

15 July 2024

Mr Fernando Ferreira



Dear Fernando

Response to Colac Otway Shire request for information

Our ref: Matter 39426

We understand that Colac Otway Shire (the Shire) are currently reviewing the flora and fauna assessment reports relating to the Ombursley Broiler farm (Biosis 2023a), the water pipeline connecting the Broiler farm to the Birregurra township (Biosis 2024b) and the targeted survey report for the striped legless lizard (Biosis 2024). The impacts to flora and fauna are currently included within the Birregurra water pipeline report, however the two proposals will be assessed separately by the Shire. As a result, the Shire has requested that the impacts associated with works proposed in the unnamed road reserve are outlined in this letter. This allows a clear separation of impacts associated with the proposed pipeline and those associated with the unnamed road reserve.

The unnamed road reserve to the north of the proposed Broiler farm (east of Mooleric Road) is proposed to be used as a thoroughfare during the construction and operation of the farm. The reserve is currently used for grazing and paddock access by neighbouring landowners and the movement of vehicles through the has resulted in the creation of a vehicle track. However, this track will not adequately support the frequency and types of vehicle movement throughout the reserve during construction and operation of the proposed Broiler farm. A six-metre wide all season road will therefore be constructed within the road reserve to facilitate more frequent movements of large vehicles and machinery.

The following letter of advice outlines the potential impacts of the construction of this road. The impacts detailed in this letter and do not differ from those presented in the previous Biosis flora and fauna assessment report (Biosis 2024b).

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Ecological values within the unnamed road reserve

General values

The unnamed government road to the north of the proposed poultry farm supports several small patches of Plains Grassy Wetland EVC 125. Beyond the mapped patches of Plains Grassy Wetland EVC 125, native vegetation is scattered throughout a largely disturbed area that supports predominantly introduced vegetation such as Toowoomba Canary-grass *Phalaris aquatica*. The soils are black, cracking clays with some surface and embedded rocks.

Tussock grasses (such as Common Tussock-grass *Poa labillardierei*) are sparse and appear to have been heavily grazed throughout the road reserve. Despite the relatively low cover of tussock grasses, the site was considered potentially suitable habitat for Striped Legless Lizard *Delma impar* because the property to the north supports moderate quality habitat with large tussock grasses, surface rocks and inter-tussock spaces. The surface rocks within the road reserve may be utilised by Striped Legless Lizards that could move in from the more suitable habitat to the north. Additionally, Striped Legless Lizards have been recorded in roadsides dominated by Toowoomba Canary-grass in western Victoria. Habitat of this type is known to also support additional small vertebrates including threatened reptiles like the Tussock Skink *Pseudemoia pagenstecheri.* The presence of a population within the road reserve was confirmed during targeted surveys undertaken in 2023, as described below.

No threatened flora were recorded within the study area during the assessment, and the high level of disturbance (evident through cattle pugging and grazing) make it unlikely that any threatened flora species persist within the patches of wetland vegetation.

The habitat zones within the unnamed road reserve were assessed for the presence of Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (Seasonal Herbaceous Wetlands; threatened ecological community listed under the EPBC Act). Several key species of this threatened community such as Common Spike-sedge *Eleocharis acuta*, Prickfoot *Eryngium vesiculosum* and Small Loosestrife *Lythrum hyssopifolia* were recorded within one of the habitat zones at a high enough cover to qualify as Seasonal Herbaceous Wetlands. However, the size threshold is not met (both individually and collectively). The remaining two habitat zones do not support any native forb species and therefore do not meet the condition or size thresholds to be considered Seasonal Herbaceous Wetlands.

There were some areas in the road reserve where Common Tussock-grass was present, but not at a high enough cover (<25% cover) to qualify as a patch. The areas were mapped to assist Spirecom in reducing their impacts to native vegetation as much as possible. It is important to note that scattered native vegetation still occurs outside these patches and the mapped Plains Grassy Wetland habitat zones.

The unnamed road reserve was previously mapped as significant habitat for Basalt Tussock Grass *Poa labillardierei* var. (Volcanic Plains). This variety of Tussock Grass is now included in *Poa labillardierei* var. *labillardierei*. Basalt Tussock Grass is used to refer to this species in Figure 1 (Appendix 1) due to the previous consideration of the road reserve as significant habitat due to the presence of this variety of Tussock Grass.

Striped legless lizard targeted surveys

Tile surveys for threatened reptiles were undertaken between 17 October and 22 December 2023. Three reptile and two amphibian species were recorded within the study area during the targeted surveys - Striped Legless Lizard, Eastern Three-lined Skink *Acritoscincus duperreyi*, Tussock Skink, Southern Brown Tree Frog *Litoria ewingii* and Spotted Marsh Frog *Limnodynastes tasmaniensis*. Additionally, one skink *Scincidae* spp. was observed but unable to be identified to the species level during the targeted surveys, as they evaded capture and/or moved too quickly to obtain visual identification. This typically occurred on warmer or more sunny days when individuals were more active.



Four Striped Legless Lizards were recorded during the surveys; one under a tile in Transect 2 (southern boundary of road reserve) and three under tiles within Transect 3 (northern boundary of road reserve; Figure 2, Appendix 1). Head scales were photographed for two of the Striped Legless Lizards captured on Transect 3, and it was determined they were the same individual captured on two separate days. The Striped Legless Lizards observed on Transect 2 and one of the individuals observed on Transect 3 evaded capture and were not able to be photographed. Hence, it is unknown whether the same individual was recorded all four times. However, it is likely that at least two different individuals were recorded as sightings as the capture points on Transect 2 and Transect 3 are located approximately 150 metres apart.

Tussock Skink were recorded on one occasion during the surveys in Transect 5. The unidentified skink that was observed, but not captured, on Transect 1 was also potentially a Tussock Skink due to its colour and size. Tussock Skink are listed as vulnerable under the FFG Act. Based on the results from the current survey, it is reasonable to assume that Tussock Skink are present in moderate abundance throughout the study area.

More information on these surveys can be found in the Striped Legless Lizard report (Biosis 2024).

Victoria's Guidelines for the removal, destruction or lopping of native vegetation (the Guidelines)

The Guidelines set out and describe the application of Victoria's statewide policy in relation to assessing and compensating for the removal of native vegetation in order to achieve the objective of 'no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation' (DELWP 2017).

This objective is to be achieved through Victoria's planning system using an assessment approach that relies on strategic planning and the permit and offset system. The key policy for achieving no net loss to biodiversity is the three-step approach of avoid, minimise and offset:

- Avoid the removal, destruction or lopping of native vegetation.
- **Minimise** impacts resulting from the removal, destruction or lopping of native vegetation that cannot be avoided.
- Provide an **offset** to compensate for the biodiversity impact from the removal, destruction or lopping of native vegetation.

The following actions have been taken to avoid and/or minimise the impacts of the proposed pipeline development on the landscape:

• The six-metre wide all-weather road proposed within the unnamed road reserve has been positioned to avoid all impacts to native vegetation patches. Additionally, temporary construction fencing has been erected around the patches of native vegetation. It is important to note that the construction of the road will still impact scattered native vegetation patches and Striped Legless Lizard habitat.

The extent of native vegetation patches and the location of large trees within patches and any scattered trees within the study area were mapped (Appendix 1), and the vegetation condition was assessed in relation to standard methods (DSE 2004) and pre-determined EVC benchmarks: https://www.environment.vic.gov.au/biodiversity/bioregions-and-evc-benchmarks.

Based on the current design (provided by Spirecom on 14 December 2023), the proposed development of the all-weather road will not require the removal of any native patch vegetation. However, scattered native vegetation (that does not meet the definition of a patch within the Guidelines) will be impacted. As a result, a planning permit will be required to construct the proposed road, but native vegetation offset credits will not be required for these impacts.



Recommendations and conclusions

Striped Legless Lizard have been identified within the unnamed road reserve (see the Striped legless lizard targeted survey report for more information, Biosis 2024). As a result, it is recommended that the proposed construction of the road is referred to the Commonwealth under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). We understand that Spirecom are currently preparing an EPBC Act referral for these works.

No works should proceed within the suitable habitat for Striped legless lizard (Biosis 2024) in the unnamed road reserve before the EPBC Act referral has been assessed. This includes the construction of no-go fencing to protect native vegetation. While temporary fencing is unlikely to impact the Striped legless lizard, construction of any permanent or more invasive fencing may impact on Striped Legless Lizard habitat and should therefore be discussed with the federal government throughout the referral process before it is undertaken.

While the current proposed location of the road does not propose to remove any patches of native vegetation (as define under the Guidelines) any changes to the footprint of the road will need to be reassessed as they may result in impacts to the vegetation mapped within the reserve.

As long as the works are in line with the EPBC Act referral process and do not significantly impact Striped Legless Lizard habitat, no-go fencing should be erected around native vegetation mapped within the road reserve to ensure impacts to retained native vegetation do not occur during construction and operation of the all-weather road.

Please contact me if you have any enquiries.

Yours sincerely

Hayley Sime Botanist



References

Biosis 2023a. *320 Mooleric Road, Birregurra. Flora and Fauna Assessment*, Report prepared for Spirecom Pty Ltd. Authors: Gibson, M. and Russell, W. Biosis Pty Ltd, Ballarat, VIC. Project no. 38562.

Biosis 2024b. *Mooleric Road Birregurra: Flora and Fauna assessment*, Report prepared for Spirecom Pty Ltd. Authors: Sime, H. Eastick, D. Biosis Pty Ltd. Ballarat, Victoria. Project no. 39426.

Biosis 2024. *Mooleric Road Birregurra Striped Legless Lizard targeted survey*, Report for Spirecom Pty Ltd. Author: Eastick D. Biosis Pty Ltd, Melbourne, VC. Project no. 39426.

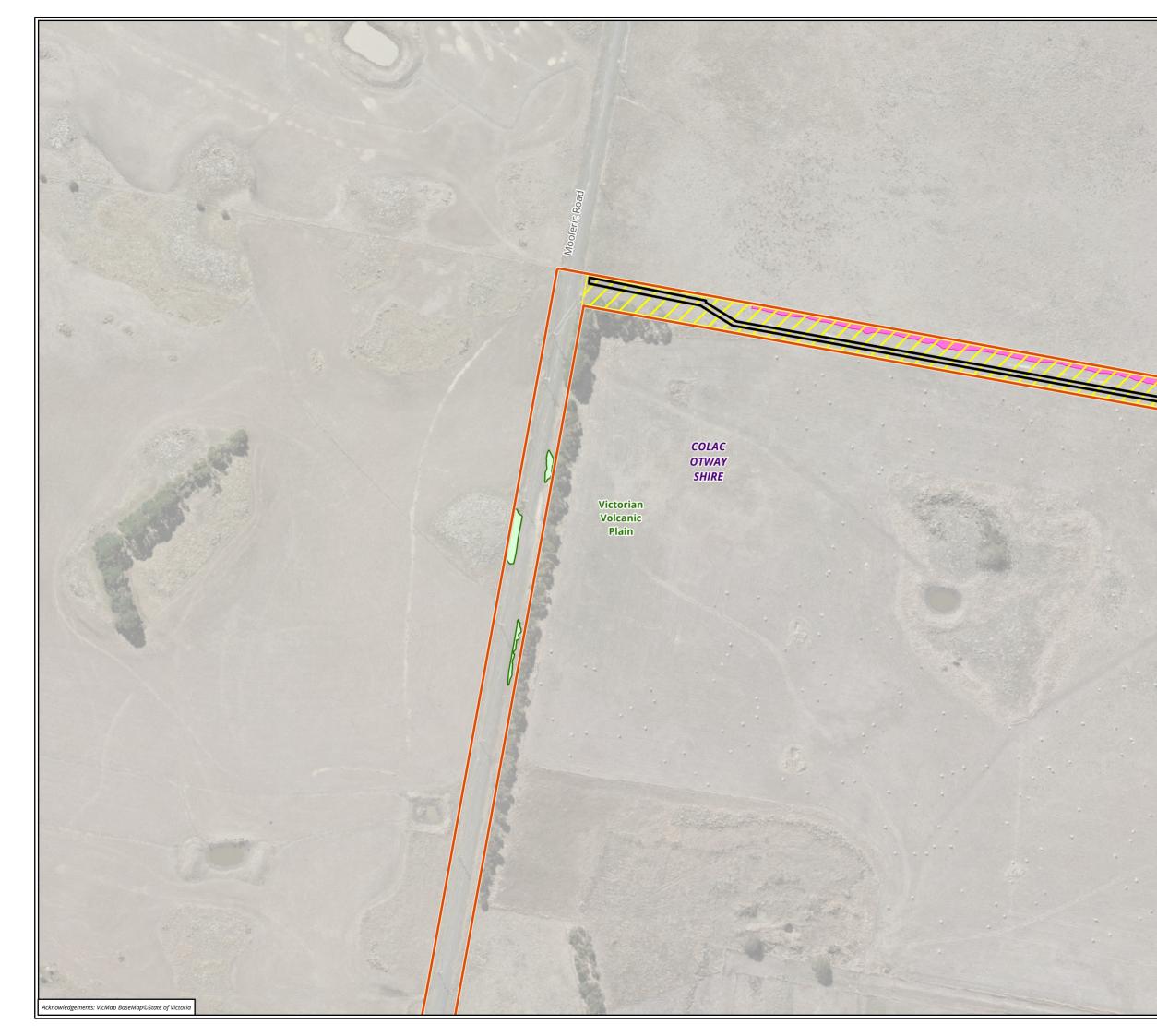
DELWP 2017. 'Guidelines for the Removal, Destruction or Lopping of Native Vegetation', https://www.environment.vic.gov.au/native-vegetation/native-vegetation-removal-regulations.



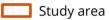
Appendices



Appendix 1 Native vegetation and Striped legless lizard figures



Legend



Impact area

Road construction

Ecological vegetation classes (EVCs)

55_61 Plains Grassy Woodland

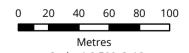
Other native vegetation

Scattered native vegetation including Basalt Poa. However, not considered native vegetation in the Guidelines.

Threatened fauna habitat

Striped Legless Lizard habitat

Figure 1.1 Vegetation proposed to be removed within the study area: detail





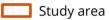
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Legend



Impact area

Road construction

Ecological vegetation classes (EVCs)

125 Plains Grassy Wetland

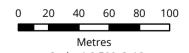
Other native vegetation

Scattered native vegetation including Basalt Poa. However, not considered native vegetation in the Guidelines.

