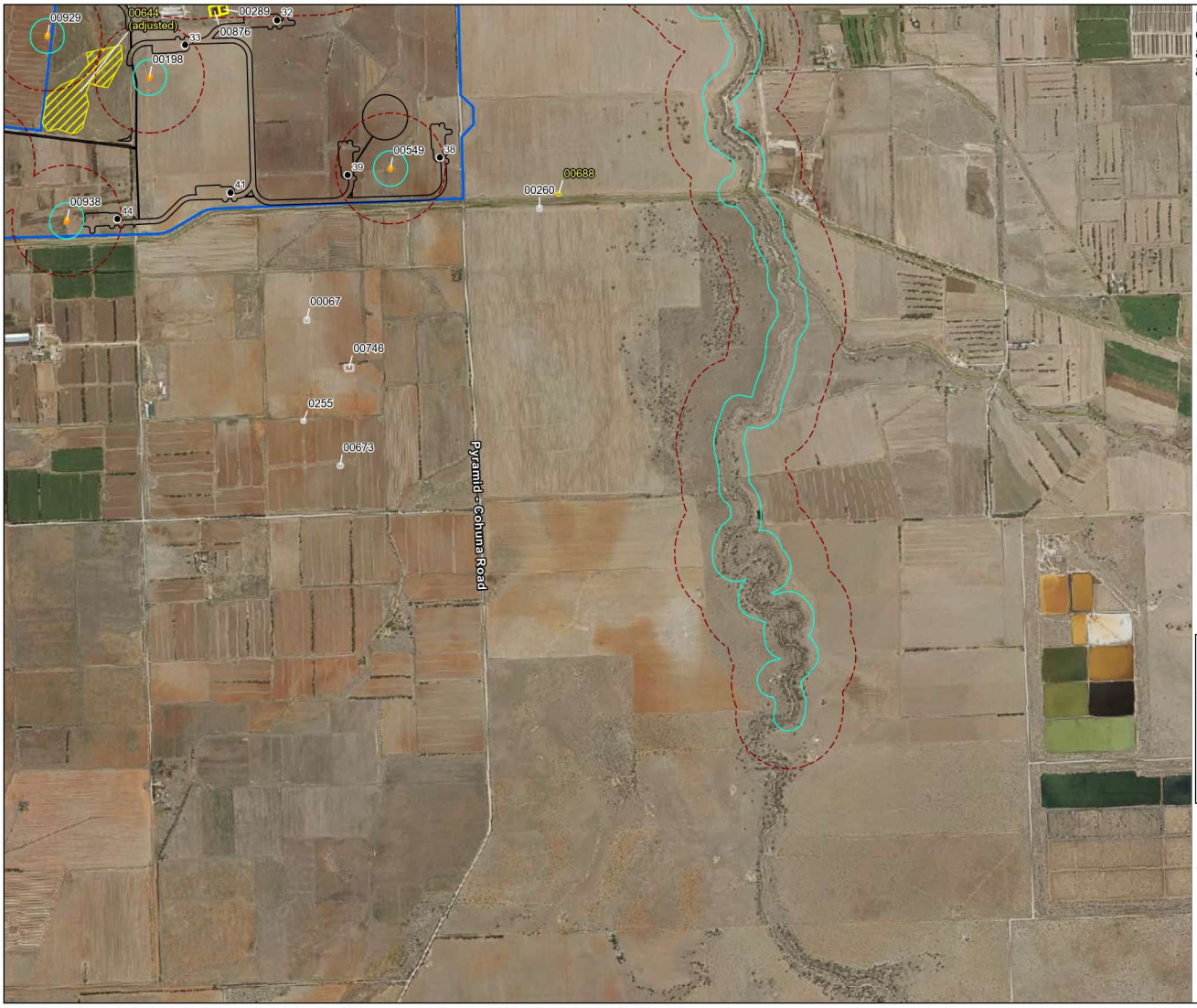


Figure 12-4-9. Results of the Growling Grass Frog habitat assessment for both desktop and field assessments

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 10/08/2026

- Project Area
- Construction footprint - v03
- Turbine

Habitat quality - Field Assessment

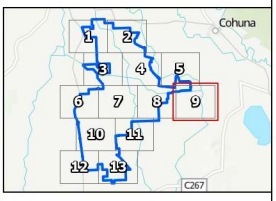
- Low

Habitat quality - Desktop Assessment

- Medium
- Low
- No habitat

Habitat buffers

- Creek line/Medium quality GGF wetland buffer - 100m
- GGF relocation and frog fence buffer - 350m
- Key GGF wetland



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Kilometers
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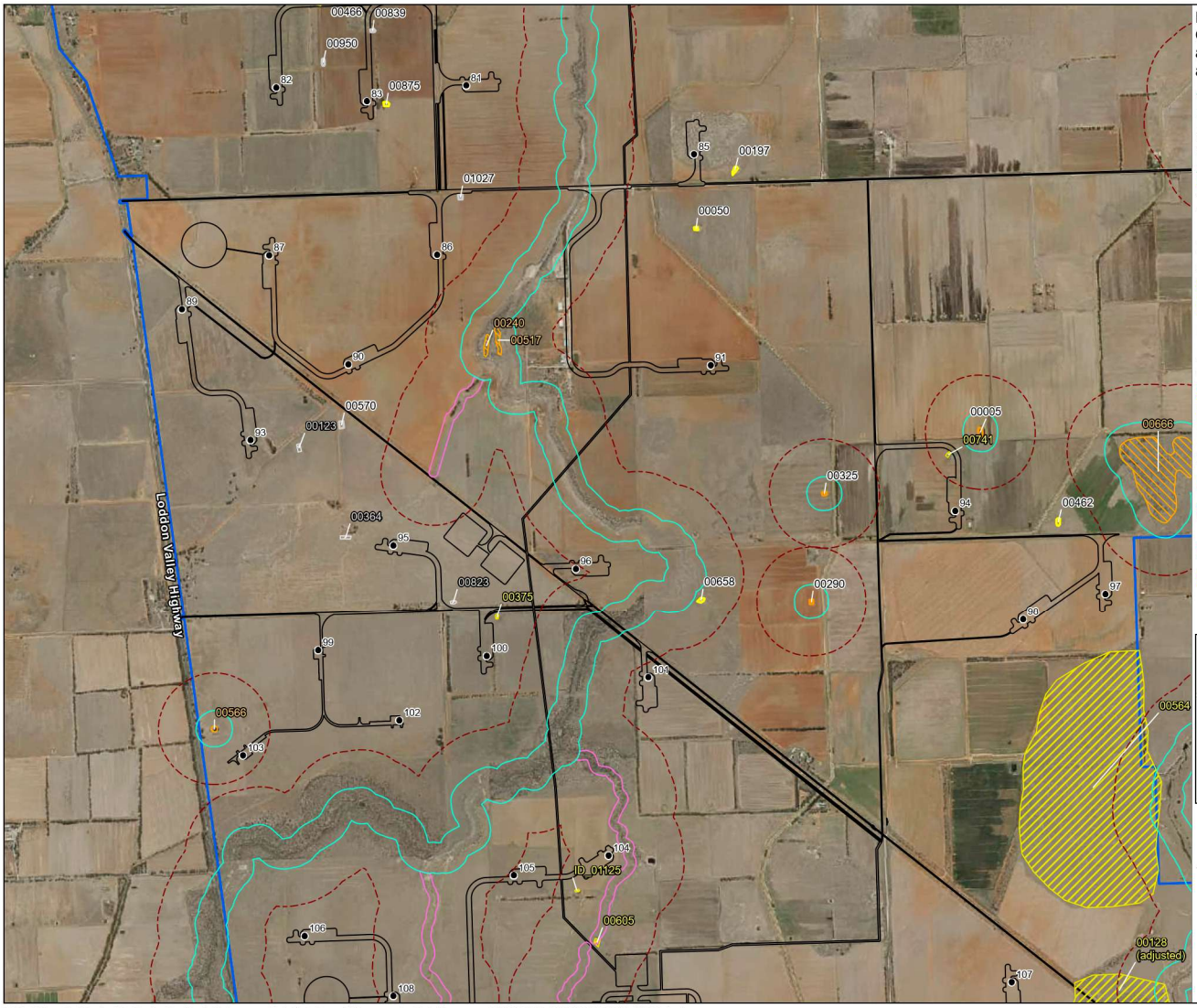


Figure 12-4-10. Results of the Growling Grass Frog habitat assessment for both desktop and field assessments

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 10/08/2026

- Project Area
- Construction footprint - v03
- Turbine

Habitat quality - Field Assessment

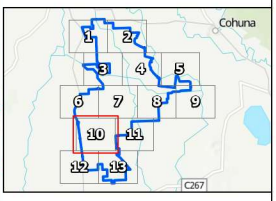
- Medium
- Low
- No habitat

Habitat quality - Desktop Assessment

- Medium
- Low
- No habitat

Habitat buffers

- Artificial drain buffer - 30m
- Creek line/Medium quality GGF wetland buffer - 100m
- GGF relocation and frog fence buffer - 350m
- Key GGF wetland



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Kilometers
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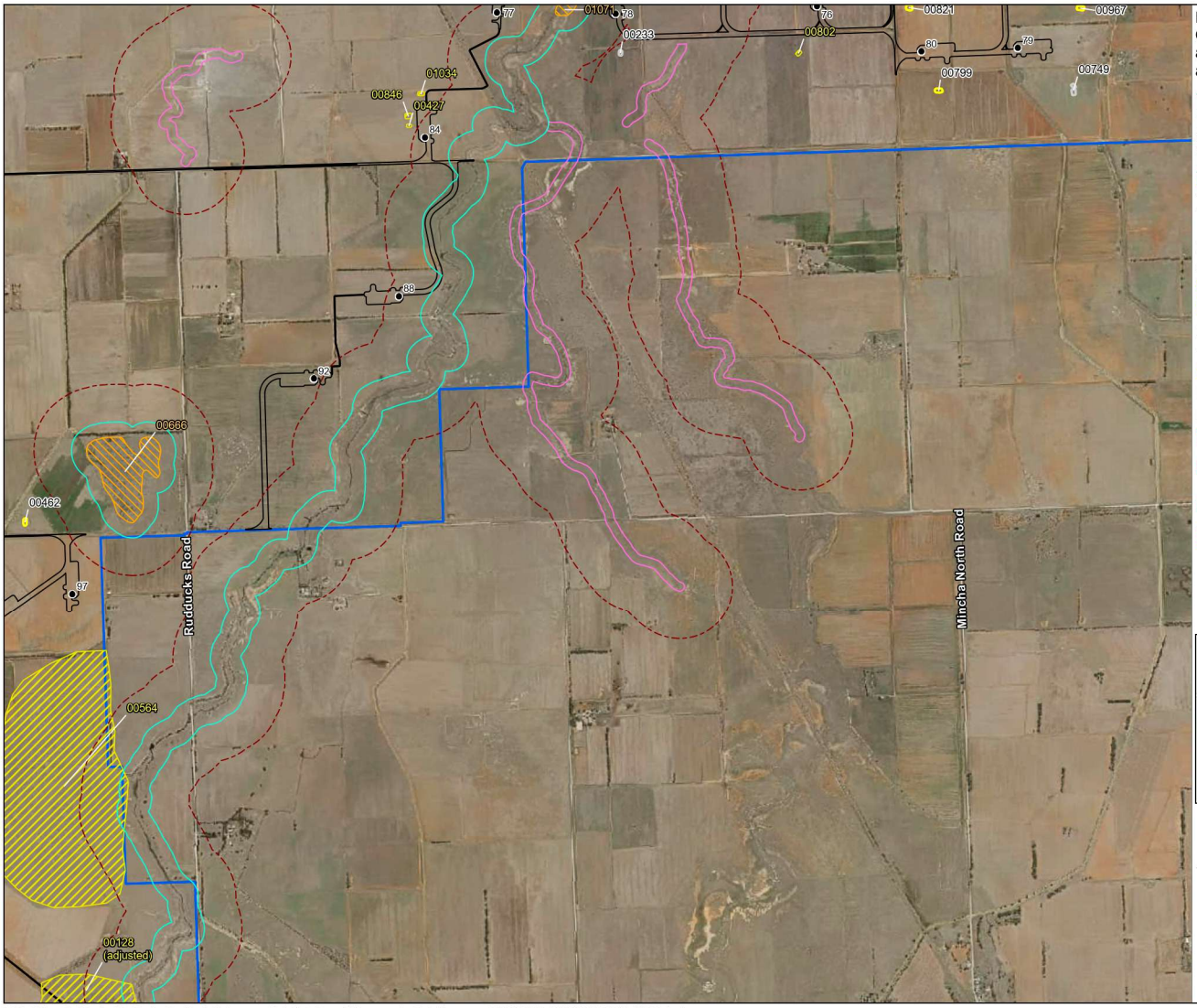


Figure 12-4-11. Results of the Growling Grass Frog habitat assessment for both desktop and field assessments

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 10/08/2026

- Project Area
- Construction footprint - v03
- Turbine

Habitat quality - Field Assessment

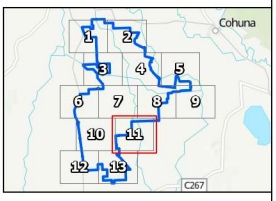
- Medium
- Low

Habitat quality - Desktop Assessment

- Low
- No habitat

Habitat buffers

- Artificial drain buffer - 30m
- Creek line/Medium quality GGF wetland buffer - 100m
- GGF relocation and frog fence buffer - 350m
- Key GGF wetland



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Kilometers
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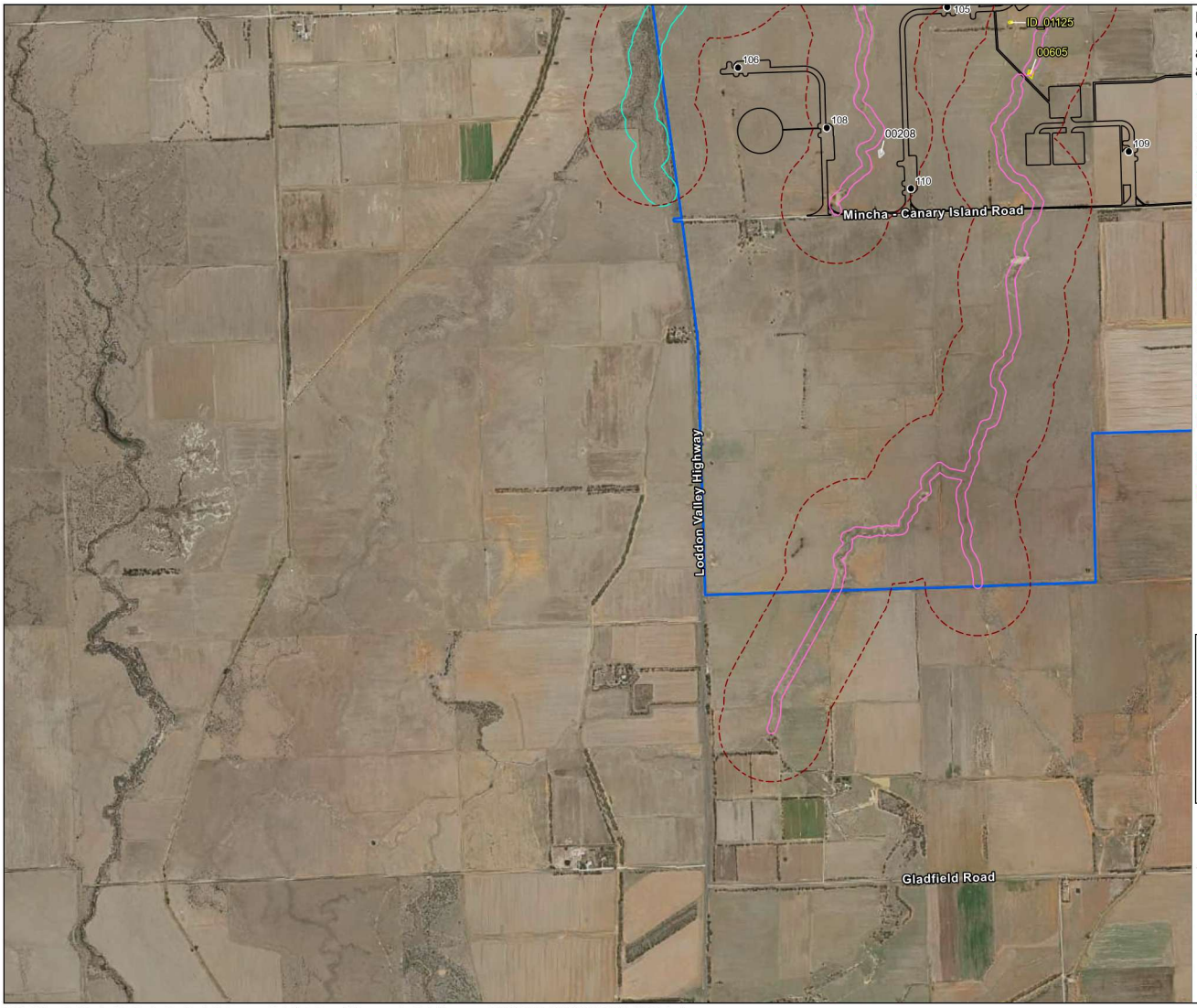