Threatened fauna habitat

Z Striped Legless Lizard habitat

Figure 1.2 Vegetation proposed to be removed within the study area: detail

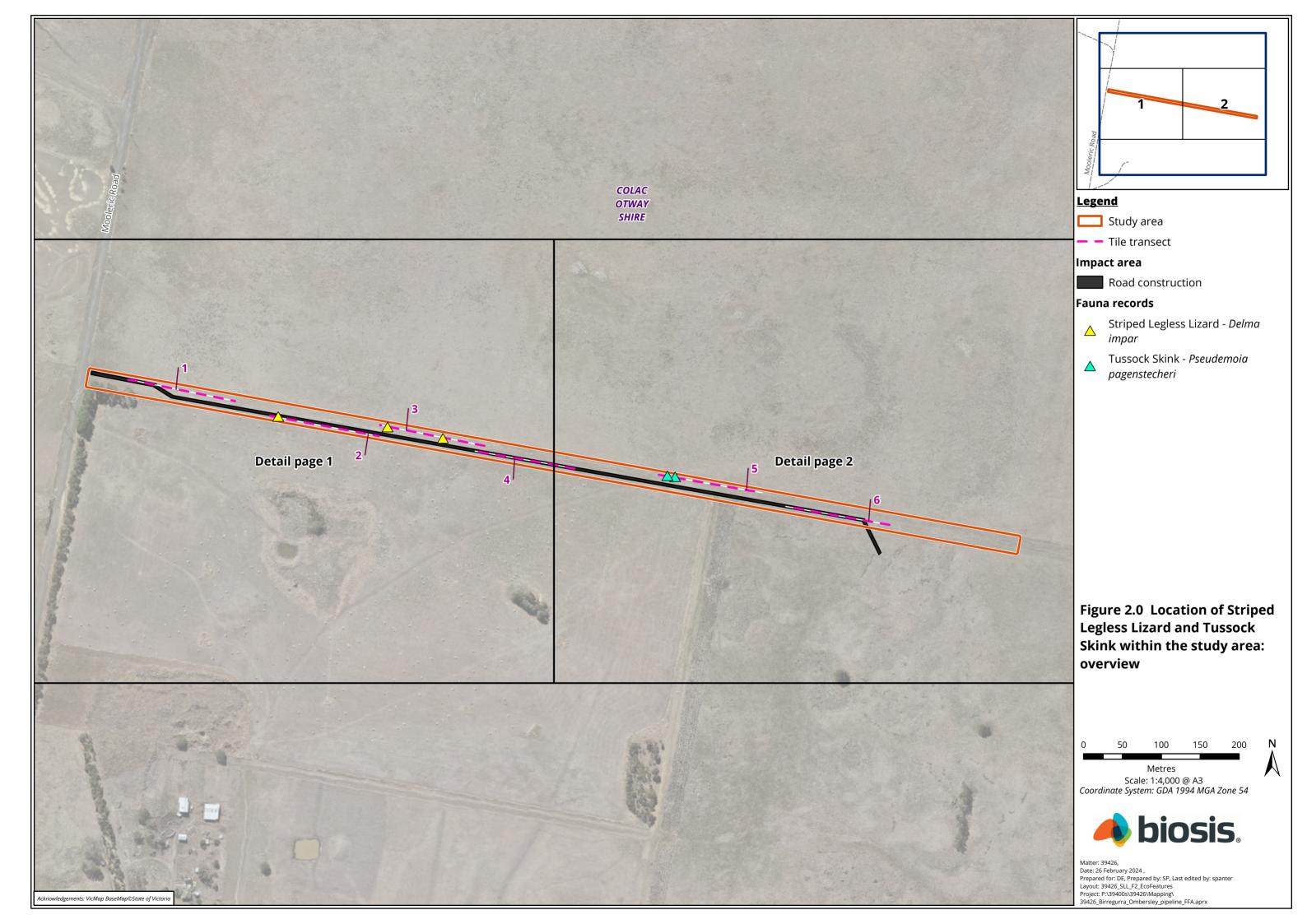




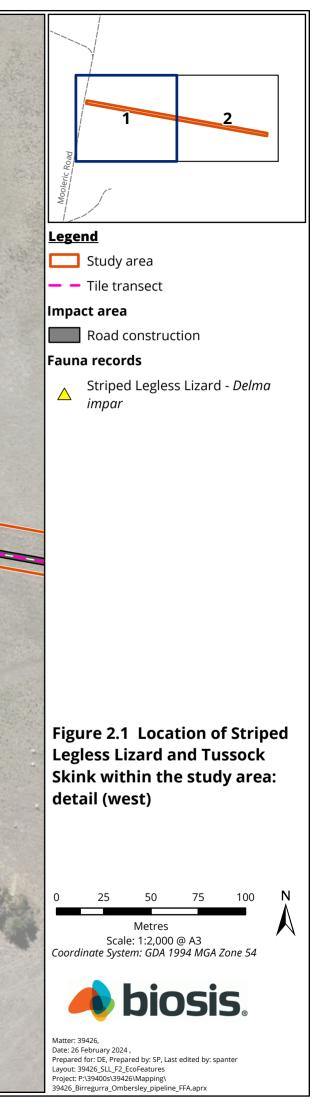
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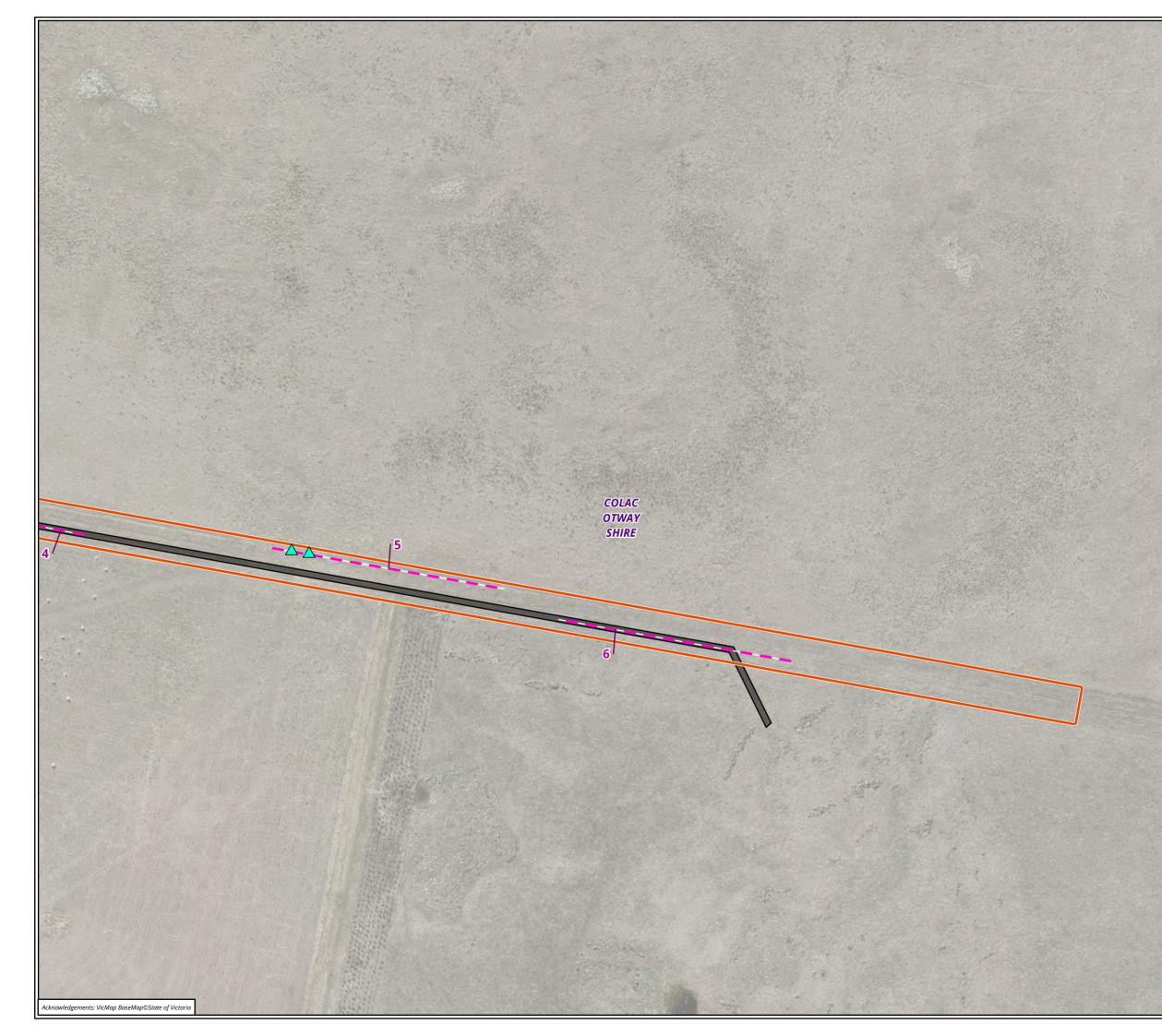


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Appendix 2 Methods

Methods

Flora assessment

An initial flora assessment was undertaken on 5 July 2023 by Hayley Sime (Botanist) in the unnamed road reserve. Several areas (particularly along the western boundary) of the road reserve were inundated at the time of the survey. An additional survey of the unnamed road reserve was undertaken on 25 September 2023. The patches of vegetation that were inundated during the previous assessment were dry and could be more effectively assessed and mapped at this time.

Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs, and grasses' (Clause 73.01).

The Guidelines classify native vegetation into two categories (DELWP 2017a):

- A **scattered tree** is defined as a native canopy tree that does not form part of a patch of native vegetation.
- A **patch** of native vegetation (measured in hectares) is either:
 - An area of native vegetation, with or without trees, where at least 25% of the total perennial understorey cover is native plants.
 - An area with three or more native canopy trees where the drip line (i.e. the outermost boundary of a tree canopy) of each tree touches the drip line of at least one other tree, forming a continuous canopy.
 - Any mapped wetland included in the Current wetlands map, available in DEECA systems and tools.

Patch vegetation is classified into ecological vegetation classes (EVCs). An EVC contains one or more floristic (plant) communities, and represents a grouping of broadly similar environments. Definitions of EVCs and benchmarks (condition against which vegetation quality at the site can be compared) are determined by DEECA.

A canopy tree is a mature tree that is greater than three metres in height and is normally found in the upper layer of a vegetation type. EVC descriptions provide a list of the typical canopy species. A scattered tree is defined as either small or large, and is determined using the large tree benchmark for the relevant EVC. The extent of a small, scattered tree is the area of a circle with a 10 metre radius (i.e. 0.031 hectares), while the extent of a large scattered tree is a circle with a 15 metre radius (i.e. 0.070 hectares). A condition score is applied to each scattered tree based on information provided by DEECA's NVIM.

A Vegetation Quality Assessment (VQA) was undertaken for all patches of native vegetation identified in the study area. This assessment is consistent with DEECA's habitat hectare method (DSE 2004) and the Guidelines (DELWP 2017a). For the purposes of this assessment the limit of the resolution for identification of a patch of native vegetation was taken to be 0.001 habitat hectares (Hha). That is, if a discrete patch of native vegetation was present with sufficient cover but its condition and extent would not have resulted in the identification of at least 0.001 habitat hectares, the vegetation patch of vegetation was not mapped or included in the assessment.

Species nomenclature for flora follows the Victorian Biodiversity Atlas (VBA).



Fauna assessment

The study area was investigated on 5 July and 25 September 2023 by Ian Smales (Principal Zoologist) and Danielle Eastick (Zoologist) to determine its values for fauna. These were determined based on the types and qualities of habitat(s) present. All species of fauna observed during the assessment were noted and active searching for fauna was undertaken. This included direct observation, searching under rocks and logs, examination of tracks and scats and identifying calls. Particular attention was given to searching for significant species and their habitats. Fauna species were recorded with a view to characterising the values of the site and the investigation was not intended to provide a comprehensive survey of all fauna that has potential to utilise the site over time.



Appendix 3 Vegetation Quality Assessment results

EVC #: Name			Plains Grassy Wetland		
Max Score		Score	Score	Score	
	Large Trees	10	NA	NA	NA
	Tree Canopy Cover	5	NA	NA	NA
	Lack of Weeds	15	9	9	9
c	Understorey	25	10	5	5
Site Condition	Recruitment	10	3	3	3
Si	Organic Matter	5	3	3	3
U	Logs	5	0	0	0
	Total Site Score		25	20	20
	EVC standardiser		1.36	1.36	1.36
	Adjusted Site Score		34	27.2	27.2
U	Patch Size	10	1	1	1
Landscape Value	Neighbourhood	10	0	0	0
Val	Distance to Core Area	5	1	1	1
Ľ.	Total Landscape Score		2	2	2
labitat points	= #/100	100	18.25	23.25	23.25
ONDITION SC	ORE	1	0.18	0.23	0.23
labitat Zone a	rea (ha)		0.00342	0.0047	0.0052
Habitat Hectares (Hha)			0.0006	0.0011	0.0012

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320 Mooleric Road Birregurra

Flora and fauna assessment

FINAL REPORT

Prepared for Spirecom Pty Ltd

12 October 2023



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- Victorian Government Department of Environment, Energy and Climate Action for access to the Victorian Biodiversity Atlas, NatureKit and EnSym/Native Vegetation Information Management tool
- Australian Government Department of Climate Change Energy the
 Environment and Water for access to the Protected Matters Search Tool

Biosis staff involved in this project were:

- Matt Gibson and Wyn Russell (field assessment)
- Grace O'Loghlin (mapping)
- Katrina Sofo (quality assurance)

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SUMMARY

Biosis Pty Ltd was commissioned by Spirecom Pty Ltd to undertake a flora and fauna assessment of an area of land proposed for development of a poultry facility. The study area is located in agricultural land approximately 20 kilometres north-east of Colac, Victoria.

Ecological values

Key ecological values identified within the study area are as follows:

- Patches of Plains Grassy Wetland, that correspond with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed threatened community Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains.
- Plains Grassy Wetland areas may provide habitat for several threatened fauna species, including Brolga Antigone rubicunda, Tussock Skink Pseudemoia pagenstecheri, Hairy Burrowing Crayfish Engaeus sericatus and Growling Grass Frog Litoria raniformis.
- Plains Grassy Wetland areas may provide habitat for several threatened flora species, including Matted Flax-lily *Dianella amoena*, Clover Glycine *Glycine latrobeana*, Pale Swamp Everlasting *Coronidium gunnianum* and Purple Blown-grass *Lachnagrostis semibarbata*.
- The site may be utilised by several wide ranging threatened species including Black Falcon *Falco subniger*, White-throated Needletail *Hirundapus caudacutus*, Grey-headed Flying-fox *Pteropus poliocephalus* and Southern Bent-wing Bat *Miniopterus orianae bassanii*.

Government legislation and policy

An assessment of the project in relation to key biodiversity legislation and policy is provided and summarised below.

Legislation / policy	Relevant ecological feature on site	Permit / approval required
EPBC Act	Patches of Plains Grassy Wetland, that correspond with the listed threatened community Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains.	Referral not required if patches of Plains Grassy Wetland can be completely avoided.
	Plains Grassy Wetland areas provide potential habitat for Matted Flax-lily, Clover Glycine and Growling Grass Frog.	
	Grey-headed Flying-fox, White-throated Needletail and Southern Bent-wing Bat may make occasional use of the area.	
FFG Act	Potential habitat for several threatened species present.	Site is on private land. Protected Flora Permit not required
Planning & Environment Act	Site contains patches of remnant Plains Grassy Wetland.	Planning permit required to lop or remove native vegetation if native vegetation if native vegetation cannot be avoided.

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Legislation / policy	Relevant ecological feature on site	Permit / approval required
CaLP Act	Three noxious weed species recorded within the study area	Comply with requirements to control/eradicate these species.

Guidelines for the removal, destruction or lopping of native vegetation (the Guidelines)

There is no design established for the site as yet, and there is scope to build the facility without impacting upon any native vegetation. Offsets will be required if native vegetation removal cannot be avoided within the study area, or if there are other impacts required for the project outside of the study area (not included in this assessment).

Recommendations

The results of this assessment should be incorporated into the project design, by adding the flora and fauna mapping information into the planning maps and investigating options to retain as much of the mapped vegetation/habitats as possible.

All areas of EVC 125 Plains Grassy Wetland should be considered in the design process, to ensure there are no direct or indirect impacts.

Specific detail relating to preventing impacts to retained native vegetation and aquatic and terrestrial habitat should be addressed in a site-specific Construction Environmental Management Plan. This will include issues relating to contractors such as environmental inductions, installation of temporary fencing/signage, drainage and sediment control.



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1. Introduction

1.1. Project background

Biosis Pty Ltd was commissioned by Spirecom Pty Ltd to undertake a flora and fauna assessment of four land parcels at 320 Mooleric Road Birregurra. Construction and operation of poultry farming sheds is proposed for the study area.

1.2. Scope of assessment

The objectives of this investigation are to:

- Describe the vascular flora (ferns, conifers, flowering plants), vertebrate fauna (mammals, birds, reptiles, frogs, fishes) and decapod crustacea (e.g. crayfish).
- Map native vegetation and other habitat features.
- Review the implications of relevant biodiversity legislation and policy, including Victoria's Guidelines for the removal, destruction or lopping of native vegetation ('the Guidelines').
- Identify potential implications of the proposed development and provide recommendations to assist with development design.
- Recommend any further assessments of the site that may be required (e.g. a vegetation impact assessment or targeted searches for threatened species).

The study site was limited to private land, as shown in Figures 1 and 2. No assessment of offsite areas, including road reserves, was undertaken.

1.3. Location of the study area

The study area includes the following four land parcels, located at 320 Mooleric Road Birregurra.

- Lot 1 TP247757
- Lot 3 TP372519
- Lot 4 TP247757
- Lot 4 TP372519

The study area is located approximately 7 kilometres north of Birregurra, and 20 kilometres north-east of Colac (Figure 1). It encompasses 130 hectares of private land. It is currently zoned Farming Zone (FZ) and is used for sheep and cattle grazing. A commercial quarry is operating on the adjacent land to the east, between the study area and Mooleric Road.

The study area is within the:

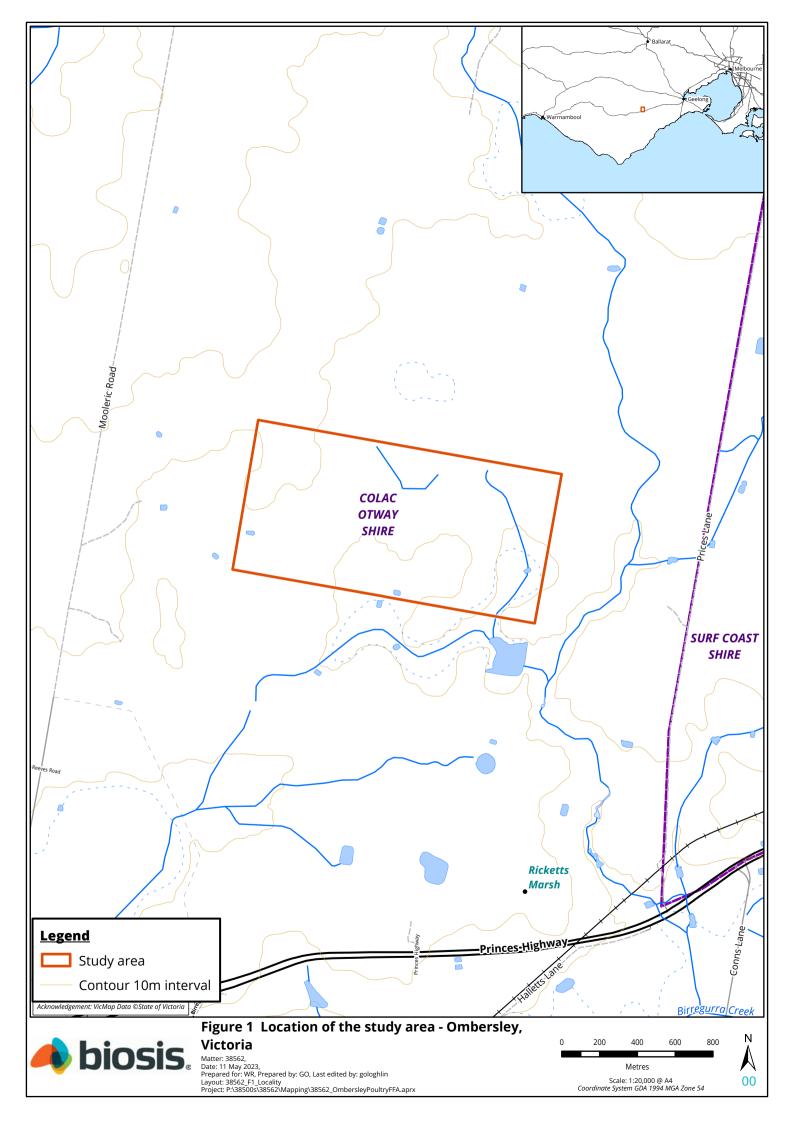
- Victorian Volcanic Plain Bioregion
- Barwon River Basin
- Management area of the Corangamite Catchment Management Authority (CMA)

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- Colac Otway Shire local government area
- Traditional lands of the Eastern Maar.





2. Methods

2.1. Database review

In order to provide a context for the study area, information about flora and fauna from within 5 kilometres of the study area (the 'local area') was obtained from relevant biodiversity databases, many of which are maintained by the Victorian Government Department of Energy, Environment and Climate Action (DEECA) (formerly Department of Environment, Land, Water and Planning (DELWP)) or the Australian Government Department of Climate Change, Energy, Environment and Water (DCCEEW). Records from the following databases were collated and reviewed:

- DEECA's Victorian Biodiversity Atlas (VBA), including the 'VBA_FLORA25, FLORA100 & FLORA Restricted' and 'VBA_FAUNA25, FAUNA100 & FAUNA Restricted' datasets.
- DCCEEW's Protected Matters Search Tool for matters protected by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Other sources of biodiversity information were examined including:

- DEECA's NatureKit mapping tool.
- DEECA's Habitat Importance maps.
- DEECA's Native Vegetation Information Management (NVIM) system.
- Planning Scheme overlays relevant to biodiversity based on <u>http://planningschemes.dpcd.vic.gov.au</u>.
- Biosis (2014). Ombersley Quarry: Flora and Fauna Assessment. Report prepared for MCG Quarries Pty Ltd. Biosis Project #17781.

2.2. Definitions of threatened species or communities

Threatened species or communities include those species or communities that are listed under the EPBC Act and/or FFG Act. The conservation status of a species or ecological community is determined by its listing status under Commonwealth or State legislation / policy (Table 1).

Government level	Conservation status	
National	Listed as nationally critically endangered, endangered or vulnerable under the EPBC Act	
State	Listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable or conservation dependent in Victoria under the FFG Act	

 Table 1
 Conservation status of threatened species and ecological communities

Lists of threatened species generated from the databases are provided in Appendix A (flora) and Appendix B (fauna) and the species have been assessed to determine their likelihood of occurrence based on the process outlined below.



2.3. Determining likelihood of occurrence of threatened species

Likelihood of occurrence indicates the potential for a species or ecological community to occur regularly within the study area. It is based on expert opinion, information in relevant biodiversity databases and reports, and an assessment of the habitats on site. Likelihood of occurrence is ranked as negligible, low, medium, high or recorded. The rationale for the rank assigned is provided for each species in Appendix A (flora) and Appendix B (fauna). Those species for which there is little or no suitable habitat within the study area are assigned a likelihood of low or negligible and are not considered further.

Only those species listed under the EPBC Act or the FFG Act (hereafter referred to as ' threatened species') are assessed to determine their likelihood of occurrence. The habitat value for threatened species is calculated by the Habitat Importance Modelling produced by DEECA (DELWP 2017a). Where threatened species are recorded in the study area this is noted in Appendix A (flora) and Appendix B (fauna).

Threatened species which have at least medium likelihood of occurrence are given further consideration in this report. The need for targeted survey for these species is also considered.

2.4. Site investigation

2.4.1. Flora assessment

The flora assessment was undertaken on 9 May 2023 and a list of flora species was collected. This list will be submitted to DEECA for incorporation into the Victorian Biodiversity Atlas. Planted species have not been recorded unless they are naturalised.

Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs, and grasses' (Clause 73.01).

The Guidelines classify native vegetation into two categories (DELWP 2017a):

- A **patch** of native vegetation (measured in hectares) is either:
 - An area of native vegetation, with or without trees, where at least 25% of the total perennial understorey cover is native plants.
 - An area with three or more native canopy trees where the drip line (i.e. the outermost boundary
 of a tree canopy) of each tree touches the drip line of at least one other tree, forming a
 continuous canopy.
 - Any mapped wetland included in the Current wetlands map, available in DEECA systems and tools.

Patch vegetation is classified into ecological vegetation classes (EVCs). An EVC contains one or more floristic (plant) communities, and represents a grouping of broadly similar environments. Definitions of EVCs and benchmarks (condition against which vegetation quality at the site can be compared) are determined by DEECA.

• A **scattered tree** is defined as a native canopy tree that does not form part of a patch of native vegetation.

A canopy tree is a mature tree that is greater than three metres in height and is normally found in the upper layer of a vegetation type. Ecological vegetation class descriptions provide a list of the typical canopy species. A scattered tree is defined as either small or large, and is determined using the large tree benchmark for the

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relevant EVC. The extent of a small scattered tree is the area of a circle with a 10 metre radius (i.e. 0.031 hectares), while the extent of a large scattered tree is a circle with a 15 metre radius (i.e. 0.070 hectares). A condition score is applied to each scattered tree based on information provided by DEECA's NVIM.

A Vegetation Quality Assessment (VQA) was undertaken for all patches of native vegetation identified in the study area. This assessment is consistent with DEECA's habitat hectare method (DSE 2004) and the Guidelines (DELWP 2017a). For the purposes of this assessment the limit of the resolution for identification of a patch of native vegetation was taken to be 0.001 habitat hectares (Hha). That is, if a discrete patch native vegetation was present with sufficient cover but its condition and extent would not have resulted in the identification of at least 0.001 habitat hectares, the vegetation patch of vegetation was not mapped or included in the assessment.

Where relevant, notes were made on specific issues such as noxious weed infestations, evidence of management works, current grazing impacts and the regeneration capacity of the vegetation.

Species nomenclature for flora follows the Victorian Biodiversity Atlas (VBA).

2.4.2. Fauna assessment

The study area was investigated on 9 May 2023 to determine its values for fauna. These were determined primarily on the basis of the types and qualities of habitat(s) present. All species of fauna observed during the assessment were noted and active searching for fauna was undertaken. This included direct observation, searching under rocks and logs, examination of tracks and scats and identifying calls. Particular attention was given to searching for significant species and their habitats. Fauna species were recorded with a view to characterising the values of the site and the investigation was not intended to provide a comprehensive survey of all fauna that has potential to utilise the site over time.

2.4.3. Permits

Biosis undertakes flora and fauna assessments under the following permits and approvals:

- Wildlife Authorisation issued by DEECA under the *Victorian Wildlife Act 1975* (Permit Number 10010193).
- Permit to Take/Keep Protected Flora issued by DEECA under the *Flora and Fauna Guarantee Act 1988* (FFG Act) (Permit Number 10010194).
- Permit to Take Protected Fish issued by DEECA under the *Flora and Fauna Guarantee Act 1988* (FFG Act) (Permit Number 10010195).
- Permit to Conduct Research in areas managed by the Parks Victoria issued by DEECA under the *National Parks Act 1975, Crown Land (Reserves) Act 1978* and *Parks Victoria Act 2018* (Permit Number 10010071).
- Permit to catch and release fish issued by the Victorian Fisheries Authority under the *Victorian Fisheries Act 1995* (Permit Number RP 1220, Personal File Number 13041).
- Approvals 18.21 and 20.21 issued by the Wildlife and Small Institutions Animal Ethics Committee of the Victorian Government Department of Economic Development, Jobs, Transport and Resources (DEDJTR).
- Scientific Procedures Fieldwork Licence issued by DEDJTR's Wildlife and Small Institutions Animal Ethics Committee (Licence Number 20020).

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2.5. Qualifications

Ecological surveys provide a sampling of flora and fauna at a given time and season. There are a number of reasons why not all species will be detected at a site during survey, such as low abundance, patchy distribution, species dormancy, seasonal conditions, and migration and breeding behaviours. In many cases these factors do not present a significant limitation to assessing the overall biodiversity values of a site.

The current flora and fauna assessment was conducted in May (autumn), which is not an optimal time for survey, however the conditions were appropriate for assessing the extent of native vegetation and habitats present within the site.

2.6. Legislation and policy

The implications for the project were assessed in relation to key biodiversity legislation and policy including:

- Matters listed under the EPBC Act, associated policy statements, significant impacts guidelines, listing advice and key threatening processes.
- Threatened taxa, communities and threatening processes listed under Section 10 of the FFG Act and associated action statements and listing advice.
- Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017a).
- Native Vegetation Management Plans prepared by Catchment Management Authorities.
- *Planning and Environment Act 1987* specifically Clauses 12.01-2, 52.17 and 66.02 and Overlays in the Planning Scheme.
- Noxious weeds and pest animals lists under the Catchment and Land Protection Act 1994 (CaLP Act).

2.7. Mapping

Mapping was conducted using hand-held GPS-enabled tablets and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the tablets (generally \pm 7 metres) and dependent on the limitations of aerial photo rectification and registration.

Mapping has been produced using a Geographic Information System (GIS). Electronic GIS files which contain our flora and fauna spatial data are available to incorporate into design concept plans. However this mapping may not be sufficiently precise for detailed design purposes.



3. Results

The ecological features of the study area are described below and mapped in Figure 2.

Species recorded during the flora and fauna assessment are listed in Appendix A (flora) and Appendix B (fauna). Unless of particular note, these species are not discussed further.

Threatened species recorded or predicted to occur in the local area is also provided in those appendices, along with an assessment of the likelihood of the species occurring within the study area.

3.1. Vegetation and fauna habitat

Most of the study area has been highly modified due to clearing and grazing by stock. Most of the study area has been significantly degraded and supports predominantly introduced vegetation that is of limited ecological value.

Areas of Plains Grassy Wetland vegetation were identified in two locations within the study area. These areas correspond with an endangered community and provide potential habitat for several threatened flora and fauna species. Brolgas could use the mapped Plains Grassy Wetland for foraging and roosting, and it is also potentially suitable breeding habitat for the FFG Act listed Brolga. A known breeding wetland is located within 860 metres of the mapped Plains Grassy Wetland, north of the study area, is within walking distance for unfledged chicks and could be part of a breeding pair's home range (Veltheim et al. 2019). The site also contains linear plantings of native and introduced trees, and areas of surface rock within the cleared pasture. These features are described further in Table 2 and mapped in Figure 2.

Photos are provided in Appendix C.



Table 2 Summary of vegetation and habitat types within the study area

Vegetation or habitat type	Description	Location	Significant values
Predominantly introduced vegetation (Photo 1)	The majority of the study area supports degraded paddocks that have been cleared in the past and are currently used for grazing purposes.	Majority of the study area.	Potential habitat for common open- country species, including White-throated Needletail <i>Hirundapus caudacutus</i> , Southern Bent-winged Bat <i>Miniopterus</i> <i>orianae bassanii</i> and Black Falcon <i>Falco</i> <i>subniger</i> .
Planted vegetation (Photo 2)	Several linear plantings are present within the study area, including a planting of native trees and shrubs along the eastern boundary fence, and plantings of introduced Radiata Pine <i>Pinus radiata</i> , Monterey Cypress <i>Hesperocyparis macrocarpa</i> and Sugar Gum <i>Eucalyptus</i> <i>cladocalyx</i> .	Several linear plantations shown on Figure 2.	Planted eucalypts may be occasionally visited, when in flower, by foraging Grey- headed Flying-fox <i>Pteropus poliocephalus</i> from the colony at the Colac Botanic Gardens.
Plains Grassy Wetland EVC (Photo 3)	The fenced area in the south-eastern corner of the study area supports dense cover of Common Tussock-grass <i>Poa labillardierei</i> . There is also a smaller associated area along the southern boundary of the property.	Fenced area in the south-eastern corner of the study area (Figure 2). Unfenced area near the southern boundary of the property is part of a larger wetland area that extends into the property to the south.	Potential habitat for several threatened species, including Matted Flax-lily <i>Dianella</i> <i>amoena</i> , Clover Glycine <i>Glycine latrobeana</i> , Pale Swamp Everlasting <i>Coronidium</i> <i>gunnianum</i> , Purple Blown-grass <i>Lachnagrostis semibarbata</i> , Growling Grass Frog <i>Litoria raniformis</i> , Tussock Skink <i>Pseudemoia pagenstecheri</i> and Hairy Burrowing Crayfish <i>Engaeus sericatus</i> . Possible foraging and roosting habitat for Brolga <i>Antigone rubicunda</i> , which has been recorded locally. Potential to be part of a breeding home range and to support nesting. Local records include breeding pairs, and the study area occurs within the potential home range of a pair.
Constructed dams (Photo 3)	Several dams were recorded within the study area. Most of these are accessible to stock and were in heavily grazed areas, lacking native vegetation. The dam in the	Scattered throughout the site.	The constructed dam near the south- eastern corner of the study area may provide habitat for Growling Grass Frog.

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Vegetation or habitat type	Description	Location	Significant values
	south-eastern corner of the study area was in a fenced area, excluded from stock. This dam showed some development of aquatic vegetation and aquatic habitat features.		Dams in the study area may provide roosting habitat for Brolgas occurring locally.
Rock outcrops (Photo 4)	Areas of surface rock are present in the western half of the study area. These areas are heavily grazed and support a similar suite of introduced grasses and other weeds as the surrounding pasture areas.	Rock outcrops limited to western half of study area. Rock piles in eastern half of study area where historical rock clearing and cropping has occurred.	Habitat for a range of native reptiles and small mammals. Unlikely to support threatened species due to significant disturbance of surrounding grassland, except for Brolga, which could occasionally forage amongst the rocky outcrops



3.2. Landscape context

The study area is in a rural farming area and the majority of surrounding land-use is either grazing or cropping. The site has experienced long term disturbance through grazing, cropping and removal of surface rocks.

The study area is not located close to any large conservation reserves. It is approximately 20 kilometres from Lake Colac and Lake Murdeduke, and a similar distance to the north of the forested area of the Otway Ranges.

Some neighbouring properties and road reserves support remnant grasslands or wetland vegetation, including the property to the north, which is managed for grazing and wind energy generation.

The property to the south supports a large, low lying area that contains Plains Grassy Wetland vegetation, and two sections of this wetland extend short distances into the study area, near the southern boundary.

No major waterways pass through the site. The Birregurra Creek and Barwon River both flow through the landscape several kilometres to the south of the site.

3.3. Threatened species and ecological communities

Threatened species recorded or predicted to occur within 5 kilometres of the study area or from the relevant catchment (aquatic species) are listed in Appendix A (flora) and Appendix B (fauna). An assessment of the likelihood of these species occurring in the study area and an indication of where within the site (i.e. which habitats or features of relevance to the species) is included. A summary of those species recorded or with a medium or higher likelihood of occurring in the study area is provided in Table 3.

Species name	Listing status	Area of value within the study area
Matted Flax-lily Dianella amoena	Endangered under EPBC Act Endangered under FFG Act	Fenced area of Plains Grassy Wetland in the south-east corner of the study area.
Clover Glycine Glycine latrobeana	Vulnerable under EPBC Act Vulnerable under FFG Act	Fenced area of Plains Grassy Wetland in the south-east corner of the study area.
Pale Swamp Everlasting Coronidium gunnianum	Critically endangered under FFG Act	Fenced area of Plains Grassy Wetland in the south-east corner of the study area.
Purple Blown-grass Lachnagrostis semibarbata var. filifolia	Endangered under FFG Act	Fenced area of Plains Grassy Wetland in the south-east corner of the study area.
Purple Blown-grass Lachnagrostis semibarbata var. semibarbata	Endangered under FFG Act	Fenced area of Plains Grassy Wetland in the south-east corner of the study area.
Growling Grass Frog Litoria raniformis major	Vulnerable under EPBC Act and FFG Act	Constructed dam surrounded by the fenced area of Plains Grassy Wetland in the south- east corner of the study area. May move through wet depressions and drainage lines when dispersing between wetlands.

Table 3	Summary	of EPBC Act and	FFG Act listed	species most likel	y to occur in the study	v area
	Summur	y of LI DC Act und	I I G ACL IISLCG	species most inter	y to occur in the stud	y ui cu

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Species name	Listing status	Area of value within the study area
White-throated Needletail Hirundapus caudacutus	Vulnerable under EPBC Act and FFG Act	Wide-ranging aerial species that may pass through the area on occasion.
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	Vulnerable under EPBC Act	Species may occasionally forage in flowering Sugar Gums planted on the east and west borders of the study area.
Southern Bent-winged Bat Miniopterus orianae bassanii	Critically endangered under EPBC and and FFG Act	May forage throughout the general area.
Brolga Antigone rubicunda	Endangered under FFG Act	Fenced area of Plains Grassy Wetland in the south-east corner of the study area. Potential breeding home range movement corridor between this wetland and a known breeding wetland within 860 metres. Locally occurring pair may also forage within the study area, within the wetland, drainage lines and rocky outcrops.
Black Falcon Falco subniger	Critically endangered under FFG Act	May forage throughout the general area.
Tussock Skink Pseudemoia pagenstecheri	Endangered under FFG Act	Fenced area of Plains Grassy Wetland in the south-east corner of the study area.
Hairy Burrowing Crayfish Engaeus sericatus	Vulnerable under FFG Act	Fenced area of Plains Grassy Wetland in the south-east corner of the study area.

3.3.1. Threatened ecological communities

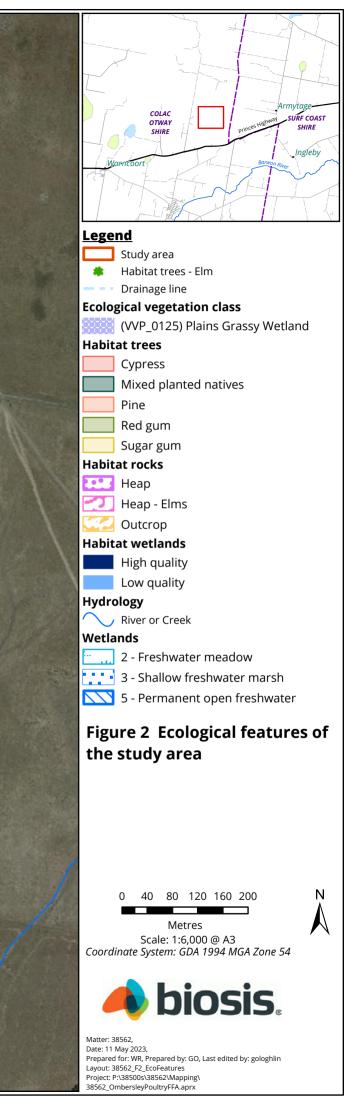
The fenced area in the south-east corner of the study area supports a high cover of Common Tussock-grass, and this area corresponds with the definition of the EPBC Act listed community Natural Temperate Grassland of the Victorian Volcanic Plain. This community is likely to have occurred across most of the site prior to clearing for agriculture.

3.4. Further survey recommendations

No development plan is currently available.

Ecological values on the site are limited to the fenced area of Plains Grassy Wetland in the south-eastern corner of the study area and a potential movement corridor for locally breeding Brolga, which could be associated with the breeding wetland in the adjacent property, within approximately 200 metres north of the study area and 860 metres of the Plains Grassy Wetland. No further assessments are required if development can be excluded from this area. If the Plains Grassy Wetland was proposed to be disturbed, further survey would be required to determine the presence/absence of a range of threatened species and ecological communities, including those listed in Table 3.







4. Biodiversity legislation and government policy

This section provides an assessment of the project in relation to key biodiversity legislation and government policy. This section does not describe the legislation and policy in detail. Where available, links to further information are provided.

4.1. Commonwealth

4.1.1. Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (MNES) protected under the Act.

Further information including a guide to the referral process is available at http://www.environment.gov.au/epbc/index.html

The MNES relevant to the project are summarised in Table 4. It includes an assessment against the EPBC Act policy statements published by the Australian Government which provide guidance on the practical application of EPBC Act.

MNES	Project specifics	Assessment against significant impact guidelines
EPBC Act listed species	The likelihood of threatened flora and fauna species occurring in the study area is assessed in Appendix A (flora) and Appendix B (fauna). Six species are considered potentially present, including two flora species: • Matted Flax-lily • Clover Glycine and four fauna species: • White-throated Needletail • Grey-headed Flying-fox • Southern Bent-winged Bat • Growling Grass Frog	White-throated Needletail, Grey-headed Flying-fox and Southern Bent-wing Bat have potential to fly and forage throughout the general area, but are unlikely to be impacted by the proposed development, as the study area does not support areas of important habitat for these species. Potential habitat for Growling Grass Frog, Matted Flax-lily and Clover Glycine is limited to the two patches of Plains Grassy Wetland mapped within the study area. If these areas can be avoided, there would be no requirement for further targeted surveys or referrals.
EPBC Act listed ecological communities	Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (critically endangered) is present within the study area. Two patches of Plains Grassy Wetland EVC correspond with the definition of this community, located near the southern boundary of the study area.	This community is unlikely to be impacted if direct removal is avoided, and the project is designed in a manner that does not alter the local hydrology.

Table 4Assessment of project in relation to the EPBC Act



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MNES	Project specifics	Assessment against significant impact guidelines
Migratory species	Thirteen migratory species have been recorded or predicted to occur in the project search area (Appendix B.3).Latham's Snipe	While some of these species would be expected to use the study area on occasions, and some of them may do so regularly or may be resident, it does not provide important habitat for an ecologically significant proportion of any of these species. The Latham's Snipe could use the wetland habitat, drains and inundated areas with native and non-native vegetation.
Wetlands of international importance (Ramsar sites).	The study area is identified as being within the catchment of two Ramsar sites: Western District Lakes and Port Phillip Bay (western shoreline) and Bellarine Peninsula.	The study area does not drain directly into either Ramsar site and the development is not likely to result in a significant impact.

On the basis of criteria outlined in the relevant Significant Impact Guidelines it is considered unlikely that a significant impact on a Matter of National Environmental Significance would result from the proposed action, if direct and indirect impacts to the mapped areas of Plains Grassy Wetland EVC can be avoided. If the final design avoids impacts then referral of the proposed action to the Australian Government Minister for the Environment to determine whether the action requires approval under the EPBC Act is therefore unlikely to be required.

4.2. State

4.2.1. Flora and Fauna Guarantee Act 1988 (FFG Act)

The FFG Act is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes. Under the FFG Act a permit is required from DEECA to 'take' protected flora species. Permit exemptions under the FFG Act generally apply to the non-commercial removal of protected flora from private land, unless there is 'critical habitat' that has been declared on the land. Authorisation under the FFG Act is required to collect, kill, injure or disturb listed fish on private or public land.

The study area is on private land, does not contain any declared 'critical habitat' for the purposes of the FFG Act and the flora species are not being taken for the purpose of commercial sale. A protected flora permit is therefore not required, however the presence of rare or threatened flora and habitat for threatened fauna will be considered by the Responsible Authority in determining its response to an application for native vegetation removal under Clause 52.17 (see below).

4.2.2. Catchment and Land Protection Act 1994 (CaLP Act)

The CaLP Act identifies and classifies certain species as noxious weeds or pest animals, and provides a system of controls on noxious species.

Declared noxious weeds identified in the study area are listed in Appendix A (Table 7) and established pest animals are listed in Appendix B (Table 10).



The proponent must take all reasonable steps to eradicate regionally prohibited weeds, prevent the growth and spread of regionally controlled weeds, and prevent the spread of and as far as possible eradicate established pest animals. The State is responsible for eradicating State prohibited weeds from all land in Victoria.

Further information is at http://agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds

4.2.3. Planning and Environment Act 1987 (incl. Planning Schemes)

The *Planning and Environment Act 1987* controls the planning and development of land in Victoria, and provides for the development of planning schemes for all municipalities.

Of particular relevance to the development proposal are controls relating to the removal, destruction or lopping of native vegetation contained within the Colac Otway Planning Scheme (the Scheme), including permit requirements. The Scheme (Clause 73.01) defines 'native vegetation' as 'Plants that are indigenous to Victoria, including trees, shrubs, herbs, and grasses'. It is an objective of Clause 12.01-2 of the State Planning Policy Framework (Native Vegetation Management) that removal of native vegetation results in no net loss in the contribution made by native vegetation to Victoria's biodiversity.

Clause 52.17 (Native Vegetation) requires a planning permit to remove, destroy or lop native vegetation including some dead native vegetation. Decision guidelines that must be considered by the referral or responsible authority are contained in Section 7 of the Guidelines, and referred to in Clause 52.17-4. Clause 52.17 does not apply if a Native Vegetation Precinct Plan corresponding to the land is incorporated in the Scheme. It should be noted that where native vegetation does not meet the definition of a patch or scattered tree, as described in Section 3.1, the Guidelines do not apply. However, a permit may still be required to remove, destroy or lop native vegetation under the provisions of the Scheme.

Under Clause 66.02 a permit application to remove, destroy or lop native vegetation is required to be referred to DEECA as a recommending referral authority if any of the following apply:

- the class of application is on the detailed assessment pathway
- a property vegetation precinct plan applies to the site or
- the native vegetation is on Crown land occupied or managed by the Responsible Authority.