Figure 12-4-12. Results of the Growling Grass Frog habitat assessment for both desktop and field assessments

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 10/08/2026

- Project Area
- Construction footprint - v03
- Turbine

Habitat quality - Field Assessment

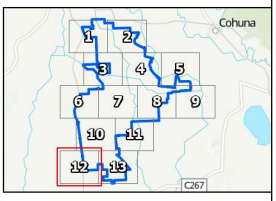
- Low

Habitat quality - Desktop Assessment

- No habitat

Habitat buffers

- Artificial drain buffer - 30m
- Creek line/Medium quality GGF wetland buffer - 100m
- GGF relocation and frog fence buffer - 350m
- Key GGF wetland



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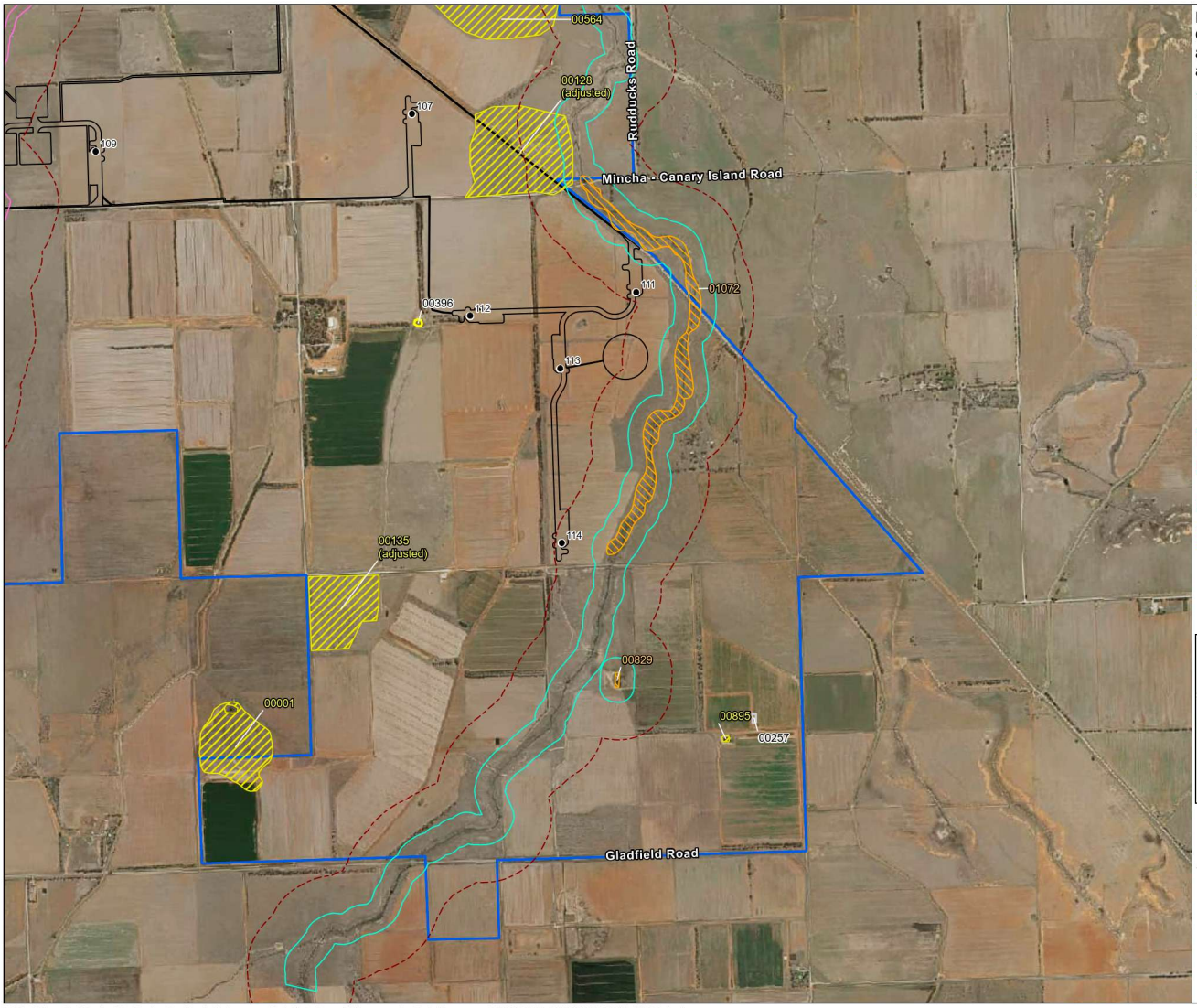


Figure 12-4-13. Results of the Growling Grass Frog habitat assessment for both desktop and field assessments

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 10/08/2026

- Project Area
- Construction footprint - v03
- Turbine

Habitat quality - Field Assessment

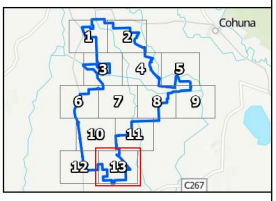
- Medium
- Low

Habitat quality - Desktop Assessment

- Low
- No habitat

Habitat buffers

- Artificial drain buffer - 30m
- Creek line/Medium quality GGF wetland buffer - 100m
- GGF relocation and frog fence buffer - 350m
- Key GGF wetland



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12.4. Conclusions and recommendations

12.4.1. Summary of findings

The desktop assessment found no historical records of GGF within the Project Area, and desktop and field assessments found no 'high' quality GGF wetland habitat. The lack of 'high' quality GGF habitat within the Project Area suggests that breeding activity is unlikely to occur. Most (82 %) of the wetlands assessed were assigned as 'low' quality or 'not a wetland' as they provided limited ecological value, comprising mostly farm dams without vegetation, poor connectivity to other habitats, or lacked other key habitat features.

The 29 wetlands classified as medium quality are more likely to provide dispersal opportunities than breeding habitat, as not all habitat features were present (e.g. emergent vegetation, rocks, logs, etc.).

There are historical records of GGF in the higher-quality and more reliable breeding habitat outside the project site, such as Hird and Johnson Swamps as well as smaller swamps associated with the Loddon River (Tragowel and Two Mile Swamps). Whilst historical records from these sites are more than 40 years old, a 2 km buffer has been applied to these larger wetland systems which will completely avoid impacts to potential GGF habitat from MAWF in those locations.

Important populations for this species are defined as any viable population, any populations near the limits of the species' range, and/or any well-studied populations with a long history of monitoring (DEWHA 2009). Given the lack of high-quality habitat or historical records, it appears unlikely that the Project Area supports any population. The Project Area is neither near the limits of the species' range, nor does it contain any well-studied populations. If a population is present, it is even more unlikely that it is viable, which is defined as "a population not isolated from other populations or waterbodies, such that it can interact with other nearby populations or can establish new populations when waterbodies fill and become available" (DEWHA 2009).