The study area is not covered by any overlays relevant to biodiversity under the Scheme.

Victoria's Guidelines for the removal, destruction or lopping of native vegetation

The Guidelines are incorporated into the Victoria Planning Provisions and all planning schemes in Victoria (DELWP 2017a). The Guidelines replaced the previous incorporated document titled Permitted clearing of native vegetation – Biodiversity assessment guidelines (DEPI 2013) on 12 December 2017.

The purpose of the Guidelines is to guide how impacts to biodiversity should be considered when assessing a permit application to remove, destroy or lop native vegetation. The objective for the guidelines in Victoria is 'No net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation'.

A detailed assessment of the implications for the project under the Guidelines is provided in Section 5 of this report. Under the Guidelines, there are three assessment pathways for assessing an application for a permit to remove native vegetation: basic, intermediate and detailed.



5. Victoria's Guidelines for the removal, destruction or lopping of native vegetation

The Guidelines were introduced in December 2017. They set out and describe the application of Victoria's statewide policy in relation to assessing and compensating for the removal of native vegetation in order to achieve the objective of 'no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation'.

This objective is to be achieved through Victoria's planning system using an assessment approach that relies on strategic planning and the permit and offset system. The key policy for achieving no net loss to biodiversity is the three-step approach of avoid, minimise and offset:

- **Avoid** the removal, destruction or lopping of native vegetation to ensure that the important biodiversity values of native vegetation continue to be delivered into the future.
- Minimise impacts resulting from the removal of native vegetation that cannot be avoided.
- Provide an **offset** to compensate for the biodiversity impact resulting from the removal of native vegetation.

DEECA has provided biodiversity information tools to assist with determining the assessment pathway associated with the removal of native vegetation and the contribution that native vegetation within the study area makes to Victoria's biodiversity.

5.1. Vegetation quality assessment

The extent of native vegetation patches, the location of large trees within patches and any scattered trees were mapped within the study area (Figure 2) and the condition was assessed in relation to standard methods provided by DSE (2004) and pre-determined EVC benchmarks: <u>https://www.environment.vic.gov.au/biodiversity/bioregions-and-evc-benchmarks</u>. DEECA's Native Vegetation Information Management system was also used to determine vegetation extent and condition.

A continuous area of the same EVC is termed a 'habitat zone'. Different habitat zones exists where there are different EVCs present and/or discrete (non-continuous) patches of the same EVC. A separate vegetation quality assessment was conducted for each habitat zone. The vegetation quality assessment score was multiplied by the extent of the habitat zone to give a value in habitat hectares.

Two habitat zones were identified. The results of the vegetation quality assessment are provided in Table 5 and the area mapped as Plains Grassy Wetland is shown in Figure 2.



Site ID			1	2
Habitat Zone ID			А	А
EVC #: N	ame		125 Plains Grassy Wetland	125 Plains Grassy Wetland
		Max Score	Score	Score
	Large Trees	10	N/A	N/A
	Tree Canopy Cover	5	N/A	N/A
	Lack of Weeds	15	6	6
	Understorey	25	10	10
	Recruitment	10	3	3
	Organic Matter	5	3	3
c	Logs	5	N/A	N/A
litio	Total Site Score		21	21
Site Conc	Standardized Site Score (x 7	5/55)	28.64	28.64
alue	Patch Size	10	2	2
Landscape Value Site Condition	Neighbourhood	10	1	1
lscap	Distance to Core Area	5	1	1
Lanc	Total Landscape Score		4	4
Habitat	points = #/100	100	32.64	32.64

Table 5 Habitat hectares of native vegetation within the study area

5.2. Offset requirements

There is no design established for the site as yet, and there is scope to build the facility without impacting upon any native vegetation. Offsets will be required if native vegetation removal cannot be avoided within the study area, or if there are other impacts required for the project outside of the study area (not included in this assessment).



6. Key ecological values and recommendations

This section identifies the key ecological features of the study area, provides an outline of potential implications of proposed development on those values and includes recommendations to assist Spirecom to design a development to minimise impacts on biodiversity.

The primary measure to reduce impacts to biodiversity values within the study area is to avoid and minimise removal of native vegetation and terrestrial and aquatic habitat, potential movement corridors for the Brolga. Potential disturbance to locally breeding Brolga should be considered and avoided. It is critical that these issues be considered during the design phase of the project, when key decisions are made about the location of infrastructure including sheds, access roads, parking areas, services and temporary material storage. The results of this assessment should therefore be incorporated into the project design, by adding the flora and fauna mapping information into the planning maps and investigating options to retain as much of the mapped vegetation/habitats as possible.

A summary of potential implications of development of the study area and recommendations to minimise impacts during the **design phase** of the project is provided in Table 6.

Ecological feature (Figure 2)	Implications of development	Recommendations
Native vegetation	Remnant native vegetation is present in two locations near the southern boundary of the study area. These areas are mapped as EVC 125 Plains Grassy Wetland and correspond with the definition of the threatened ecological community Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains.	All areas of EVC 125 Plains Grassy Wetland should be considered in the design process, to ensure there are no direct or indirect impacts.
Threatened species and ecological communities	Plains Grassy Wetland mapped within the study is a threatened ecological community (Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains) and provides potential habitat for several threatened species including Growling Grass Frog and the Brolga Movement corridor and home range of a local pair is likely to include the Plains Grassy Wetland and area between this wetland and a breeding wetland 860 metres to the north/north-west of the study area.	All areas of EVC 125 Plains Grassy Wetland should be considered in the design process, to ensure there are no direct or indirect impacts. Potential impacts on habitat for likely Brolga breeding home range movement corridor and disturbance to a local breeding pair should be considered in the design process, to ensure there are no direct or indirect impacts.

Table 6Summary of key ecological values, potential implications of developing the study area and
recommendations to minimise ecological impacts during the design phase.

Construction and post-construction management

Specific detail relating to preventing impacts to retained native vegetation and aquatic and terrestrial habitat should be addressed in a site-specific Construction Environmental Management Plan. This will include issues relating to contractors such as environmental inductions, installation of temporary fencing/signage, drainage and sediment control.



REFERENCES

Veltheim I, Cook S, Palmer GC, Hill FAR, & McCarthy MA 2019. 'Breeding home range movements of prefledged brolga chicks, *Antigone rubicunda* (Gruidae) in Victoria, Australia – Implications for wind farm planning and conservation', *Global Ecology and Conservation*, 20: e00703.



APPENDICES

Appendix A. Flora

The following abbreviations and symbols are relevant to this Appendix.

Code	Meaning	Reference			
National list	ings (EPBC Act)				
EX	Extinct				
CR	Critically endangered				
EN	Endangered	Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)			
VU	Vulnerable	······································			
PMST	Protected Matters Search Tool				
State listing	s (FFG Act)				
x	Extinct				
cr	Critically endangered	Victorian Flora and Fauna Guarantee Act 1988 (FFG			
е	Endangered				
v	Vulnerable	Act)			
t	Threatened				
Р	Protected (public land only)				
SP	State prohibited species				
RP	Regionally prohibited species	Victorian Catchment and Land Protection Act 1994			
RC	Regionally controlled species	(CaLP Act)			
R	Restricted species				
Other					
#	Native species outside its natural range	Victorian Biodiversity Atlas (VBA)			



Appendix A.1. Flora species recorded from the study area

Status **Scientific Name Common Name** Indigenous species Acacia melanoxylon Blackwood Amphibromus spp. Swamp Wallaby-grass *Callitriche* spp. Water Starwort Casuarina spp. Sheoak Cycnogeton procerum (broad erect leaf variant) Common Water-ribbons Duma florulenta **Tangled Lignum** Eleocharis acuta Common Spike-sedge Epilobium hirtigerum Hairy Willow-herb Eucalyptus camaldulensis **River Red-gum** Yellow Gum Eucalyptus leucoxylon Eucalyptus ovata Swamp Gum Crane's Bill *Geranium* spp. Juncus spp. Rush Juncus subsecundus **Finger Rush** Lachnagrostis filiformis s.l. **Common Blown-grass** Duckweed Lemna spp. Limosella australis Austral Mudwort Lythrum hyssopifolia Small Loosestrife Myriophyllum spp. Water Milfoil Oxalis perennans Grassland Wood-sorrel Poa labillardierei Common Tussock-grass Stellaria angustifolia subsp. Angustifolia Swamp Starwort Non-indigenous (planted) native species v Corymbia maculata Spotted Gum e, r Melaleuca armillaris subsp. Armillaris Giant Honey-myrtle Introduced species Arctotheca calendula Cape Weed Australopyrum spp. Wheat Grass R Cirsium vulgare Spear Thistle Cypress Cupressus spp. Cynosurus echinatus Rough Dog's-tail Eucalyptus cladocalyx Sugar Gum Hesperocyparis macrocarpa Monterey Cypress Hordeum leporinum **Barley Grass** Hypochaeris radicata Flatweed Lolium perenne Perennial Rye-grass RC Lycium ferocissimum African Box-thorn

Table 7Flora species recorded from the study area

Malva parviflora

Small-flower Mallow



Status	Scientific Name	Common Name
	Phalaris aquatica	Toowoomba Canary-grass
	Polygonum aviculare s.s.	Hogweed
	Romulea rosea	Onion Grass
	Rumex crispus	Curled Dock
R	Silybum marianum	Variegated Thistle
	Sonchus asper s.s.	Rough Sow-thistle
	Sonchus oleraceus	Common Sow-thistle
	Symphyotrichum subulatum	Aster-weed
	Trifolium spp.	Clover
	Ulmus spp.	Elm
	Urtica urens	Small Nettle



Appendix A.2. Listed flora species

The following table includes threatened flora species that have potential to occur within the study area. The list of threatened species is sourced from the VBA and PMST (accessed on 8 May 2023). Where years are specified for the most recent database records, these refer to records from the VBA unless otherwise specified. Where no year is specified, the PMST has predicted that the species has potential to occur. A proportion of the flora habitat descriptions have been reproduced with permission from the Royal Botanic Gardens Victoria (RBGV 2020).

Scientific name	Common name	Conservation status		Most recent	recent records	Habitat description	Likely occurrence	Rationale for likelihood
		EPBC	FFG	database record			in study area	ranking
National significance								
Amphibromus fluitans	River Swamp Wallaby-grass	VU			PMST	Swampy areas, mainly along the Murray River between Wodonga and Echuca with scattered records from southern Victoria.	Low	Limited suitable habitat.
Dianella amoena	Matted Flax- lily	EN	cr	2013	PMST	Lowland grassland and grassy woodland, on well-drained to seasonally waterlogged fertile sandy loam soils to heavy cracking clays.	Medium	Potential habitat present. Recently recorded nearby.
Dodonaea procumbens	Trailing Hop- bush	VU			PMST	Sandy or clay soils in low-lying, winter-wet areas in grasslands, woodlands, and low-open forest.	Low	No suitable habitat or nearby records.
Glycine latrobeana	Clover Glycine	VU	V	2016	PMST	Grasslands and grassy woodlands, particularly those dominated by Kangaroo Grass.	Medium	Potential habitat present. Recently recorded nearby.
Lachnagrostis adamsonii	Adamson's Blown-grass	EN	e		PMST	Low-lying, seasonally wet or swampy areas of plains communities, often in slightly saline conditions.	Low	No suitable habitat or nearby records.

Table 8Threatened flora species recorded or predicted to occur within 5 km of the study area



Scientific name	Common name	Conservation status		Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking	
		EPBC	EPBC FFG data				in study area		
Lepidium aschersonii	Spiny Peppercress	VU	е		PMST	Heavy clay soils near salt lakes on the volcanic plains; disjunct records near Lake Omeo.	Low	No suitable habitat or nearby records.	
Lepidium hyssopifolium	Basalt Pepper-cress	EN			PMST	Basalt plains grassland and woodland communities.	Low	No suitable habitat or nearby records.	
Leucochrysum albicans subsp. Tricolor	White Sunray	EN	е		PMST	Grasslands of the Victorian Volcanic Plains, primarily on acidic clay soils derived from basalt, with occasional occurrences on adjacent sedimentary, sandy-clay soils.	Low	No suitable habitat or nearby records.	
Pimelea spinescens subsp. Spinescens	Spiny Rice- flower	CR	cr		PMST	Primarily grasslands featuring a moderate diversity of other native species and inter- tussock spaces, although also recorded in grassland dominated by introduced perennial grasses.	Low	No suitable grassland habitat or nearby records.	
Poa sallacustris	Salt-lake Tussock- grass	VU	cr		PMST	Grasslands and herblands on the sloping verges of saline lakes.	Low	No suitable habitat or nearby records.	
Prasophyllum spicatum	Dense Leek- orchid	VU	cr		PMST	Heath and heathy woodlands.	Low	No suitable habitat or nearby records.	
Pterostylis chlorogramma	Green- striped Greenhood	VU	е		PMST	Heathy woodland; more specific habitat requirements are poorly known.	Low	No suitable habitat or nearby records.	
Rutidosis Ieptorhynchoides	Button Wrinklewort	EN	e		PMST	Higher quality Plains Grassland and Grassy Woodland in Western Victoria, particularly those with fertile soil and light timber cover.	Low	No suitable habitat or nearby records.	



Scientific name	Common name	Conservation status		Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood	
		EPBC	FFG	database record			in study area	ranking	
Senecio macrocarpus	Large-headed Fireweed	VU	cr		PMST	Grassland, shrubland and woodland habitats on heavy soils subject to waterlogging and/or drought conditions in summer.	Low	No suitable habitat or nearby records.	
Senecio psilocarpus	Swamp Fireweed	VU			PMST	Seasonally inundated herb-rich swamps, growing on peaty soils or volcanic clays.	Low	No suitable habitat or nearby records.	
Thelymitra epipactoides	Metallic Sun- orchid	EN	е		PMST	Moist or dry sandy loams or loamy sands, primarily in coastal heaths, grasslands and woodlands, but also in similar communities at drier inland sites.	Low	No suitable habitat or nearby records.	
Thelymitra matthewsii	Spiral Sun- orchid	VU	e		PMST	Typically on well-drained soils on slightly elevated sites, but also on coastal sandy flats. Often in open situations following disturbance.	Low	No suitable habitat or nearby records.	
Xerochrysum palustre	Swamp Everlasting	VU	cr		PMST	Sedge-swamps and shallow freshwater marshes and swamps in lowlands, on black cracking clay soils.	Low	No suitable habitat or nearby records.	
State significance									
Calotis anthemoides	Cut-leaf Burr- daisy		cr	2010		Scattered north and west of Melbourne (e.g. Sunshine, Camperdown, Moyston, Dunkeld, Numurkah regions) on heavy soils prone to waterlogging, but now rather rare due to habitat depletion.	Low	Limited suitable habitat and very few nearby records.	



Scientific name	Common name	nme recent		recent records	Habitat description	Likely occurrence	Rationale for likelihood	
				database record			in study area	ranking
Comesperma polygaloides	Small Milkwort		cr	2019		Grasslands on the western basalt plains; less commonly in grassy woodlands between Bendigo and the Wimmera.	Low	No suitable habitat.
Coronidium gunnianum	Pale Swamp Everlasting		cr	2011		Widespread and sometimes locally common, particularly in high-rainfall areas of Victoria; often in moist sites in open forests and woodlands.	Medium	Some potential habitat and numerous records in similar locations to the south of the study area.
Cullen parvum	Small Scurf- pea		е	1973		Lowland grasslands, including pastures and occasionally in otherwise disturbed grassy areas.	Low	Limited suitable habitat and very few nearby records.
Lachnagrostis semibarbata var. filifolia	Purple Blown-grass		е	2011		Wet marshes and slightly saline swamps and depressions, on heavy soils away from the coast.	Medium	Some potential habitat and records in similar locations near the study area.
Lachnagrostis semibarbata var. semibarbata	Purple Blown-grass		е	2011		Wet marshes and slightly saline swamps and depressions in plains communities.	Medium	Some potential habitat and records in similar locations near the study area.
Melaleuca armillaris subsp. Armillaris	Giant Honey- myrtle		e	2008		Near coastal heath/scrub, rocky coast and foothill outcrops.	n/a	Any local specimens are planted.
Microseris scapigera s.s.	Plains Yam- daisy		cr	2013		Damp depressions in grasslands, woodlands, stream banks, alpine herbfields and around the margins of saline lakes and flats.	Low	Limited suitable habitat and very few nearby records.



Scientific name	Common name	Conservati	onservation status		Other records	Habitat description	occurrence	Rationale for likelihood
		EPBC	FFG	database record			in study area	ranking
Tripogonella loliiformis	Rye Beetle- grass		е	2010		Dry sites in association with escarpments and rocky outcrops.	Low	No suitable habitat or nearby records.



Appendix A.3. Threatened ecological communities

The following table includes the threatened ecological communities that have potential to occur within the project area. The list of threatened ecological communities has been compiled with reference to characteristics of FFG Act threatened communities (SAC 2013) and predictive output from the PMST (accessed on 8 May 2023).

Table 9Threatened ecological communities predicted to occur within 5 km of the project area.

Community Name	Conservation status	Source	Description
National significance			
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	Critically Endangered	PMST	Not present. No remnant woodlands present on the site.
Natural Temperate Grassland of the Victorian Volcanic Plain	Critically Endangered	PMST	Not present.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	PMST	Not present. No remnant woodlands present on the site.
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically Endangered	PMST	Present within the study area. Two areas of Plains Grassy Wetland mapped.
State significance			
Coastal Moonah (<i>Melaleuca lanceolata</i> subsp. <i>lanceolata</i>) Woodland Community	Threatened		Not present
Western Basalt Plains (River Red Gum) Grassy Woodland Floristic Community 55-04	Threatened		Not present



Appendix B. Fauna

The following abbreviations and symbols are relevant to this Appendix:

Code	Meaning	Reference		
National l	istings (EPBC Act)			
EX	Extinct	Commonwealth		
CR	Critically endangered	Environment Protection and Biodiversity Conservation Act 1999		
EN	Endangered	(EPBC Act)		
VU	Vulnerable			
NT	Near threatened			
CD	Conservation dependent			
PMST	Protected Matters Search Tool			
State listi	ngs (FFG Act)			
x	Extinct	Victorian		
cr	Critically endangered	Flora and Fauna Guarantee Act 1988 (FFG Act)		
е	Endangered			
v	Vulnerable			
t	Threatened			
Р	Protected (fish only)			



Appendix B.1. Fauna species recorded from the study area

Status	Scientific Name	Common Name
Indigenou	s species	
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill
	Acanthiza nana	Yellow Thornbill
	Anthochaera carunculata	Red Wattlebird
	Chenonetta jubata	Australian Wood Duck
	Cisticola exilis	Golden-headed Cisticola
	Colluricincla harmonica	Grey Shrike-thrush
	Egretta novaehollandiae	White-faced Heron
	Falco cenchroides	Nankeen Kestrel
	Grallina cyanoleuca	Magpie-lark
	Poliocephalus poliocephalus	Hoary-headed Grebe
	Rhipidura leucophrys	Willie Wagtail
	Tadorna tadornoides	Australian Shelduck
	Vanellus miles	Masked Lapwing
	Macropus giganteus	Eastern Grey Kangaroo
	Limnodynastes tasmaniensis	Spotted Marsh Frog
	Litoria ewingii	Southern Brown Tree Frog
	Crinia signifera	Common Froglet
	Ctenotus spaldingi	Large Striped Skink
Introduce	d species	
	Alauda arvensis	Eurasian Skylark
	Vulpes vulpes	Red Fox

Table 10 Vertebrate fauna recorded from the study area (present assessment)



Appendix B.2. Listed fauna species

The following table includes a list of threatened fauna species that have potential to occur within the study area. The list of threatened species is sourced from the VBA and PMST (accessed on 8 May 2023). Where years are specified for the most recent database records, these refer to records from the VBA unless otherwise specified. Where no year is specified, the PMST has predicted that the species has potential to occur.