12.4.2. Potential impact pathways

Construction Impacts

Impacts to GGF during construction could occur through the following pathways:

- Permanent **removal or degradation of terrestrial habitat** within 350 m of a water body may result in the loss of dispersal or overwintering opportunities.
- **Changes to surface runoff or hydrology** may result in sedimentation reaching creeks and other water bodies that can affect GGF health and, in particular, tadpole survival rates.
- Construction may facilitate the **introduction of pathogens** such as the potentially fatal Chytrid fungus into creeks or other water bodies carried by contaminated machinery.
- **Noise from construction** may interfere with the breeding cycle of a GGF population attempting to breed within the study area due to interference with their ability to hear breeding calls (Parris and Hinze 2021).The **injury or death of individuals** as a result of earthworks or collision with increased traffic from vehicles associated with the proposed project.

Operational impacts

- The **injury or death of individuals** as a result of collision with increased traffic from vehicles associated with the proposed project.

- **Altered hydrology** such as increased or decreased water flow as a result of the presence and operation of turbines and other associated infrastructure.
- **Shading** from infrastructure such as turbines which can reduce basking time for GGF and other amphibians or reptiles and reduce aquatic plant growth.

12.4.3. Assessment of potential impacts

Assessment of impacts is precautionary, as there is an absence of confirmed GGF historical records within the project site and a lack of 'high' quality wetland habitat, particularly in comparison with areas of higher-quality habitat that exist nearby but outside the Project Area.

Construction Impacts

A 100 m buffer from areas of medium-quality GGF habitat was adopted for the assessment of potential impacts to terrestrial habitat. This provides a precautionary assessment distance, which represents the zone within which terrestrial habitat could be considered impacted (DEWHA 2009; DCCEEW 2024b). Major artificial drains and constructed water channels were considered less likely to support the terrestrial habitat characteristics typically associated with GGF, and 30 m buffers of these features were used to represent impacts to habitat.

The following areas are where direct impacts occur within the terrestrial habitat zones described above (see Figure 12-4):

- The 100 m zone along the length of Calivil Creek is breached in several locations, with most of these being where access tracks follow existing roads, limiting their potential impact. There are also several instances of overhead transmission lines crossing the zone, though this will have no impact on the creek itself, as the lines will be overhead. However, an access track to T88 where there was previously no road will be constructed within the creek buffer. We note that the Proponent located this track within the creek buffer to avoid impacts on irrigation and farming operations within the cropped paddock. Another access track to T111 will also be within the creek buffer but will be on the opposite side of an existing road to the creek line, again limiting potential impacts.
- The hardstand for T2 will be within the 100 m buffer around Wetland 930, which was classified as medium-quality farm dam habitat.
- An underground cable for T27 (from the northeast) will pass through a 100 m terrestrial habitat zone around a creek. Impacts of this construction can be reduced through undertaking construction measures aligned with the Crossing Design Standards (DELWP 2017e), such as Horizontal Directional Drilling. After installation, underground cabling will have negligible ongoing impacts. This creek buffer will also have overhead powerlines built over it to the southeast of T27, though potential impacts to GGF will be negligible as the powerline will be overhead.
- There are proposed upgrades to existing roadways and overhead powerlines crossing terrestrial habitat zones around creeks and wetlands around T61 and in the vicinity of T91 and T96.
- The hardstand and access road of T21 will encroach upon the 100 m terrestrial habitat zone around Wetland 1039, which was assessed as medium-quality farm dam habitat.
- Underground cabling will be installed within the 100 m terrestrial habitat zone of Wetland 198, which was assessed as medium habitat quality. This may have potential impacts during

construction, but impacts can be reduced through undertaking construction measures aligned with the Crossing Design Standards (DELWP 2017e), such as Horizontal Directional Drilling. After installation, underground cabling will have negligible ongoing impacts.

- An access road to reach T58 will encroach on a 30 m terrestrial habitat zone around a wetland, while there was previously no road, there is an existing crossing of the stream.
- An access road that uses an existing road will encroach on the 100 m terrestrial habitat zone of Wetland 494, which was assessed as medium habitat quality. This will have a limited potential impact due to the use of an existing roadway.

The above consist of a very low proportion of the available terrestrial habitat for the species in the study area. Additionally, the species is relatively mobile and is likely to be able to cross the relatively narrow corridors of disturbance posed by the Project (DCCEEW 2024b). Impacts are, therefore, generally avoid fragmentation or barrier effects. Impacts associated with habitat removal and fragmentation are therefore considered low.

Sedimentation impacts are considered unlikely at most of the impact areas above, as:

- No wetland or creek is being directly impacted; and
- Whilst impacts are occurring <30-100 m away from wetlands, creeks or artificial drains, the generally flat landscape topography and the use of sediment fencing within these areas makes sedimentation impacts unlikely in almost all cases (see Section 12.4.4).
- However, the access track to T88 could potentially have sedimentation impacts to Calivil Creek should sedimentation control measures fail, owing to the close distance between the track and the creek (approx. 10 m at the closest point).

There is potential for contaminated machinery, vehicles, footwear and equipment to introduce or spread the pathogenic chytrid fungus into potential GGF habitats within the study area. However, this risk can be effectively controlled by implementing biosecurity measures commonly used in environmentally sensitive areas (see Section 12.4.4). Given this, the risk of introduction or spread of chytrid fungus in the study area due to works is considered low if these measures are implemented.

Noise from construction has the potential to disrupt GGF breeding behaviour (Parris and Hinze 2021). However, if construction is restricted to daylight hours during breeding season (Sept-Feb), it would be considered effective at mitigation and largely avoid noise impacts. As such, the risk of construction noise is considered low if appropriate mitigations are applied.

Some individuals may be injured or killed due to earthworks or collision with vehicles associated with the project. As works in or near areas of GGF habitat are not extensive, particularly in the vicinity of medium-quality habitat, it is not expected for this to be a large-scale or frequent occurrence, and no major impact to the viability of any GGF population in the study area is anticipated. Additionally, fauna salvage can be applied as a mitigation measure to minimise impacts from this impact pathway (see Section 12.4.4).

Operational impacts

Some individual GGFs may be injured or killed by vehicles associated with the project. It is expected that, if this happens, this would affect low numbers of individuals sporadically and would be unlikely to undermine population viability in a meaningful way. This is particularly the case given the

species' generally nocturnal habits, and the fact that most vehicle traffic associated with the project will be present during daylight hours.

12.4.4. Recommended application of mitigation hierarchy

Mitigation measures have been developed on a precautionary basis, as the presence of the species has not been confirmed but is assumed within areas of suitable habitat in accordance with the precautionary principle. The measures are intended to avoid and minimise potential impacts to the species and its habitat.

The following measures are recommended to mitigate potential impacts:

- A 100 m buffer around moderate-quality habitats and designated creek lines, unless unavoidable due to other constraints.
    - Where not avoided, the GGF Crossing Design Standards (DELWP 2017e) should be implemented to minimise impacts, which may include specific construction methods such as Horizontal Directional Drilling.
- A 30 m buffer around artificial drains and channels, unless unavoidable due to other constraints.
    - Where not avoided, the GGF Crossing Design Standards (DELWP 2017e) should be implemented to minimise impacts.
- Any works within 350 m of a medium-quality wetland or designated creek line should be subject to:
    - Pre-clearance GGF surveys with translocation to similar nearby habitat, and
    - Where GGF are detected, installation of frog-fencing to prevent recolonisation for the duration of the construction activity.
- Avoid construction activities at night during the species' breeding season (October-February) to reduce potential breeding disturbance through noise pollution.
- A Traffic Management Plan to manage the risk of road mortality.
- A Construction Environmental Management Plan (CEMP) to address, among other risks, biosecurity hygiene and sediment control.

Impacts on the GGF are considered low, and the above mitigation measures are recommended based on a precautionary approach. Following their implementation, impacts would be considered to be negligible.

12.4.5. Conclusions and further investigations

After a thorough desktop and field assessment of the potential impacts to GGF as a result of MAWF, there is potential for limited impacts to GGF, primarily as a result of the construction of some infrastructure in proximity to potential GGF habitat. These impacts may also include collision with vehicles or burial from earthworks, altered hydrology or sedimentation, and modification of terrestrial habitat around wetlands. However, these impacts are tempered by the limited quality of GGF wetlands in the Project Area (maximum of 29 'medium' quality wetlands) and that most of these wetlands are ephemeral and often dry, meaning they are likely only suitable habitat for dispersal or occasionally breeding events in very wet years. There is unlikely to be an important

population of GGFs in the Project Area (DEWHA 2009), with no recorded sightings of GGF in the last 40 years within 10 km of the Project Area.

Further refinement of the development footprint could further avoid impacts to wetland buffers with the following areas:

- The access track to T88 within the Calivil Creek buffer,
- The T2 hardstand within the 100 m buffer around Wetland 930,
- The underground cabling for T27 (from the northeast) within a 100 m creek buffer,
- The hardstand and access road of T21 within the 100 m buffer around Wetland 1039, and
- The access road to T58 within a 30 m wetland buffer.

The Project, as it is currently designed, largely avoids impacts, with occasional encroachment upon wetland buffers. With the adoption of these refinements, potential impacts to GGF are likely negligible.

13. Impact assessment summary

13.1. The project

The Project involves the development of a wind farm with up to 114 turbines. Works required to construct the wind farm that will impact native vegetation include turbine construction, road widening, access track construction, lay-down areas, transmission lines and grid connection.

13.2. Impacts on native vegetation

The project will result in the loss of a total of 45.523 ha of native vegetation under the Guidelines, as represented in Figure 13-1 .

Impacts to native vegetation comprise the following:

- 45.210 ha of native vegetation in patches (including one large tree in patches)
    - Of this, 1.216 ha are mapped DEECA wetlands
- Five scattered trees (namely, four large scattered trees and one small scattered tree), equating to an area loss of 0.313 ha

Further analysis using aerial photography concluded that 8.216 ha of native vegetation to be removed was regrowth and qualifies for the 10-year regrowth exemption under Clause 52.17. These areas of native vegetation include Plains Grassland (EVC 132) and Chenopod Grassland (EVC 829), some of which have been determined to qualify as state and federally listed ecological communities. Therefore, exempt regrowth has been excluded from the Native Vegetation Removal (NVR) report provided by DEECA (Appendix 6), in accordance with the Guidelines.

Impacts to 45.210 ha of native vegetation in patches (including 8.216 ha of exempt regrowth) represent 2.73 % of the 1,656.769 ha of native vegetation patches recorded in the study area. Accordingly, 1,611.559 ha of native vegetation in patches (97.27 %) will be retained.

Refer to the table below for a summary of the total extent of native vegetation impacted within each EVC of low, medium, and high quality.

Three patches of native vegetation impact were identified by the Proponent as areas in which impacts may be justified due to balancing of impacts associated with social and ecological values. These are detailed within Table 13-2.

Table 13-1. Extent of impacted native vegetation by EVC and quality class.

EVC	Impacted Vegetation (ha)
Plains Grassland (EVC 132)	Low quality: 6.124 Medium quality: 13.203 High quality: 0.294
Chenopod Grassland (EVC 829)	Low quality: 12.161 Medium quality: 7.647 High quality: 1.041

EVC	Impacted Vegetation (ha)
Riverine Chenopod Woodland (EVC 103)	Low quality: 0.101 Medium quality: 0.050 High quality: 0
Lignum Swamp (EVC 104)	Low quality: 1.136 Medium quality: 0.792 High quality: 1.081
Lignum Swampy Woodland (EVC 823)	Low quality: 0.365 Medium quality: 0 High quality: 0

Representative photographs of native vegetation proposed for removal are provided in Appendix 5.

To determine impacts on native vegetation, the proposed development footprint was overlaid with the native vegetation mapped as part of this investigation. Native vegetation areas intersecting with the development footprint were considered to be impacted. Trees are deemed impacted when the development footprint encroaches on 10 % or more of the Tree Protection Zone (TPZ)[5].

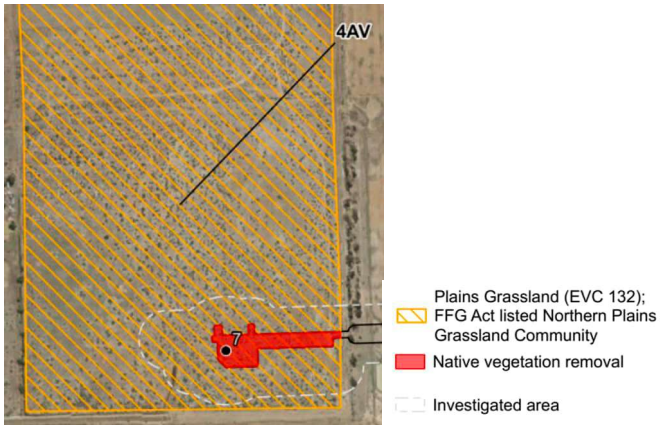
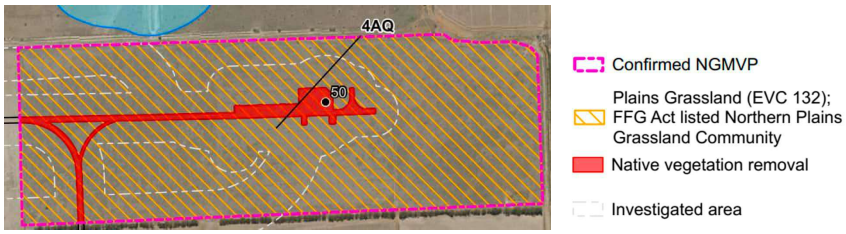
The development footprint accounted for consequential impacts, which are generally summarised below:

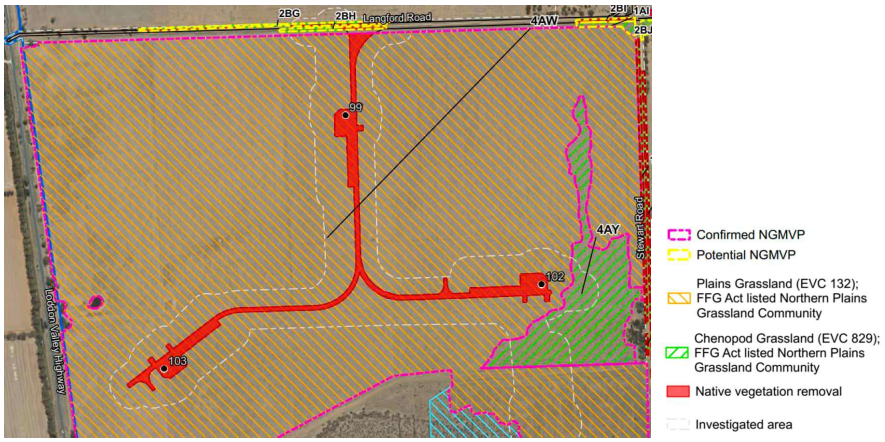
- A 5 m buffer has been applied to all proposed bench areas (substation, BESS, laydown, etc)
- A 13 m buffer has generally been applied to all other civil works areas (turbine hardstands, crane pads, access tracks). This provides a general works corridor of 34 m, in areas that have a access track with a finished width of approximately 8m. A reduction in this buffer and general works corridor has been proposed in more sensitive areas;
- A 10 m corridor has been applied to the HV overhead line route;
- A 6 m corridor has been applied to all UG cables, with a 3 m buffer on each side; and
- A 7 m wide corridor has also been included for internal public roads that have been identified as requiring upgrading.

Refer to Section 14.1 for implications under Clause 52.17.

[5] In accordance with the *Assessor's Handbook* (DELWP 2018b), a tree is deemed 'lost' when earthworks encroach on > 10 % of the TPZ, unless deemed otherwise by an arborist. However, trees which form part of a 'patch' of native vegetation are not required to be individually mapped using the habitat hectare assessment method, unless they meet the minimum DBH of a Large Tree under the relevant EVC Benchmark.

Table 13-2: Other considerations for infrastructure and native vegetation impacts.

Proposed Infrastructure	Proponent's considerations	Native vegetation impacts
Turbine 7 and associated infrastructure	The Proponent seeks to retain this infrastructure as this landowner has only one turbine proposed and no suitable alternatives are available to avoid this area of potential native vegetation.	The proposed impacts affect Patch 4AV, a generally low-quality (0.25) patch of Plains Grassland (EVC 132). The patch meets the definition of the FFG Act-listed *Northern Plains Grassland Community*. See the patch details in Appendix 1 and mapping in Figure 13-1. 
Turbine 50 and associated infrastructure	The Proponent seeks to retain this infrastructure as this landowner has only one other turbine proposed and no suitable alternatives are available to avoid this area of potential native vegetation	The proposed impacts affect Patch 4AQ, a moderate-quality (0.33) patch of Plains Grassland (EVC 132). The patch was **confirmed** as *Natural Grasslands of the Murray Valley Plains* under the EPBC Act (Critically Endangered) and also constitutes the FFG Act-listed *Northern Plains Grassland Community*. See the patch details in Appendix 1 and mapping in Figure 13-1. 