Scientific name	Common name	Conserv stat		Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
National significance								
Pedionomus torquatus	Plains- wanderer	CR	cr	1927	PMST	Native grassland with a sparse, open structure. Species extinct from much of historic range. Distribution within Victoria limited to northern arid grasslands.	Negligible	Study area is outside the species current range. Species extent within Victoria is limited to northern arid grasslands.
Rostratula australis	Australian Painted-snipe	EN	cr		PMST	Shallows of well-vegetated freshwater wetlands.	Low	No local records. Wetland habitat within the study area is either degraded, or has deep steep banks, unlikely to provide suitable foraging habitat.
Botaurus poiciloptilus	Australasian Bittern	EN	cr	1994	PMST	Shallow freshwater and brackish wetlands with abundant emergent aquatic vegetation.	Low	Wetland habitat within the study area is either degraded, or has deep steep banks, unlikely to provide suitable foraging habitat.
Falco hypoleucos	Grey Falcon	VU	V		PMST	Lightly timbered plains and Acacia scrub.	Negligible	Species is largely restricted to semi-arid inland regions. No local records.

Table 11Threatened fauna species recorded or predicted to occur within 5 km of the study area



Scientific name	Common name	Conserv stat		Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Callocephalon fimbriatum	Gang-gang Cockatoo	EN			PMST	S Vic to E NSW. Forests and woodlands from coast to alpine areas. Autumn-winter dispersal from highlands to lower elevations. Forages in eucalypts, acacias, hawthorns and some exotic garden trees and shrubs.	Low	No local records. Minimal suitable foraging habitat is fragmented, low quality, and isolated in cleared landscape. No Hawthorn <i>Crataegus monogyna</i> recorded within the study area.
Neophema chrysostoma	Blue-winged Parrot	VU			PMST	A range of coastal, sub-coastal and semi-arid regions throughout south-eastern Australia. Favour heathy woodland for breeding, nests in tree hollows in coastal eucalypt forests and woodlands.	Negligible	No local records. No suitable coastal heathy woodland or semi-arid habitat within the study area. No hollow trees.
Lathamus discolor	Swift Parrot	CR	cr		PMST	A range of forests and woodlands, especially those supporting nectar-producing tree species. Also well-treed urban areas. Species nests exclusively in Tasmania.	Low	No local records. Minimal suitable foraging habitat is fragmented, low quality, and isolated in cleared landscape.
Hirundapus caudacutus	White- throated Needletail	VU	V		PMST	An almost exclusively aerial species within Australia, occurring over most types of habitat, particularly wooded areas.	Medium	Species is highly mobile and widely distributed across eastern Australia. Species is likely to fly over the study area occasionally.
Gallinago hardwickii	Latham's Snipe			-	PMST	A migrant to Australia from July to April occurring in a wide variety of permanent and ephemeral	High	Highly mobile wetland inhabitant. Potential wetland habitat, may also use drains and dam edges and areas of native and non-native vegetation when



Scientific name	Common name	Conserv stat		Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
						wetlands. Prefers open freshwater wetlands with nearby cover, but also recorded on the edges of creeks and rivers, river-pools and floodplains. Forages in soft mud at edge of wetlands and roosts in a variety of vegetation around wetlands including tussock grasslands, reeds and rushes, tea-tree scrub, woodlands and forests.		inundated. May forage in suitable habitats in the study area.
Numenius madagascariensis	Eastern Curlew	CR	cr		PMST	Large intertidal sandflats, banks, mudflats, estuaries, inlets, coastal lagoons and bays.	Negligible	No local records. Species is primarily coastal, unlikely to visit the study area. No suitable shallow wetland habitat.
Calidris ferruginea	Curlew Sandpiper	CR	cr		PMST	Large intertidal sandflats, banks, mudflats, estuaries, inlets, sewage farms, saltworks, harbours, coastal lagoons and bays.	Low	No local records. Species is primarily coastal, unlikely to visit the study area. No suitable shallow wetland habitat.
Melanodryas cucullata	Hooded Robin	EN	V		PMST	Woodlands of eucalypt, Mallee, semi-cleared farmland with logs and woody debris.	Negligible	No local records. Minimal wooded habitat within the study area, negligible log and woody debris cover.
Aphelocephala leucopsis	Southern Whiteface	VU			PMST	Open forests and woodlands with a grassy and/or shrubby understorey.	Negligible	No local records. Minimal wooded habitat within the study area, negligible grassy and/or shrubby understorey.



Scientific name	Common name	Conserv stat		Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Grantiella picta	Painted Honeyeater	VU	V		PMST	Dry open woodlands and forests. Typically forages for fruit and nectar in mistletoes and in tree canopies.	Negligible	No local records. Minimal woodland and forest habitat. No mistletoes recorded within the study area.
Anthochaera phrygia	Regent Honeyeater	CR	cr		PMST	A range of dry woodlands and forests dominated by nectar- producing tree species. Species extinct from much of historic range. Distribution within Victoria limited to north-east.	Negligible	Species is widely considered extinct in Victoria other than in the north-east of the state. No suitable habitat or local records.
Stagonopleura guttata	Diamond Firetail	VU	V		PMST	Open forests and woodlands with a grassy ground layer.	Negligible	No local records. No suitable grassy woodland habitat.
Climacteris picumnus	Brown Treecreeper	VU			PMST	Often observed feeding on insects as it spirals up trees or when hopping along the ground or on fallen litter. Generally inhabits open eucalypt forests, woodlands and Mallee, often where there are stands of dead trees.	Negligible	No local records. No suitable wooded habitat or stands of dead trees within the study area.
Dasyurus maculatus maculatus (SE mainland population)	Spot-tailed Quoll	EN			PMST	Rainforest and wet and dry sclerophyll forests and woodlands.	Negligible	No local records. No suitable wooded habitat within the study area. Species unlikely to persist in cleared agricultural landscapes.
Antechinus minimus maritimus	Swamp Antechinus	VU	V		PMST	Dense wet heath and heathy woodland, sedgeland and dense tussock grassland.	Negligible	No local records. No suitable heathy or sedgeland habitat within the study area.
Perameles gunnii	Eastern Barred Bandicoot	EN	e	1949		Natural temperate grasslands and grassy woodlands. This species is considered extinct within the wild.	Negligible	No recent records. Species is considered extinct from the wild.



Scientific name	Common name	Conser stat		Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Petaurus australis	Yellow-bellied Glider	VU			PMST	Sclerophyll forest with large hollow-bearing trees, prefers mature eucalypt dominated forest and woodland. Distributed along South-eastern Australia.	Negligible	No local records. No suitable tall contiguous forest within the study area.
Potorous tridactylus trisulcatus	Long-nosed Potoroo	VU	V		PMST	Forest, heathy woodlands and heathlands.	Negligible	No local records. No suitable heathy woodland habitat.
Pseudomys novaehollandiae	New Holland Mouse	VU	е		PMST	Coastal heathland, heathy woodland and dry sclerophyll forest.	Negligible	No local records. No coastal heathy woodland habitat.
Isoodon obesulus obesulus	Southern Brown Bandicoot	EN	е		PMST	Heathland, shrubland, sedgeland, heathy open forest and woodland; also exotic vegetation, such as blackberry thickets and rank grasses where native vegetation has been removed.	Negligible	No local records. No suitable heathy woodland habitat. Species unlikely to persist in cleared agricultural landscapes.
Pteropus poliocephalus	Grey-headed Flying-fox	VU	V		PMST	Rainforest, wet and dry sclerophyll forest, woodland and urban areas. Forms large colonies in tall dense tree canopies, often at population centres.	Medium	Study area is approximately 20 kilometres from active category 2-3 camp at Colac botanic gardens. Species may occasionally forage in flowering Sugar gums planted on the east and west borders of the study area.



Scientific name	Common name	Conser stat		Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Miniopterus orianae bassanii	Southern Bent-winged Bat (southern ssp.)	CR	cr		PMST	Woodlands, grasslands, pasture especially near wetlands. Roosts in caves, crevices in cliff faces and in mines.	Medium	No local records. No suitable roosting habitat within the study area. Individuals may occasionally forage over wetlands and adjacent grassland and pasture habitat.
Delma impar	Striped Legless Lizard	VU	e	2008	PMST	Natural temperate grassland, grassy woodland and exotic grassland. Often associated with surface rocks and cracking clay soils as shelter.	Low	Grassland habitat within majority of the study area is significantly disturbed by heavy grazing and rock removal. Grassland in south-east fenced section is unlikely to provide suitable habitat due to: seasonal flooding, extremely dense 'choaked' grass structure, no rock cover, and Red gums shading grassland and providing perches for predatory birds.
Lissolepis coventryi	Swamp Skink	EN	е		PMST	Densely vegetated swamps and associated watercourses, and adjacent wet heaths, sedgelands and saltmarshes.	Low	No local records. No suitable vegetated swamp or saltmarsh habitat.
Eulamprus tympanum marnieae	Corangamite Water Skink	EN	e		PMST	Basalt rock outcrops and stonewalls associated with remnant vegetation and adjacent to permanent or ephemeral wetlands.	Low	No local records. Study area is outside the known distribution of the species. Negligible rocky wetland habitat.



Scientific name	Common name	Conser stat		Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Litoria raniformis major	Growling Grass Frog	VU	V	2017	PMST	Still or slow-flowing waterbodies and surrounding terrestrial vegetation.	Medium	Several recent local records. High quality mapped wetland and surrounding vegetation in fenced south-east corner of study area contains potentially suitable habitat for foraging and breeding.
Prototroctes maraena	Australian Grayling	VU	е		PMST	Adults inhabit cool, clear, freshwater streams.	Negligible	No local records. No stream habitat within the study area.
Galaxiella pusilla	Dwarf Galaxias	VU	е		PMST	Slow-flowing or still freshwater wetlands such as swamps, drains and backwaters of streams.	Negligible	No local records. Study area is outside of the species known range. Distribution within Victoria is limited to waterways around Portland, and east of Melbourne.
Nannoperca obscura	Yarra Pygmy Perch	VU	V		PMST	Lakes, pools and slow-flowing streams with abundant aquatic vegetation.	Low	No local records. Minimal suitable wetland habitat within the study area is restricted to small dams and ephemeral drainage lines.
Synemon plana	Golden Sun Moth	VU	V	2017	PMST	Natural temperate grassland, grassy woodland and pasture supporting spear grasses and wallaby grasses and exotic grassland dominated by Chilean needle grass.	Low	Grassland habitat within the study area is severely degraded, and lacks suitable cover of required feed grasses.



Scientific name Commo name	Common name	Conser stat		Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record		in study area		
State significance <i>Antigone rubicunda</i>	Brolga		е	2021		Shallow freshwater and brackish wetlands, crops, grassland and pasture.	High	Local recent records, including breeding records within 200 metres of study area. Some suitable foraging habitat in mapped high quality wetland in fenced south-east corner of study area. Plains Grassy Wetland habitat provides suitable foraging and roosting habitat, andcould potentially or occasionally support nesting. The wetland may be within breeding home range of a
Spatula rhynchotis	Australasian Shoveler		V	2010		Variety of wetlands, with a preference for large, permanent, freshwater lakes/swamps with dense fringing vegetation.	Low	known breeding site within 860 metres. Minimal suitable wetland habitat. Species prefers large densely vegetated swamp habitat.
Accipiter novaehollandiae	Grey Goshawk		е	2014		Rainforest, gallery forest, tall wet forest and woodland. Also partially cleared agricultural land.	Low	Species is rarely recorded within the region. No wet forest habitat. Species may occasionally pass through the study area, but is unlikely to inhabit it.



Scientific name	Common name	Conserv stat		Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Falco subniger	Black Falcon		cr	2010		Woodlands, open country and around terrestrial wetlands areas, including rivers and creeks. Mostly hunts over open plains and undulating land with large tracts of low vegetation. Primarily occurs in arid and semi-arid zones in the north, north-west and west of Victoria, though can be forced into more coastal areas by droughts and subsequent food shortages.	Medium	Several records throughout the region. Species may hunt over the study area occasionally, but is unlikely to nest due to minimal tree cover.
Gelochelidon macrotarsa	Australian Gull-billed Tern		е	1986		Floodplains, saltmarsh, claypans and flooded pasture.	Low	No recent local records. Species may occasionally pass through the study area, or forage within flooded pasture, but is unlikely to inhabit it.
Actitis hypoleucos	Common Sandpiper		V		PMST	Migrates to Australia from Eurasia in August where it inhabits a wide variety of coastal and inland wetlands with muddy margins before departing north in March.	Negligible	No local records. No suitable wetlands with muddy margins.
Tringa nebularia	Common Greenshank		e		PMST	A variety of ephemeral and permanent inland wetlands and sheltered coastal wetlands with shallow margins.	Low	No local records. No suitable shallow marshy wetland habitat.
Ornithorhynchus anatinus	Platypus		V	1994		A variety of freshwater waterbodies, particularly those with stable banks suitable for burrows, and shallow waters for foraging.	Negligible	No suitable wetland or waterway habitat within the study area.



Scientific name	Common name	Conserv stat		Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Pseudemoia pagenstecheri	Tussock Skink		e	2008		On the ground in a range of grasslands or sparse grassy woodlands from alps to coast.	High	Recent local records. Some potentially suitable grassland habitat in ungrazed, fenced south-east corner of property.
Engaeus sericatus	Hairy Burrowing Crayfish		V	2008		Burrows are connected to the water table, typically adjacent to creeks or on floodplains. Although it is widespread in Victoria, most records are found in an area extending from the Otways, west to Port Fairy and north to Ballarat.	Medium	No burrowing crayfish burrows observed within the study area, however, study area contains some suitable wetland habitat surrounding mapped high quality wetland in fenced south- east corner of property. Unlikely to inhabit areas of grazed rocky pasture.



Appendix B.3. Migratory species (EPBC Act listed)

Scientific name	Common name	Most recent record
Migratory species		
Gallinago hardwickii	Latham's Snipe	PMST
Hirundapus caudacutus	White-throated Needletail	PMST
Apus pacificus	Fork-tailed Swift	PMST
Pandion haliaetus	Osprey	PMST
Numenius madagascariensis	Eastern Curlew	PMST
Actitis hypoleucos	Common Sandpiper	PMST
Tringa nebularia	Common Greenshank	PMST
Calidris ferruginea	Curlew Sandpiper	PMST
Calidris acuminata	Sharp-tailed Sandpiper	PMST
Calidris melanotos	Pectoral Sandpiper	PMST
Motacilla flava	Yellow Wagtail	PMST
Rhipidura rufifrons	Rufous Fantail	PMST
Myiagra cyanoleuca	Satin Flycatcher	PMST

Table 12 Migratory fauna species recorded or predicted to occur within 5 km of the study area



Appendix C. Photos of the study area



Photo 1 Exotic pasture grasses cover most of the study area.



Photo 2 Revegetation along the eastern boundary of the study area.





Photo 3 Dam and surrounding area of native vegetation (Plains Grassy Wetland EVC) in the south-eastern corner of the study area.



Photo 4 Example of potential Brolga breeding habitat in the Plains Grassy Wetland vegetation.





Photo 5 Basalt rocky rise (rock outcrops) in the western paddock.



Appendix D. Addendum to 320 Mooleric Road, Birregurra flora and fauna assessment report: Letter addressing council comments

12 October 2023



Dear Fernando

Addendum to 320 Mooleric Road, Birregurra flora and fauna assessment report: Letter addressing council comments. Project number: 38562

Biosis Pty Ltd (Biosis) provided Spirecom Pty Ltd (Spirecom) with a draft report on 15 June 2023, detailing the findings of a flora and fauna assessment (FFA) of the site of a proposed poultry farm in Ombursley, Victoria. The report was submitted by Spirecom to Colac Otway Shire (Council) who have subsequently requested additional information. The additional information is addressed in the following letter and will be attached to the final version of the FFA report as an addendum.

This letter also details the ecological values present within the government road reserve to the north of the initial footprint that will be used for accessing the poultry farm site. This area was not included in the initial study area. No detailed impact or construction footprints have been provided for the road reserve, meaning that vegetation loss cannot be calculated for this area at this stage.

Colac Otway Shire request for further information

Potential impacts to surrounding wetlands and waterways

According to the works footprint provided by Spirecom (dated 16 June 2023), native vegetation will not be directly impacted for the construction of the poultry farm (Figure 1 and Figure 2, Appendix A). However, indirect impacts to surrounding wetland, waterways and the flora and fauna they support may still occur during the construction and operation of the poultry farm.

Several streams and wetlands that occur within and adjacent to the study area feed into the Birregurra Creek. Indirect impacts to streams and wetlands can occur during construction when adequate protections against erosion and sedimentation are not implemented (see Appendix E for suggested mitigation measures).

Minimisation and (where possible) avoidance of risks to waterways and wetlands surrounding the poultry farm should extend beyond construction to the daily operation of the poultry farm. For example, risks of the water retarding basin overflowing into adjacent areas should be minimised to ensure this does not impact surrounding wetlands and waterways.

Table 1 presents some of the key legislation relevant to waterways and the implications of proposed impacts.

	poultry farm		
Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
State legislat	ion		
Water Act 1989	Creeks, streams and wetlands that flow into the Birregurra Creek.	Referral to relevant Catchment Management Authority (CMA) for a works on waterways permit if any works are proposed to directly impact streams, creeks and wetlands.	Only indirect impacts are likely to occur because of construction and operation of the poultry farm. However, Spirecom should consult the relevant CMA to determine the need for a permit to undertake the proposed works.
Fisheries Act 1995	Protected aquatic biota may be impacted if in stream or bank works are proposed within or in proximity to streams or wetlands that flow into the Birregurra Creek.	Provided appropriate mitigation actions are taken, a permit is unlikely to be required.	Direct impacts to Birregurra Creek are not likely to occur during construction and operation of the poultry farm.
Environment Protection Act 2017	Instream and riparian habitats of Birregurra Creek and the wetlands and waterways that flow into it.	The project works must comply with the <i>Environment Protection Act 2017</i> (EP Act), Environment Protection Regulations 2021 and Environment Reference Standards (ERS). Specifically, the project manager must comply with the General Environmental Duty (GED) under the EP Act including: Clause 42 – Construction activities and Clause 45 – Native vegetation protection and rehabilitation.	Impacts to surface water quality because of the project must not result in changes that exceed background levels and/or the water quality objectives to protect surface water uses and values. To ensure that direct and indirect (e.g. runoff) impacts to surface water quality do not exceed the background levels and/or water quality objectives, it is recommended that Spirecom engage with the Environment Protection Authority (EPA) and prepare and implement a site-specific Construction Environmental Management Plan (CEMP), which includes all EPA approved erosion control measures. These temporary control measures should be inspected during rainfall events to ensure controls are able to prevent/minimise offsite discharges and long-term impacts. Sediment control measures selected should also reflect the level of protection required to protect the ecological values within and surrounding the study area. Suggested mitigation measures are provided in Appendix E.

Table 1Key legislation and policy considerations for the waterways and wetlands surrounding the proposed
poultry farm

Impacts to Brolga Antigone rubicunda

The flora and fauna assessment (FFA) report has been updated to reflect community feedback regarding the utilisation of nearby wetlands for breeding by Brolga *Antigone rubicunda* (listed as endangered under the *Flora and Fauna Guarantee Act 1988;* FFG Act). These changes include:

- Updating the likelihood of occurrence from medium to high.
- Updating wording in the likelihoods table in Appendix A of the FFA report and habitat values in Table 2 of the FFA report.
- Section 3.1, Section 3.4, Section 6 Table 2, Table 3, Table 4 added information on the habitat suitability and potential use.

VBA database shows numerous breeding and non-breeding records in the area between Mooleric Road, Ondit Road West and Prices Lane, which has a number of wetlands and wet depressions throughout. The nearest breeding wetland is within 200 metres of the study area. Local records suggest that at least two pairs could regularly be present in the area.

The Plains Grassy Wetland is within potential breeding home range of the nearest known breeding site and could be used by a pair and their chicks for foraging, roosting and potentially nesting. It is uncertain how regularly the wetland in the study area would be used by Brolgas given the presence of a quarry to the west and possible disturbance from its operations. Pairs nesting within 2 kilometres of the Plains Grassy Wetland could potentially move through the study area and may move between it and the known breeding wetland 200 metres north if the study area boundary.