Proposed infrastructure	Proponent's considerations	Native vegetation impacts
Turbines 99, 102 and 103	The Proponent seeks to retain this infrastructure as this lot belongs to a small landowner with limited other infrastructure and no suitable alternatives are available to avoid this area of potential native vegetation.	The proposed impacts affect three native grassland patches of differing quality and conservation significance. The entrance crossing intersects Patch 2BH and 2BG. Both are low-quality (each 0.17) patches of Chenopod Grassland (EVC 829), which have been identified as **potential** *Natural Grasslands of the Murray Valley Plains* under the EPBC Act. Both patches also constitute the FFG Act-listed *Northern Plains Grassland Community*. Other project infrastructure is located within Patch 4AW, a high-quality (0.40) patch of Plains Grassland (EVC 132), which was **confirmed** as *Natural Grasslands of the Murray Valley Plains* (EPBC Act: Critically Endangered). Patch 4AW also meets the definition of the FFG Act-listed *Northern Plains Grassland Community*. See the patch details in Appendix 1 and mapping in Figure 13-1. 

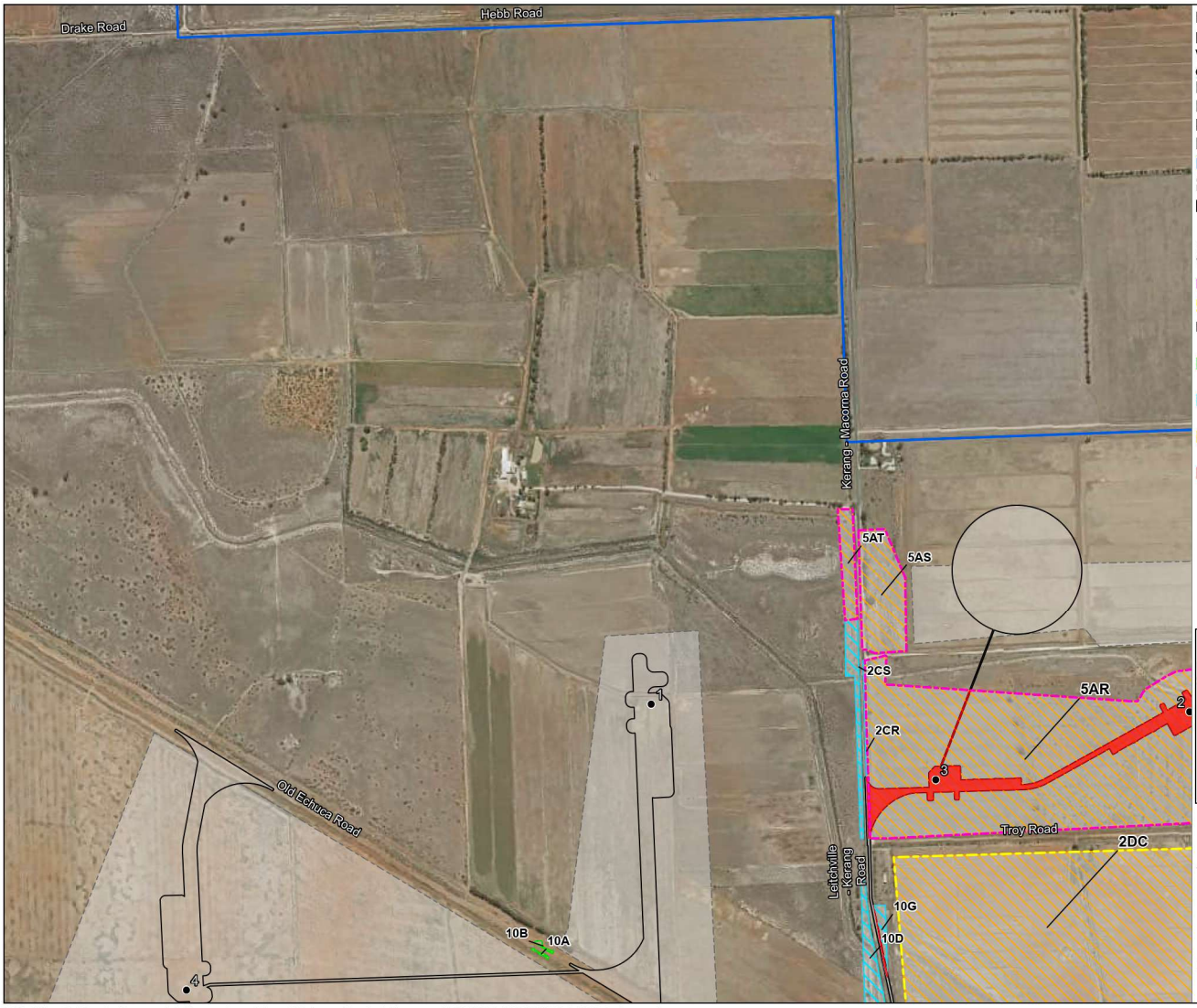


Figure 13-1. Impacts of the proposed wind farm on native vegetation and listed communities

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 13/08/2026

- Project Area
- Investigated area
- Construction footprint - Rev03
- Turbine

Natural Grasslands of the Murray Valley Plains community

- Confirmed
- Potential

Native vegetation

- Chenopod Grassland (EVC 829); FFG Act listed Northern Plains Grassland Community
- Lignum Swamp (EVC 104)
- Plains Grassland (EVC 132); FFG Act listed Northern Plains Grassland Community
- Native vegetation removal

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Figure 13-1. Impacts of the proposed wind farm on native vegetation and listed communities

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Project location: Macorna Wind Farm, VIC
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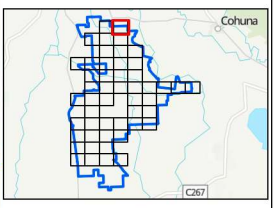
- Project Area
- Investigated area
- Construction footprint - Rev03
- Turbine

Natural Grasslands of the Murray Valley Plains community

- Confirmed
- Potential

Native vegetation

- Plains Grassland (EVC 132); FFG Act listed Northern Plains Grassland Community
- Native vegetation removal
- Exempt native vegetation under Clause 52.17-7
- Native vegetation removal (regrowth areas)



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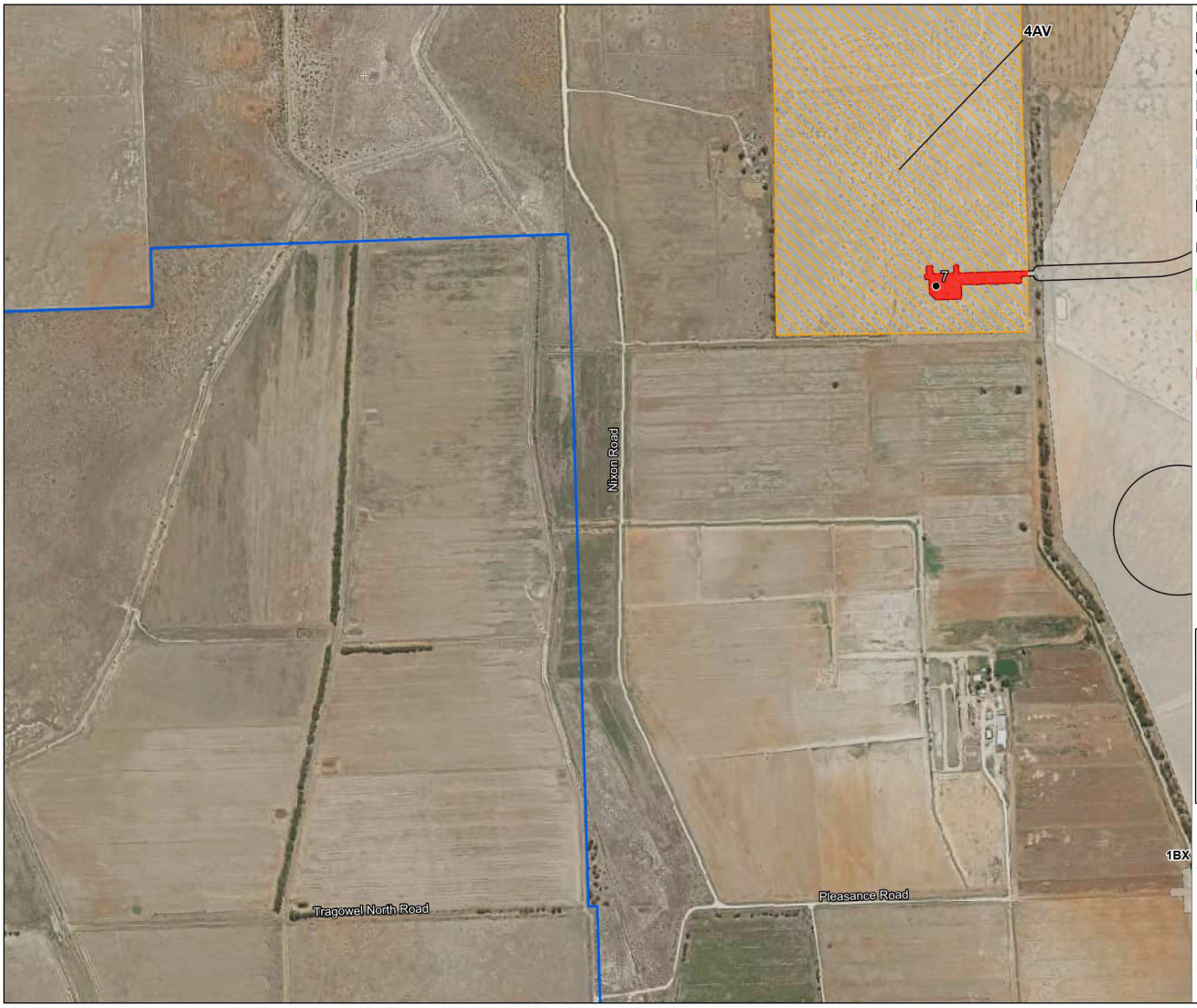

Figure 13-1. Impacts of the proposed wind farm on native vegetation and listed communities

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 13/08/2026

- Project Area
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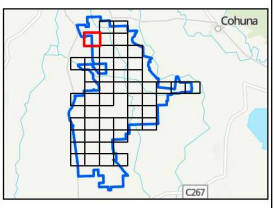
- Turbine

Native vegetation

- Chenopod Grassland (EVC 829); FFG Act listed Northern Plains Grassland Community
- Plains Grassland (EVC 132); FFG Act listed Northern Plains Grassland Community
- Native vegetation removal



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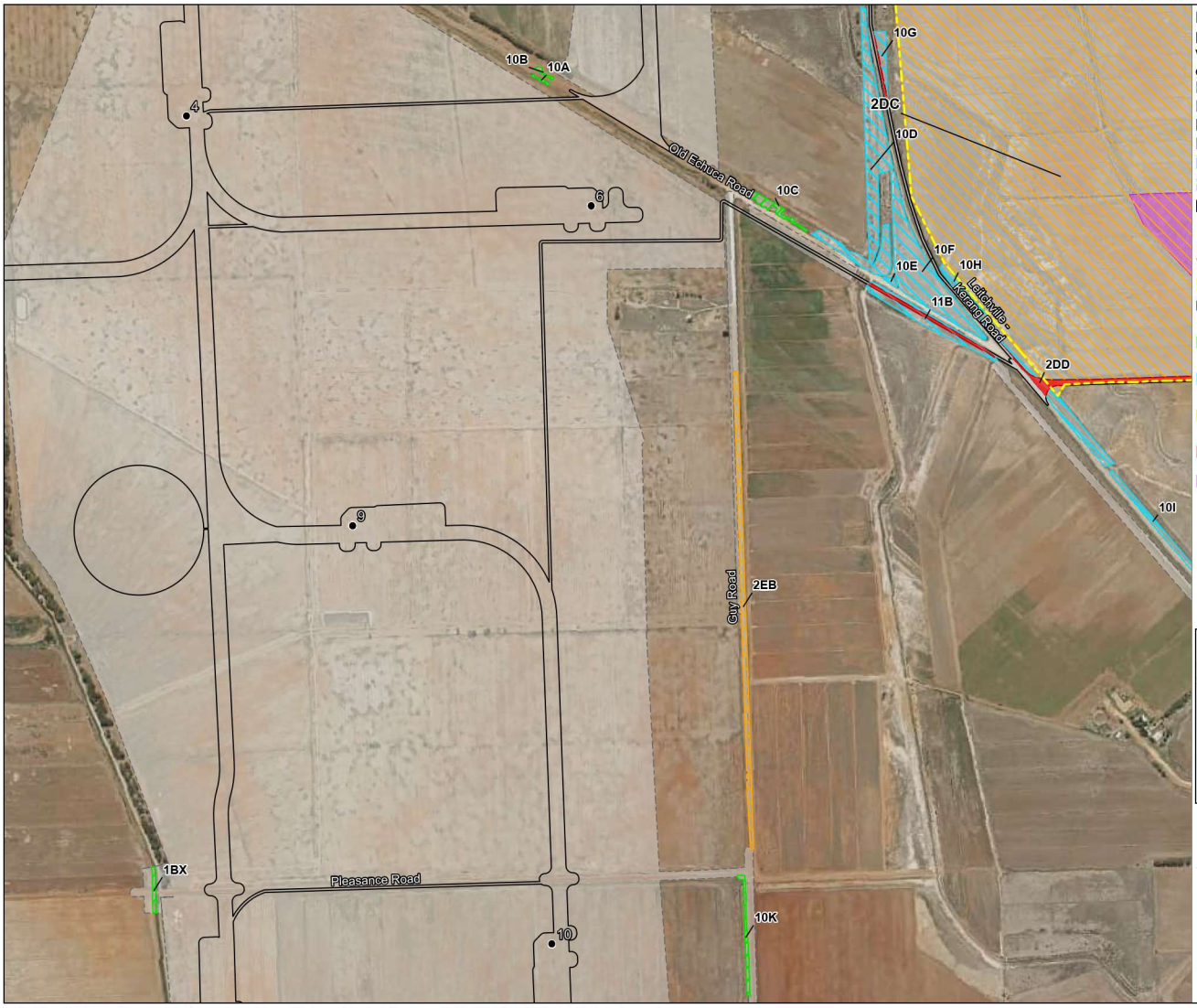


Figure 13-1. Impacts of the proposed wind farm on native vegetation and listed communities

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 13/08/2026

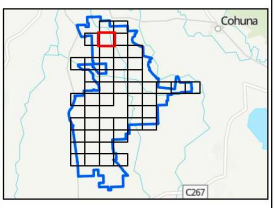
- Project Area
- Investigated area
- Construction footprint - Rev03
- Turbine

Natural Grasslands of the Murray Valley Plains community

- Potential

Native vegetation

- Chenopod Grassland (EVC 829); FFG Act listed Northern Plains Grassland Community
- Lignum Swamp (EVC 104)
- Plains Grassland (EVC 132); FFG Act listed Northern Plains Grassland Community
- Native vegetation removal
- Exempt native vegetation under Clause 52.17-7