While the construction and operation of a poultry farm could disturb breeding activity of the Brolga, and may exclude or reduce activity of Brolgas within the study area, this is likely to affect one or two pairs, based on the known breeding sites and activity of the species locally. The proposed poultry farm is unlikely to result in a significant impact to the population, however, potential impacts to local pairs could be avoided and minimised through implementing disturbance buffers around the wetlands and the likely movement corridor. The wetland habitat in the study area will not be impacted as it is outside of the development footprint.

Victoria's Guidelines for the removal, destruction or lopping of native vegetation (the 'Guidelines')

The steps that have been taken during the design of the development to ensure that impacts on biodiversity from the removal of native vegetation have been avoided and minimised include:

- Avoiding direct impacts to all native vegetation mapped within the proposed poultry farm footprint.
- Locating temporary site storage and compounds on existing disturbed land (away from any patches of native vegetation) to minimise impacts to native vegetation.

All planning permit applications to remove native vegetation are assigned to an assessment pathway determined by the extent and location of proposed native vegetation removal. The assessment pathway will dictate the information to be provided in a planning permit application and the decision guidelines the responsible authority (e.g. Council) and/or DEECA as a referral authority will use to assess the permit application.

Proposed removal of native vegetation

Following submission of the draft FFA report on 15 June 2023, Spirecom have provided Biosis with a proposed impact footprint of the development. No native vegetation is proposed to be removed for the construction of the poultry farm in this masterplan (Figure 2, Appendix A). If the impact footprint changes and impacts are proposed to any native vegetation, a Guidelines assessment will need to be undertaken and vegetation losses and offset requirements calculated.

An impact footprint has not yet been provided for the unnamed government road in the north of the study area (see Figure 2). Once this impact footprint has been provided, the proposed losses to native vegetation can be calculated. If native vegetation is proposed for removal, a planning permit will be required under Clause 52.17 of the Colac Otway Planning Scheme.

Further survey requirements

Threatened flora

Four threatened flora species are also considered to have a medium or higher likelihood of occurring within the study area:

- Matted Flax-lily *Dianella amoena* (EPBC Act: Endangered; FFG Act; Critically endangered)
- Clover Glycine *Glycine clandestina* (EPBC Act: Vulnerable; FFG Act; Vulnerable)
- Pale Swamp Everlasting *Coronidium gunnianum* (FFG Act; Critically endangered)
- Purple Blown-grass Lachnagrostis semibarbata var. filifolia (FFG Act; Endangered)
- Purple Blown-grass Lachnagrostis semibarbata var. semibarbata (FFG Act; Endangered)

Suitable habitat for these species is limited to areas of Plains Grassy Wetland Ecological Vegetation Class (EVC) 125. As shown in Figure 2, the current masterplan (Dated 16 June 2023) does not propose to impact this vegetation and, as a result, is not considered to constitute a significant impact on any of these species.

The Plains Grassy Wetland EVC 125 vegetation within the unnamed road reserve is unlikely to support threatened flora species listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or FFG Act due to disturbance from cattle and vehicle access.

Threatened fauna

As discussed in the FFA report, five threatened fauna species are considered to have a medium or higher likelihood of occurring within the study area:

- Growling Grass Frog *Litoria raniformis* (*Environment Protection and Biodiversity Conservation* Act (EPBC Act): Vulnerable; FFG Act; Vulnerable)
- Brolga Antigone rubicunda (FFG Act; Endangered) (discussed above)
- Black Falcon Falco subniger (FFG Act; Critically endangered)
- Tussock Skink Pseudemoia pagenstecheri (FFG Act; Endangered)
- Hairy Burrowing Crayfish Engaeus sericatus (FFG Act; Vulnerable)

The EPBC Act Migratory listed species Latham's Snipe Gallinago hardwickii may also occur.

As with the flora, additional surveys are only recommended if impacts are proposed within areas of Plains Grassy Wetland EVC 125 within the poultry farm footprint (no impacts currently proposed). Additional targeted surveys for these species are not recommended unless the development footprint is altered, and impacts are proposed in areas of Plains Grassy Wetland EVC 125 (Figure 2).

While Growling Grass Frogs may utilise the site as a dispersal corridor between patches of more suitable habitat, the development is unlikely to result in a significant impact to the species as it will not completely remove movement corridors within the study area.

The unnamed road reserve may provide suitable habitat for Striped Legless Lizard *Delmar impar*. As a result, targeted surveys are currently being undertaken. The results of these surveys will be available in early 2024.

Qualifications

As discussed in the main FFA report, the assessment of the poultry farm was undertaken in autumn which is not an optimal time to survey for many of the threatened species that are assessed as having a medium or higher likelihood of occurrence within the poultry farm footprint. However, the high level of disturbance to vegetation in the paddock was clear and it is therefore unlikely that any threatened flora species that require seasonal surveys are present within the impact footprint. If the impact footprint changes and extends to the patches of Plains Grassy Wetland, the survey will not have been adequate to determine whether any of the threatened species listed above are present.

As none of these species are likely to occur within the construction footprint, the current survey is adequate.

Extension of the study area to include the unnamed government road

The FFA report does not present the ecological values within the unnamed government road that occurs to the north - northwest of the proposed poultry farm. This area was surveyed as part of an assessment for the proposed water pipeline that will connect the poultry farm to the Birregurra township (submitted to Spirecom on 3 August 2023 (Biosis Pty Ltd 2023)). Council has since requested the results of the assessment are included in this addendum. The area will be used for vehicle access for the purpose of the poultry farm and installation of the proposed pipeline.

In addition, Council raised concerns regarding the native vegetation mapping within the road reserve. The unnamed road reserve has since been re-surveyed and the following results updated accordingly.

Field assessment methods

The unnamed road reserve was assessed on 5 July 2023 by Hayley Sime (Botanist) and Danielle Eastick (Zoologist). The road reserve was flooded along the northern boundary during the initial assessment making it difficult to assess the presence of native vegetation.

After receiving information from Council regarding the presence of significant native vegetation in the unnamed road reserve (driven by the presence of Common Tussock-grass *Poa labillardierei*) the road reserve was assessed again on 25 September 2023 by Hayley Sime in more favourable conditions for plant identification. Photos are provided in Appendix B and a list of flora and fauna species recorded is provided in Appendix C and Appendix D respectively.

Flora and fauna habitat

The unnamed government road to the north of the proposed poultry farm supports several small patches of Plains Grassy EVC 125. Beyond the mapped patches of Plains Grassy Wetland EVC 125, native vegetation is scattered throughout a largely disturbed area that supports predominantly introduced vegetation such as Toowoomba Canary-grass *Phalaris aquatica*. The soils are black, cracking clays with some surface and embedded rocks.

Tussock grasses (such as Common Tussock-grass *Poa labillardierei*) are sparse and appear to have been heavily grazed throughout the road reserve. Despite the relatively low cover of tussock grasses, the site is considered potentially suitable habitat for Striped Legless Lizard *Delma impar* because the property to the north supports moderate quality habitat with large tussock grasses, surface rocks and inter-tussock spaces. The surface rocks within the road reserve may be utilised by Striped Legless Lizards that could move in from the more suitable habitat to the north. Additionally, Striped Legless Lizards have been recorded in roadsides dominated by Toowoomba Canary-grass in western Victoria. Targeted surveys for Striped Legless Lizard are currently being undertaken within the road reserve.

No threatened flora were recorded within the study area during the assessment, and the high level of disturbance (evident through cattle pugging and grazing) means it is unlikely that any threatened flora species persist within the patches of wetland vegetation.

The habitat zones within the unnamed road reserve were assessed for the presence of Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (Seasonal Herbaceous Wetlands; threatened ecological community listed under the EPBC Act). Several key species of this threatened community such as Common Spike-sedge *Eleocharis acuta,* Prickfoot *Eryngium vesiculosum* and Small Loosestrife *Lythrum hyssopifolia* were recorded within habitat zone 22 (Figure 1, Appendix A) at a high enough cover to qualify as Seasonal Herbaceous Wetlands. While habitat zone 22 meets the condition thresholds for Seasonal Herbaceous Wetlands, the size threshold is not met (both individually and collectively). Habitat zones 23 and 24 do not support any native forb species and therefore do not meet the size or condition thresholds to be considered Seasonal Herbaceous Wetlands.

Polygons have been mapped around most areas where Common Tussock-grass occurs as scattered individuals outside of the mapped patches of native vegetation. These areas were mapped due to the importance of the species within the landscape and to maximise the opportunities for avoiding impacts to the species.

Brolga and Latham's Snipe may occasionally utilise the area for foraging when it is inundated, with most likely use in areas with native vegetation.

Recommendations

The ecological values identified in the unnamed road reserve and proposed poultry farm footprint need to be considered during the design, construction and post construction phase of the project. The following recommendations should be considered by Spirecom to avoid and minimise the impacts of this development to native vegetation:

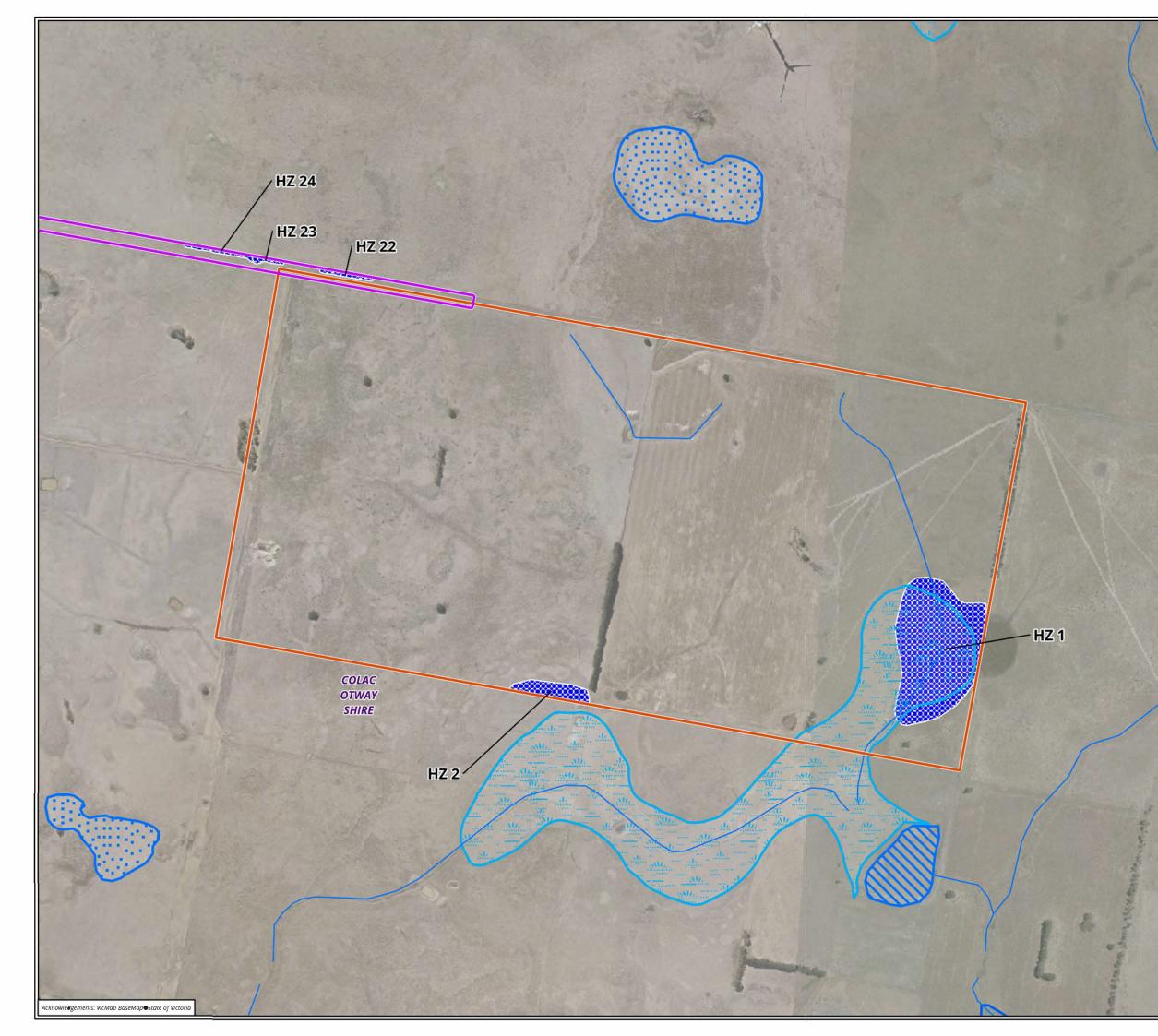
Create and incorporate a site-specific Construction Environmental Management Plan (CEMP) which
addresses environmental inductions for contractors, vegetation retention and management,
installation of temporary fencing/signage, drainage and sediment control and
management/enhancement of retained threatened species habitats.

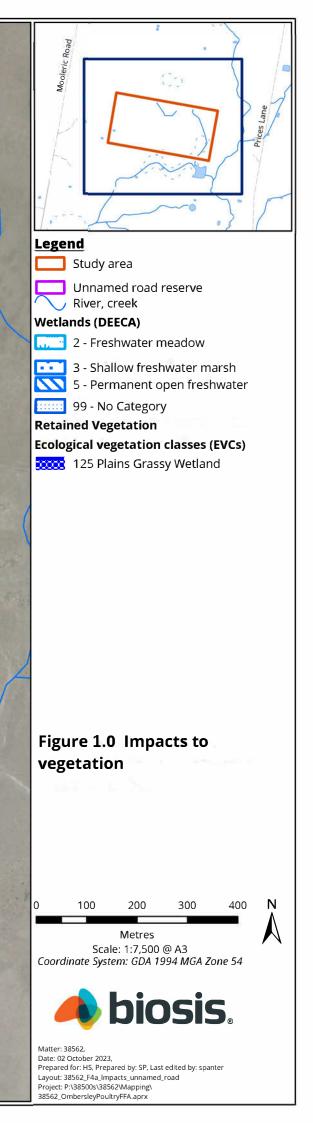
- Adopt similar practices during the operation of the poultry farm to ensure ongoing impacts to surrounding wetlands are minimised.
- Incorporate the native vegetation and polygon mapping within the unnamed government road reserve into the design of the access road to avoid impacting most of the wetland vegetation and Common Tussock-grass within the reserve.

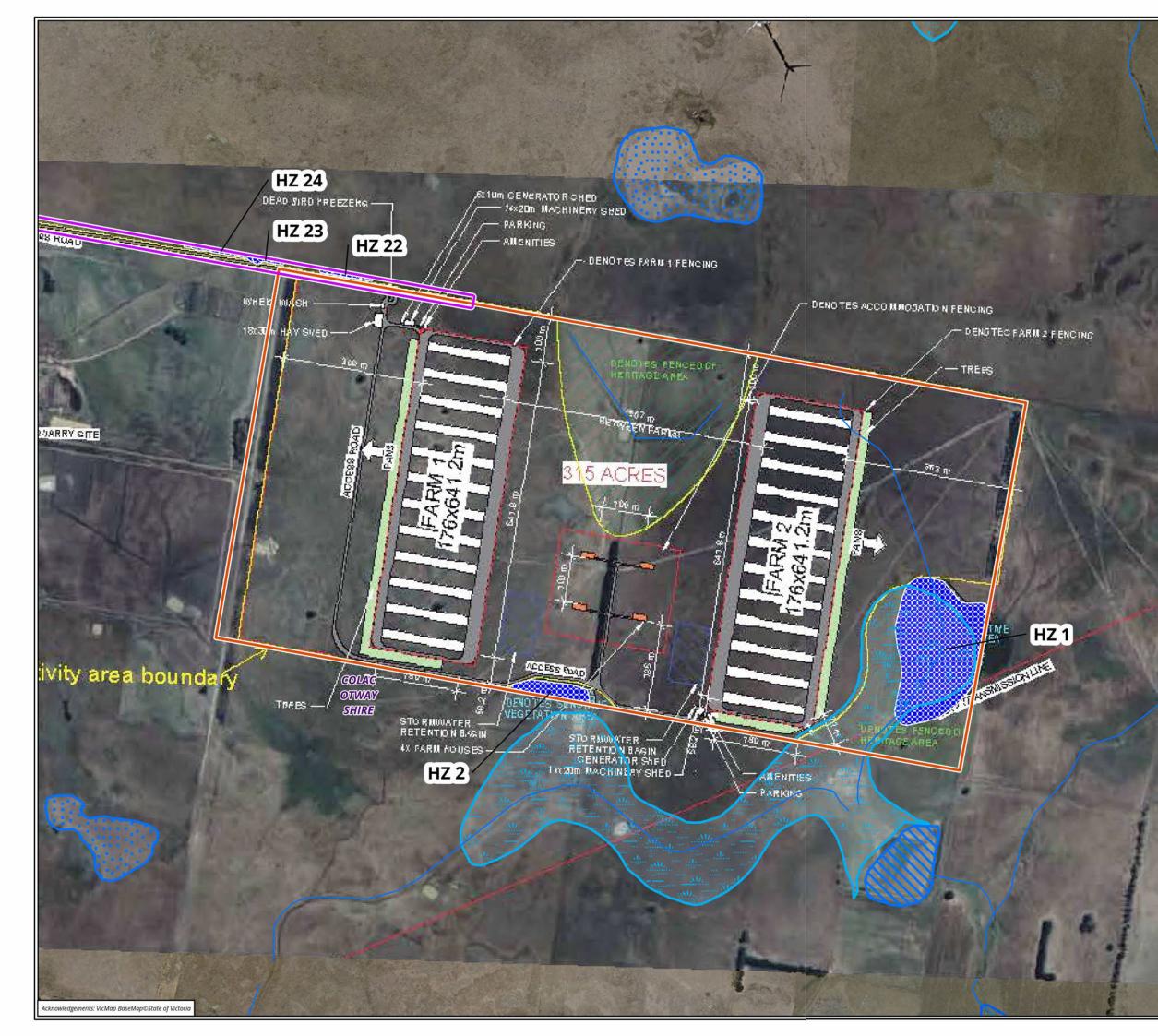
Yours sincerely

Hayley Sime 0

Hayley Sime Botanist







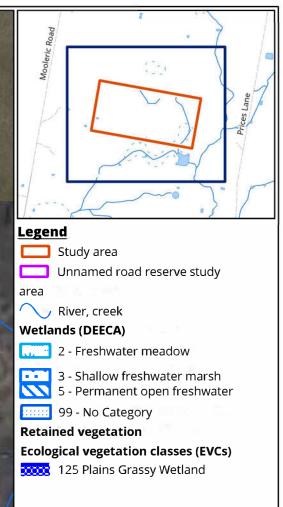
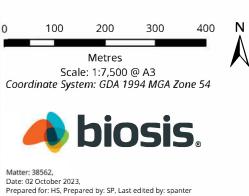


Figure 2.0 Impacts to vegetation.



Layout: 38562_F4b_Impacts_unnamed_road_plan Project: P:\38500s\38562\Mapping\ 38562_OmbersleyPoultryFFA.aprx



HZ 22



HZ 23

HZ 24

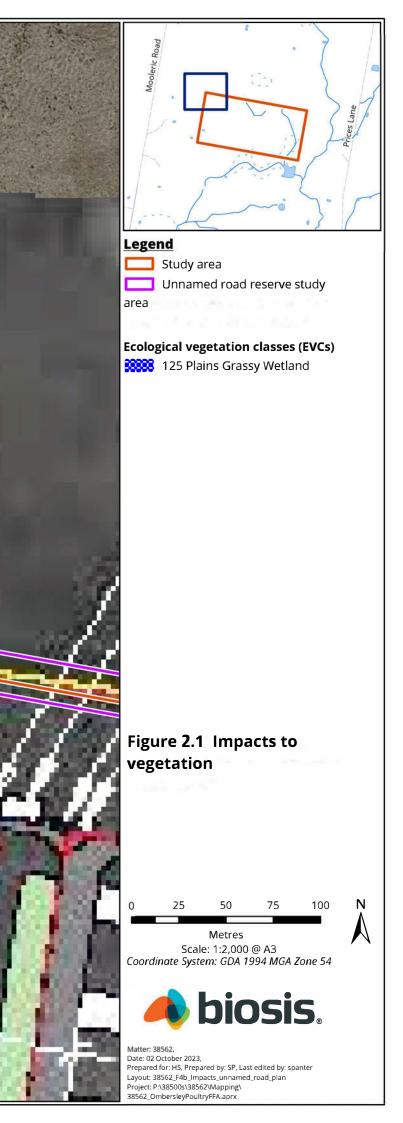
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OTWAY

SHIRE

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Acknowledgements: VicMap BaseMap©State of Victoria



Appendix B. Photos of the unnamed road reserve



Photo 1 Example of Plains Grassy Wetland EVC 125 recorded within the unnamed road reserve. Photo taken facing northwest on 25 September 2023.