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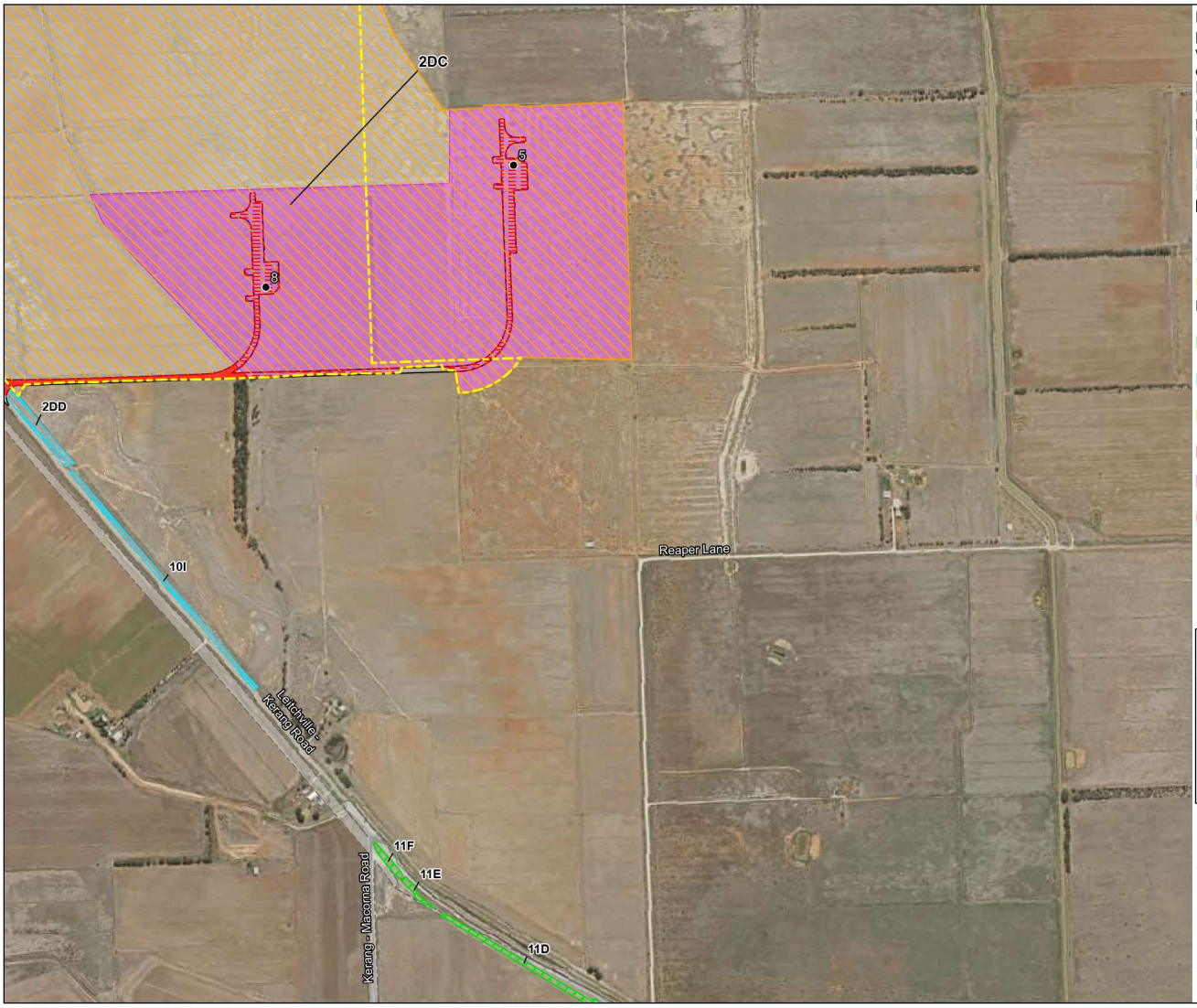


Figure 13-1. Impacts of the proposed wind farm on native vegetation and listed communities

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 13/08/2026

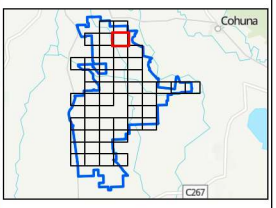
- Project Area
- Investigated area
- Construction footprint - Rev03
- Turbine

Natural Grasslands of the Murray Valley Plains community

- Potential

Native vegetation

- Chenopod Grassland (EVC 829); FFG Act listed Northern Plains Grassland Community
- Lignum Swamp (EVC 104)
- Plains Grassland (EVC 132); FFG Act listed Northern Plains Grassland Community
- Native vegetation removal
- Exempt native vegetation under Clause 52.17-7
- Native vegetation removal (regrowth areas)



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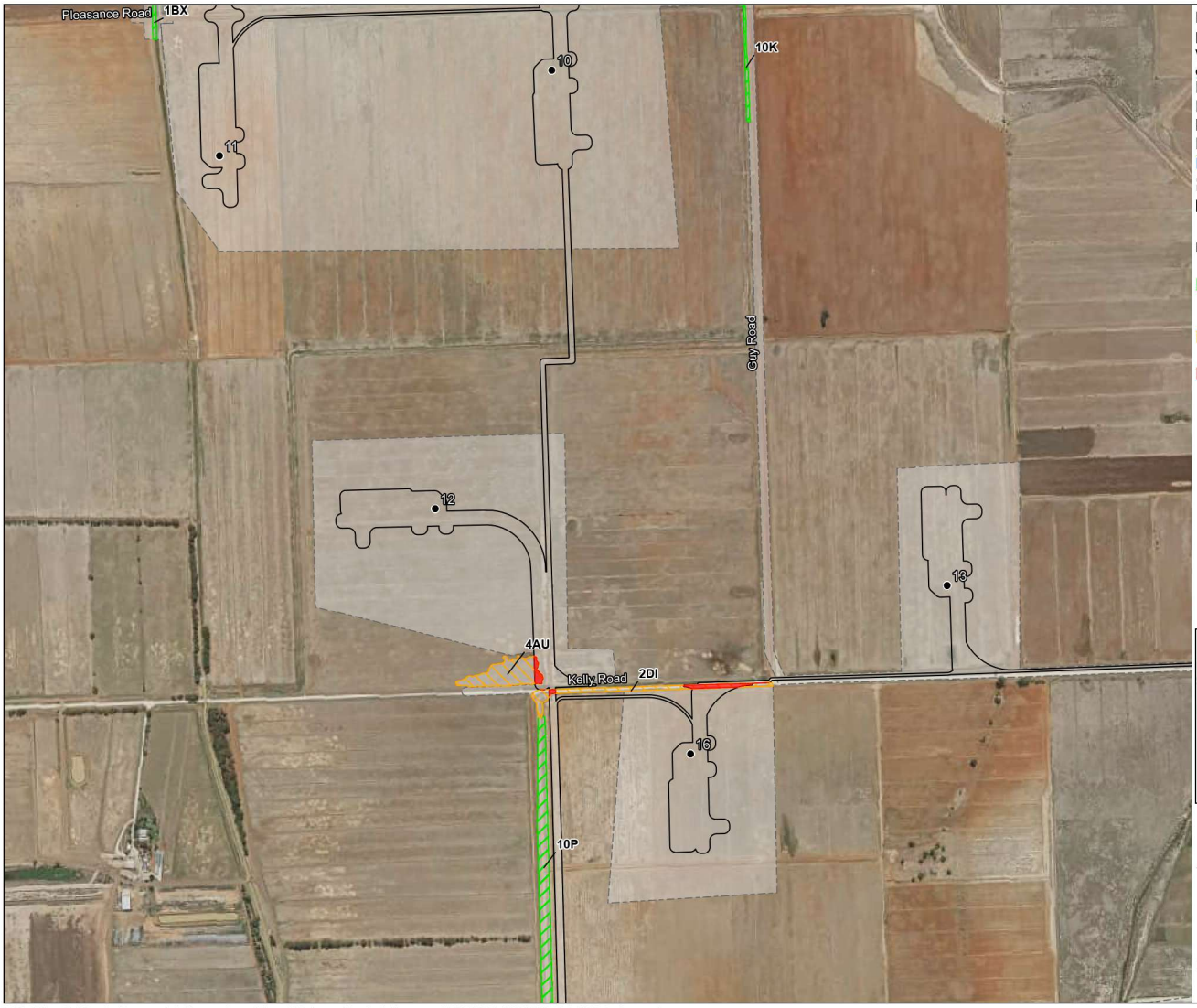


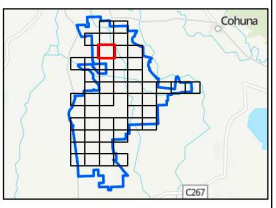
Figure 13-1. Impacts of the proposed wind farm on native vegetation and listed communities

Project No: 24129.09
Project location: Macorna Wind Farm, VIC
Date: 13/08/2026

- Project Area
- Investigated area
- Construction footprint - Rev03
- Turbine

Native vegetation

- Chenopod Grassland (EVC 829); FFG Act listed Northern Plains Grassland Community
- Plains Grassland (EVC 132); FFG Act listed Northern Plains Grassland Community
- Native vegetation removal



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