Photo 2 Majority of the southern half of the unnamed road reserve is highly disturbed and dominated by introduced species. Photo taken facing southwest on 25 September 2023.



Photo 3 Example of scattered and grazed Common Tussock-grass that occurs through the unnamed road reserve but is predominantly restricted to the northern boundary. Photo taken facing northwest on 25 September 2023.



Photo 4 Large surface rocks occur along the northern boundary of the unnamed road reserve. Photo taken facing east on 25 September 2023.



Photo 5 Illustration of the higher quality habitat found in the adjacent property to the north of the unnamed road reserve. Higher grazing pressure may have reduced the cover of Common Tussock-grass in the unnamed road reserve. Photo taken facing east on 25 September 2023.



Photo 6 The unnamed road reserve has been degraded due to vehicle access and cattle pugging the soil. Photo taken facing east on 25 September 2023.



Photo 7 Scattered native vegetation within the unnamed road reserve that does not meet the definition of a patch. Photo taken facing west on 25 September 2023.

Appendix C. Flora species list from the unnamed road reserve

The following abbreviations and symbols are relevant to this Appendix.

Code	Meaning	Reference
National listi	ngs (EPBC Act)	
EX	Extinct	
CR	Critically endangered	
EN	Endangered	Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
VU	Vulnerable	, , , ,
PMST	Protected Matters Search Tool	
State listings	(FFG Act)	
x	Extinct	
cr	Critically endangered	
е	Endangered	Victorian Flora and Fauna Guarantee Act 1988 (FFG
v	Vulnerable	Act)
t	Threatened	
Р	Protected (public land only)	
SP	State prohibited species	
RP	Regionally prohibited species	Victorian Catchment and Land Protection Act 1994
RC	Regionally controlled species	(CaLP Act)
R	Restricted species	
Other		
#	Native species outside its natural range	Victorian Biodiversity Atlas (VBA)

Appendix C.1. Flora species recorded from the study area

Status	Scientific Name	Common Name
Indigenous spe	ecies	
	Austrostipa spp.	Spear Grass
	Poa labillardierei var. (Volcanic Plains)	Basalt Tussock-grass
Р	Calocephalus citreus	Lemon Beauty-heads
	Carex spp.	Sedge
	Drosera hookeri	Branched sundew
	Juncus spp.	Rush
	<i>Rytidosperma</i> spp.	Wallaby Grass
Introduced spe	ecies	
	Arctotheca calendula	Cape Weed
	Centaurium erythraea	Common Centaury
RC	Cynara cardunculus subsp. flavescens	Artichoke Thistle
	Cynodon dactylon	Couch
	Hypochaeris glabra	Smooth Cat's-ear
	Lactuca serriola	Prickly Lettuce
RC	Lycium ferocissimum	African Box-thorn
R	Nassella neesiana	Chilean Needle-grass
R	Oxalis pes-caprae	Soursob
	Paspalum distichum	Water Couch
	Phalaris aquatica	Toowoomba Canary-grass
	Plantago coronopus	Buck's-horn Plantain
	Plantago lanceolata	Ribwort
	Romulea rosea	Onion Grass
RC	Rosa rubiginosa	Sweet Briar
	Sanguisorba minor	Salad Burnet
R	Verbascum thapsus subsp. thapsus	Great Mullein
	Vicia sativa subsp. cordata	Common Vetch

Table 2Flora species recorded from the study area

Appendix D. Fauna species list from the unnamed road reserve

following abbreviations and symbols are relevant to this Appendix:

Code	Meaning	Reference
National	listings (EPBC Act)	
EX	Extinct	Commonwealth
CR	Critically endangered	Environment Protection and Biodiversity Conservation Act 1999
EN	Endangered	(EPBC Act)
VU	Vulnerable	
NT	Near threatened	
CD	Conservation dependent	
PMST	Protected Matters Search Tool	
State list	ings (FFG Act)	
x	Extinct	Victorian Flora and Fauna Guarantee Act 1988
cr	Critically endangered	(FFG Act)
е	Endangered	
v	Vulnerable	
t	Threatened	
Ρ	Protected (fish only)	

Appendix D.1. Fauna species recorded from the study area

Table 3	Vertebrate fauna recorded from the study area (present assessment)
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Status	Scientific name	Common name
Indigenous spec	ies	
	Accipiter novaehollandiae	Grey Goshawk
	Anthochaera carunculata	Red Wattlebird
	Anthus novaeseelandiae	Australasian Pipit
EN, e	Callocephalon fimbriatum	Gang-gang Cockatoo
	Cracticus tibicen	Australian Magpie
	Crinia signifera	Common Froglet
	Falco cenchroides	Nankeen Kestrel
	Macropus giganteus	Eastern Grey Kangaroo
	Ocyphaps lophotes	Crested Pigeon
	Ptilotula penicillata	White-plumed Honeyeater
	Rhipidura leucophrys	Willie Wagtail
Introduced spec	ies	
	Alauda arvensis	European Skylark
	Carduelis carduelis	European Goldfinch

Construction and post construction management

Specific detail relating to preventing impacts on retained native vegetation and aquatic and terrestrial habitat should be addressed in a site-specific Construction Environmental Management Plan (CEMP). This will include issues relating to contractors such as environmental inductions, installation of temporary fencing/signage, drainage and sediment control.

Recommendations to be considered prior to and during the construction phase are summarised in Table 4.

-		1	
Actions		Timing	Responsibility
Construction Environmental Management Plan	CEMP to be prepared.	Prior to construction.	Spirecom and/or construction contractor
Stockpiles and laydown areas	All material stockpiles, vehicle parking and machinery storage will be located within cleared areas or areas proposed for clearing, and not in areas of retained native vegetation.	Prior to and during construction.	Spirecom and/or construction contractor
Soil erosion/ sedimentation	Dust suppression measures should be implemented during construction. Implementation of temporary stormwater controls during construction is necessary to ensure that discharges and drainage channels are consistent with existing conditions. Particular attention needs to be given to potential indirect impacts on streams and wetlands within and adjacent to the study area that flow into Birregurra Creek.	Prior to construction, during construction and ongoing operation of the farm.	Spirecom and/or construction contractor
Weed control on site	Where practicable all fill, soil or rocks transported on site should be weed and pathogen free and all vehicles operating on site should be washed down prior to works commencing.	During construction and ongoing operation of the farm.	Spirecom and/or construction contractor

Table 4Suggested mitigation measures to be considered prior to and during the construction phase and
included in the project CEMP





Table 6 Estimated Traffic Generation per Production Year (PER SITE)

Activity	Vehicle Type	Vehicles (One Way Vehicle Trips) PER ANNUM, PER SITE
Heavy Vehicles		
Delivery of shed bedding material – Free Range sheds	Twin axle rigid truck	110
Delivery of chicks	Twin axle rigid truck	67
Delivery of feed- Free Range sheds	Semi-trailer	416
Delivery of gas (LPG)	Rigid tanker	32
Broiler pick up	Semi-trailer	875
Removal of shed litter material	Semi-trailer	165
Removal of dead birds	Twin axle rigid truck	11
	Heavy Vehicle Sub-Total	1679
Light Vehicles		
Staff visits and catching crew	Car	730
Tradesman	Ute/Van	58
Maintenance	Van	26
Shed litter material removal contractors	Car	93
Shed wash down contractors	Car	187
	Light Vehicle Sub-Total	1094
	TOTAL	2773

6.0 Conclusion

This assessment of the traffic issues for the construction of the Proposed Birregurra Farm at Government Road

Birregurra, VIC, 3242, has concluded the following:

- The farm will generate a maximum demand of approximately 3 staff vehicles and 5 trucks per day during operational phase.
- The main access point is off the Government Road.
- All the above-mentioned roads in Table 4.1 can absorb the additional vehicles in the peak hour.
- Vehicles departing the site are expected to experience no delays.

As per the data contained herewith regarding traffic movements provided, we request that the Shire should Take the details herewith supplied into consideration that there are no traffic related reasons why a planning permit for the Birregurra Farm should not be issued.



Technical Memorandum

12 March 2024

То	Fernando Ferreira, Spirecom	Email	
Copy to	Corangamite CMA Colac-Otway Shire Council	Email	
From	Ashley Roberts & Emma Mackenzie	Project No.	12629222
Project Name	Birregurra Broiler Farm - Stormwater Management Plan		
Subject	Existing Conditions Flood Assessment		

1. Introduction

1.1 Purpose of this Memorandum

The purpose of this Memorandum is to document the analysis undertaken to establish a robust understanding of the current or base case flood conditions at the Birregurra site – 320 Mooleric Road, Ombersley, VIC 3241.

1.2 Scope and limitations

This technical memorandum has been prepared by GHD for ProTen Pty Ltd. It is not prepared as, and is not represented to be, a deliverable suitable for reliance by any person for any purpose. It is not intended for circulation or incorporation into other documents. The matters discussed in this memorandum are limited to those specifically detailed in the memorandum and are subject to any limitations or assumptions specially set out.

Accessibility of documents

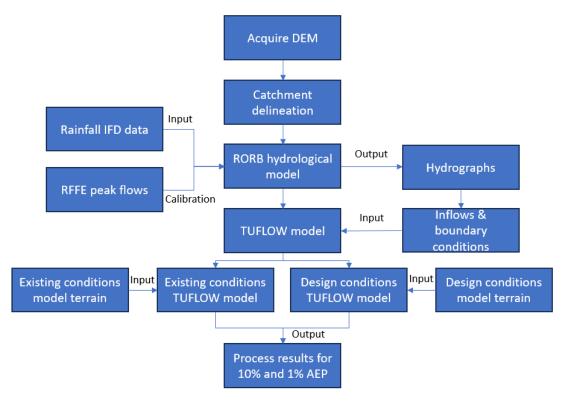
If this Technical Memorandum is required to be accessible in any other format this can be provided by GHD upon request and at an additional cost if necessary.

This Technical Memorandum is provided as an interim output under our agreement with ProTen Pty Ltd. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

The Power of Commitment

1.3 Methodology

We have undertaken this assessment of the current flood conditions in accordance with Australian Rainfall & Runoff 2019. An overview of our approach and its various components is shown below.



1.3.1 Hydrological Model

Hydrological modelling was undertaken using RORB to get estimates of the flow hydrographs for the 10% and 1% AEP events for multiple storm durations and temporal patterns:

- Entering the site from the upstream catchment
- Within the site, due to excess rainfall

Flow hydrographs are extracted for each storm duration and temporal pattern. The maximum of median flows was determined for each of the AEP's and compared with peak flows of the Regional Flood Frequency Estimation (RFFE) model as a sensibility check. Comparison of results at an upstream location show good alignment, as shown below:

AEP	RFFE (m ³ /s)	RORB (m ³ /s)
10%	2.68	2.40
1%	6.11	6.22

1.3.2 Hydraulic Model

The existing conditions TUFLOW hydraulic model was developed based on the ARR 2019 guidelines. It covers an area of approximately 440 ha and includes the project site extending another 500 m to the north, west and east and more than 800 m south of the site under investigation.

The following key inputs were provided to enable the TUFLOW model build:

- Model terrain: 1m site survey (110 ha) and 5m broader DEM based on LiDAR for the remaining modelled area
- Inflows: RORB output hydrographs for the 10% and 1% AEPs applied to TUFLOW model as inflows at different locations
 - Flow Hydrograph from site upstream
 - Excess rainfall falling on site
- Downstream boundary set: normal depth boundary condition at a few hundred metres downstream of the site to take into account the complexities of the wetland located around the downstream end of the site

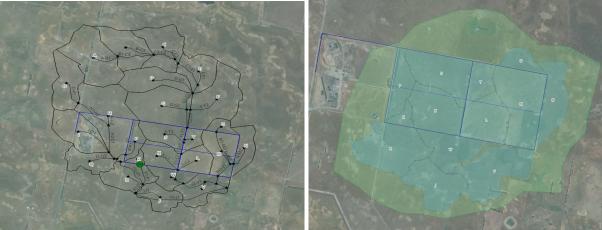


Figure 1 – RORB Model Boundary

Figure 2 – TUFLOW Model Boundary

The existing conditions TUFLOW model was run for 10 temporal patterns of from 10min-12hr storm durations for the 1% AEP and 10% AEP events. A depth map was produced based on the max of median storms for each AEP. The flood extents have been produced after applying a 5 cm filter.

1.4 Results

Flood depth and velocity maps for the existing conditions TUFLOW model runs are presented below.

1.4.1 Comparison of flood extents 2016 vs 2024

1% AEP flood extents from the 2016 Flood Mapping Study were compared with that of the 2024 TUFLOW model for the site and are presented below.

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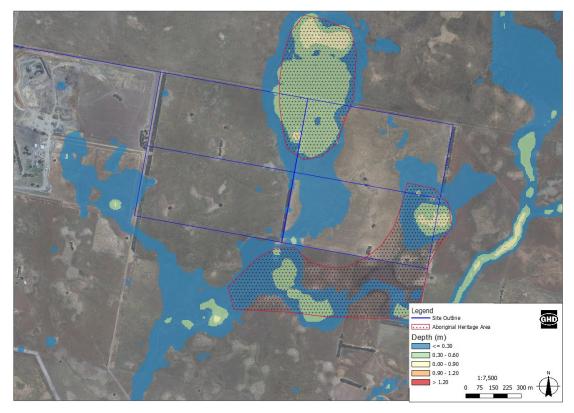


Figure 3 2016 flood mapping study 1% AEP flood extent.

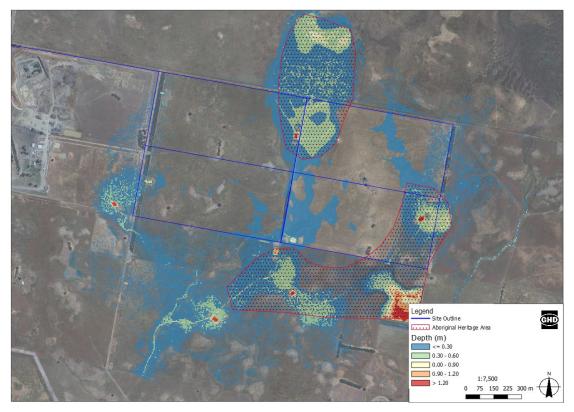


Figure 4 2024 TUFLOW flood model 1% AEP flood extent.

Generally, the main flow paths are similar across both TUFLOW models. However, there are some differences in the flood depths and extents which can be due to:

- Modelling guidelines: The 2024 model has been set up based on 2019 ARR guidelines. The 2016 model would have been developed using guidelines appropriate at the time of the study. The differences in these guidelines could be attributed to the way losses are applied to different surfaces. Additionally, the 2019 guidelines recommend the use of ten temporal patterns of a particular storm duration for model runs, while previously a single pattern was used for a particular storm duration
- Terrain data quality and survey extent: A 1m farm survey digital elevation model (DEM) was input to the 2024 TUFLOW model, providing greater definition through the site. This was not available for the 2016 study as modelling that was undertaken was at a broader scale for the whole Barwon river catchment and thus used a coarser DEM

1.4.2 10% AEP Flood

The flood depth and velocity maps for the 10% AEP event were overlayed with the proposed site concept design to understand any potential issues with the current layout. These are illustrated below.

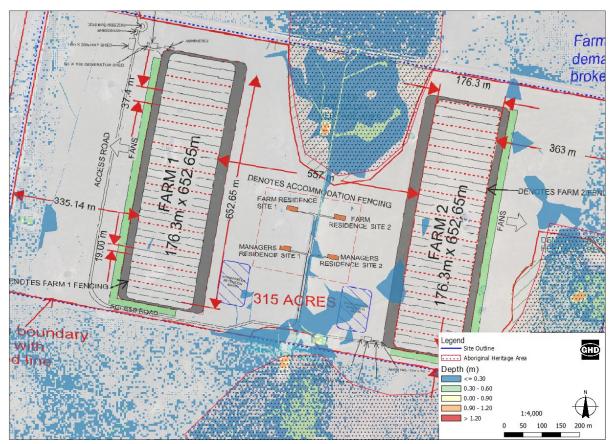


Figure 5 10% AEP flood depth map with design layout overlayed.

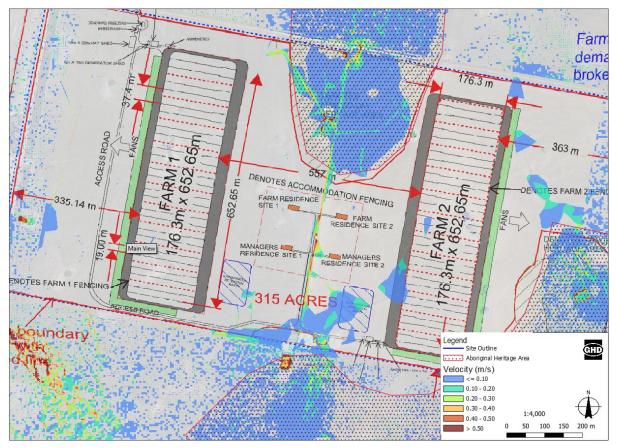
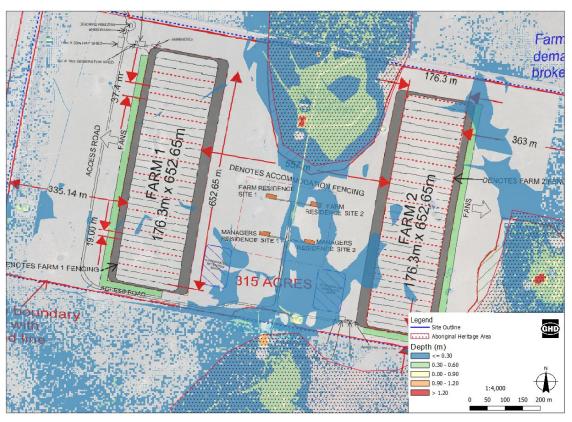


Figure 6 10% AEP flood velocity map with design layout overlayed.

Key findings from the 10% AEP event summarised below:

- The buildings lie just outside the 10% AEP flood extents
- Access roads and hardstand areas lie within the 10% AEP flood extents
- Higher velocities are contained within the main drain passing through the site

1% AEP Flood



Similar results for the 1% AEP event are provided below.

Figure 7 1% AEP flood depth map with design layout overlayed.

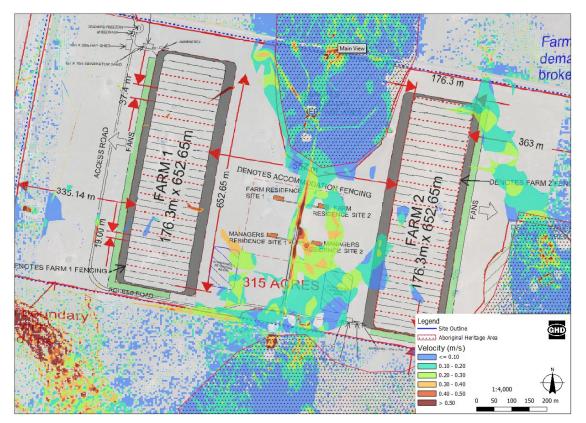


Figure 8 1% AEP flood depth map with design layout overlayed.

Key findings from the 1% AEP event summarised below:

- It is interpreted that the residence buildings of the site and the access roads lie within the 1% AEP flood extents. However, flood depths in this area are less than 300 mm.
- Higher velocities are confined to within the channel drain

1.5 Recommendations

The results of the existing conditions flood assessment were presented and discussed on 4th March 2024. Minor adjustments to the development proposal to reduce potential flood impacts both on site and on neighbouring properties were identified, these are shown below.

- Residences those on the eastern part of the site need to be outside the 1% flood extent, particularly as the flow appears to be an active overland flow path with a flood conveyance function.
- Access roads where possible move these outside of the 1% flood extent. Noting however that the east-west road cannot be relocated due to site constraints (aboriginal cultural heritage), but the flooding of this road is less than 300mm, and measures will be incorporated in the road design to mitigate impacts, including cross drainage culverts and setting the road level to be above the 10% AEP as a minimum.
- Any bunding proposed should ideally be located outside of the flood extent to avoid loss of flood storage (as loss of flood storage could lead to downstream flood impacts that exceed the allowable tolerances that the CMA may not accept)
- If mitigation is required we could consider increasing the capacity of channelised drain, noting this is already a constructed channel which is not known to provide habitat for significant native flora or fauna. The design for increased capacity of the channel would need to retain the existing flow regime without increasing flows downstream of the site;
- Pump station infrastructure ensure this is outside the 1% flood extent.

Once the above measures have been incorporated into the proposed development design, we are confident that the current floodplain storage can be maintained and that there will be no significant offsite impacts in terms of afflux, (with a maximum tolerance of 5mm increase in flood level downstream of the site).

Please contact either myself or Ash Roberts on

Kind regards,



Emma Mackenzie Senior Water Resources Engineer



Mooleric Road Birregurra 39426

Striped Legless Lizard targeted survey

FINAL REPORT Prepared for Spirecom Pty Ltd 29 January 2024

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- Hayley Sime (project management)
- Ian Smales, Wyn Russell, Clare McCutcheon, Shannon Braun, Michael Bodnacuk, Karthika Jayakumar (assistance in the field)
- Sam Panter (mapping)
- Ian Smales (quality assurance)

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1. Introduction

1.1. Project background

Biosis Pty Ltd was commissioned by Spirecom Pty Ltd (Spirecom) to undertake a targeted survey for Striped Legless Lizard *Delma impar* for a proposed access road (the study area) to a poultry production development at 320 Mooleric Road, Ombersley (the project). The project requires an upgrade to the existing unnamed government road to an 'all weather' road. The impact area of the road construction is proposed to be six meters wide and approximately 1.2 kilometres long (Figure 2).

Biosis undertook a flora and fauna assessment (FFA) for the project in 2023 (Biosis 2023a) and identified the presence of suitable habitat for the Striped Legless Lizard, which is listed as vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Targeted surveys for Striped Legless Lizard were subsequently recommended for an impact area of approximately 2.6 hectares of potential habitat, with survey results to be incorporated into an EPBC Act referral. It is understood that Spirecom is seeking an EPBC Act referral for the construction of the all weather road.

1.2. Scope of assessment

The objectives of this investigation are to:

- Undertake a targeted survey for Striped Legless Lizard in the study area.
- Provide a short report outlining the findings of the survey.
- Determine the potential nature and extent of impacts from proposed works on Striped Legless Lizard.
- Prepare a significant impact assessment for the component of the project impacting Striped Legless Lizard in accordance with:
 - Environment Protection and Biodiversity Conservation Act 1999 referral guidelines for the vulnerable striped legless lizard, Delma impar (DSEWPC 2011).
 - Significant Impact Guidelines 1.1 Matters of National Environmental Significance (vulnerable species) (DE 2013).

1.3. Location of the study area

The study area is located along an east-west oriented public road reserve near Ombersley, 20 kilometres north-east of Colac, Victoria (Figure 1). It encompasses approximately 2.6 hectares of public land currently zoned in the Colac Otway Planning Scheme as Farming Zone (FZ). It occurs within a predominantly agricultural landscape with the surrounding properties cleared for grazing and cropping. An operational basalt quarry is adjacent to the majority of its southern boundary, and Mount Gellibrand Windfarm is the property to its northern boundary.

The study area is within the:

- Victorian Volcanic Plain and the Otway Plain Bioregion.
- Barwon River Basin.
- Management area of the Corangamite Catchment Management Authority (CMA).
- Colac Otway Shire local government area.



• Traditional lands of the Eastern Maar.

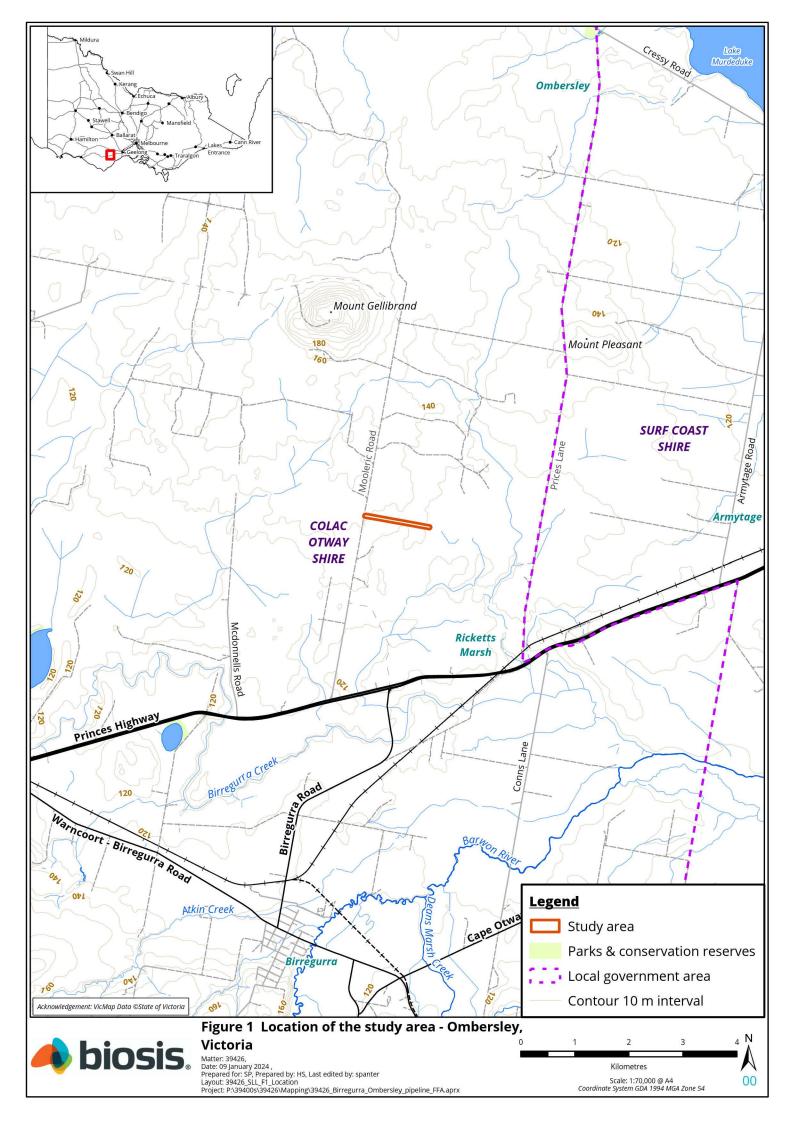
1.4. Species description

The Striped Legless Lizard *Delma impar* is a long, thin-bodied lizard of the Pygopodidae family. The Striped Legless Lizard, like all members of the Pygopodidae, lacks forelimbs and has reduced or vestigial hind limbs (NSW NPWS 1999). Striped Legless Lizards reach a maximum length of approximately 300 millimetres with the tail contributing over half of this length. The snout to vent length is approximately 120 millimetres. Striped Legless Lizards exhibit considerable variation in colour patterning ranging from pale to grey-brown on the dorsal surface to pale cream on the ventral surface. A series of stripes run the length of the body and become diagonal bands on the tale. Some adults and most juveniles are pale brown with a dark head and lack the dorsal patterning more regularly associated with this species (NSW NPWS 1999). Striped Legless Lizards are often confused with snakes but can be differentiated by the presence of ear openings, an undivided (entire) tongue and the high tail to body-length ratio (NSW NPWS 1999).

The species is listed as vulnerable under the EPBC Act and as endangered under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act).

Striped Legless Lizards have sometimes been thought to exclusively inhabit native grasslands dominated by *Austrostipa* and *Themeda* species in south-eastern Australia, ranging from the Australian Capital Territory in the north-east to just over the South Australia border in the south-west (DEWHA 2011). However, further studies indicate the species also utilises introduced pasture grass and inhabits cleared woodland areas (NSW NPWS 1999). This more general habitat specification indicates that a dense grassland structure along with suitable soil type, is the principal habitat requirement as opposed to a specific composition of native grass species (Harley et al. 2005).

Major threats to the Striped Legless Lizard include loss of grassland habitat due to urban expansion, particularly on Melbourne's western fringe and habitat modification from agricultural development across the species range (NSW NPWS 1999). Other threats include inappropriate fire regimes and possibly predation by native and introduced predators (NSW NPWS 1999).





2. Methods

2.1. Survey methodology

The primary method used to survey for Striped Legless Lizard within the study area was the placement of artificial shelter (terracotta roof tile) transects, in accordance with the *Survey guidelines for Australia's threatened reptiles* (DEWHA 2011). Each tile transect consisted of 25 terracotta roof tiles spaced approximately 5 metres apart. Three tile transects were placed in suitable habitat along the northern side of the road reserve (grids 1, 3, 5), and three transects on the southern side (grids 2, 4, 6), such that a total of 150 tiles were surveyed.

Tile transects were established within the study area on 22 September 2023, three weeks prior to the initial survey. Tile checks were conducted in the species active period, with a total of ten tile checks completed from 17 October to 22 December 2023 at approximately weekly intervals. Survey grids were decommissioned on 22 December 2023. Transects were sampled across a variety of weather conditions, on days when ambient temperatures did not exceed 28°C (except for survey 9, which was undertaken at 30°C).

In addition to tile transects, active searching was also undertaken opportunistically throughout the study area while completing tile transect checks. This included lifting rocks and other debris to locate reptiles sheltering beneath. Animals were only briefly handled to obtain a photograph for the purpose of data collection and identification, and were released immediately afterwards at the point of capture. All vertebrate species encountered within the study area were noted and species records will be submitted to the Department of Energy, Environment and Climate Action (DEECA) for inclusion in the Victorian Biodiversity Atlas (VBA).

A summary of survey timing and weather conditions is presented in Table 1.

Check	Date	Start time	End time	Temperature (°C)	Cloud cover	Average wind speed (km/hr)	Relative humidity (%)
1	17/10/2023	12:45 PM	1:20 PM	13.9	1/8	7.0	62
2	23/10/2023	12:00 PM	1:15 PM	11.9	8/8	13.0	76.8
3	02/11/2023	10:00 AM	11:00 AM	15.0	8/8	0.0	77
4	09/11/2023	2:15 PM	3:00 PM	21.8	0/8	1.2	51.6
5	16/11/2023	11:45 PM	12:30 PM	15.7	7/8	19.9	60
6	22/11/2023	12:30 PM	1:30 PM	18.5	1/8	18.5	54
7	28/11/2023	10:00 AM	11:00 AM	19	8/8	3.0	91

Table 1 Survey timing and conditions





Check	Date	Start time	End time	Temperature (°C)	Cloud cover	Average wind speed (km/hr)	Relative humidity (%)
8	04/12/2023	10:00 AM	11:00 AM	22	8/8	3.0	65
9	13/12/2023	1:30 PM	2:45 PM	30	4/8	15	50
10	22/12/2023	12:00 PM	1:00 PM	23.3	3/8	12	52

2.2. Mapping and data collection

Mapping was conducted using hand-held GPS-enabled tablets and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the tablets (generally \pm 7 metres) and dependent on the limitations of aerial photo rectification and registration. Spatial data collected from the study area were regularly synchronised with a cloud server.

Mapping has been produced using a Geographic Information System (GIS). Electronic GIS files which contain our spatial data are available to incorporate into design concept plans. However, this mapping may not be sufficiently precise for detailed design purposes.

2.2.1. Permits

Biosis undertakes targeted fauna surveys under the following permits and approvals:

- Wildlife Authorisation issued by DEECA under the Victorian Wildlife Act 1975 (Permit Number 10010193)
- Approvals 18.21 issued by the Wildlife and Small Institutions Animal Ethics Committee of the Victorian Government Department of Economic Development, Jobs, Transport and Resources (DEDJTR)
- Scientific Procedures Fieldwork Licence issued by DEDJTR's Wildlife and Small Institutions Animal Ethics Committee (Licence Number 20020).

2.3. Legislation and policy

The implications for the project were assessed in relation to key biodiversity legislation and policy including:

- Matters of National Environmental Significance listed under the EPBC Act and associated policy statements, significant impacts guidelines, listing advice and key threatening processes.
- Threatened taxa listed under Section 10 of the FFG Act and associated action statements and listing advice.



3. Results

3.1. Survey results

Three reptile and two amphibian species were recorded within the study area during the targeted surveys -Striped Legless Lizard, Eastern Three-lined Skink *Acritoscincus duperreyi*, Tussock Skink *Pseudemoia pagenstecheri*, Southern Brown Tree Frog *Litoria ewingii* and Spotted Marsh Frog *Limnodynastes tasmaniensis*. Additionally, one skink *Scincidae* spp. was observed but unable to be identified to the species level during the targeted surveys, as it evaded capture and moved too quickly to obtain visual identification.

Four Striped Legless Lizards were recorded during the surveys (Table 2); one under a tile in Transect 2 (southern boundary of road reserve) and three under tiles within Transect 3 (northern boundary of road reserve; Figure 2). Head scales were photographed on two occasions when a Striped Legless Lizard was captured on Transect 3, and it was determined they were the same individual captured on two separate days. The Striped Legless Lizards observed on Transect 2 and one of the individuals observed on Transect 3 evaded capture and were not able to be photographed. Hence, it is unknown whether the same individual was recorded all four times. However, it is likely that at least two different individuals were recorded as the sighting points on Transect 2 and Transect 3 are located approximately 150 metres apart. Photographs of the Striped Legless Lizards captured are provided in Appendix A.

The unnamed government road where Striped Legless Lizard were recorded supports several small patches of Plains Grassy Wetland EVC 125, and native vegetation is scattered throughout a largely disturbed area that supports predominantly introduced vegetation such as Toowoomba Canary-grass *Phalaris arundinacea*. The soils are black, cracking clays with some surface and embedded rocks. Tussock grasses (such as Common Tussock-grass *Poa labillardierei*) are sparse and appear to have been heavily grazed throughout the road reserve. Although Striped Legless Lizards typically prefer native grasslands, the findings are consistent with the current understanding of the species requirements which can include sites with exotic grasses that are used for breeding and foraging by the species (Threatened Species Scientific Committee 2016, Hartley et al. 2005). The surface rocks within the road reserve may be utilised by Striped Legless Lizards that could move in from the more suitable habitat to the north, which supports moderate quality habitat with large tussock grasses, surface rocks and inter-tussock spaces.

The land to the north of the road reserve is occupied by Mount Gellibrand Windfarm which underwent a Flora and Fauna assessment before development (BL&A 2005). BL&A determined there was marginal habitat throughout the windfarm site with the exception of the high-quality grasslands in the southern part of the site, which appears to correspond to the suitable Striped Legless Lizard habitat directly north of the study area. In addition, there are records of Striped Legless Lizard from 2022 within Mount Gellibrand Windfarm approximately 2.5 kilometres west of the study area. Much of the area immediately south of the road reserve is occupied by an operational quarry that is not habitat suitable for Striped Legless Lizards (Biosis 2014). The remaining land to the south of the road reserve is used for livestock grazing and the soil is highly disturbed, and much of this land has been assessed for the proposed Ombersley Poultry Farm and determined no suitable habitat for Striped Legless Lizard (Biosis 2023b).

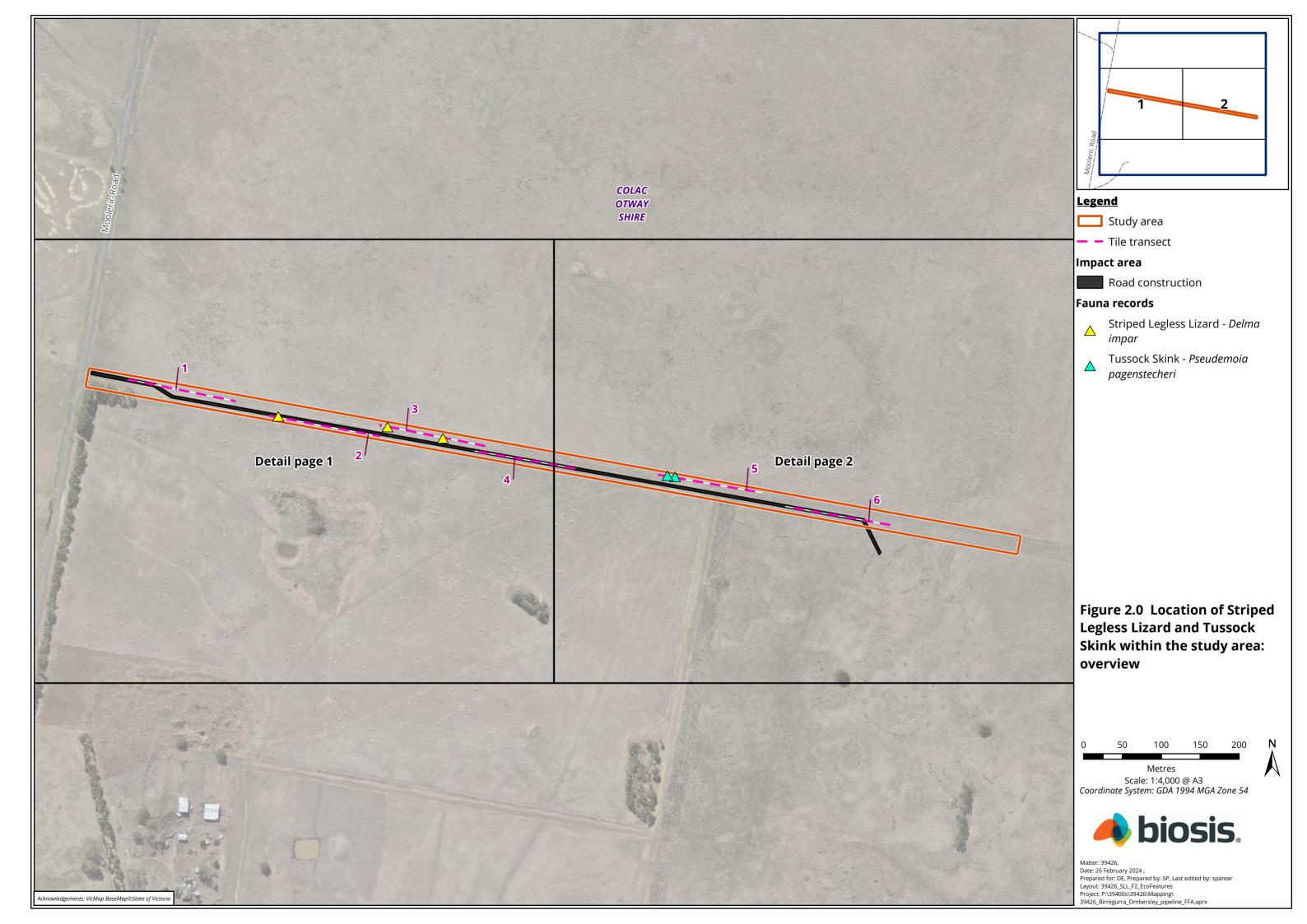
Tussock Skink were recorded on one occasion during the surveys in Transect 5. The unidentified skink that was observed, but not captured, on Transect 1 was also potentially a Tussock Skink due to its colour and size. Tussock Skink is listed as vulnerable under the FFG Act. Based on the results from the current survey and characteristics of available habitat, it is reasonable to assume that Tussock Skinks are present in moderate abundance throughout the study area.



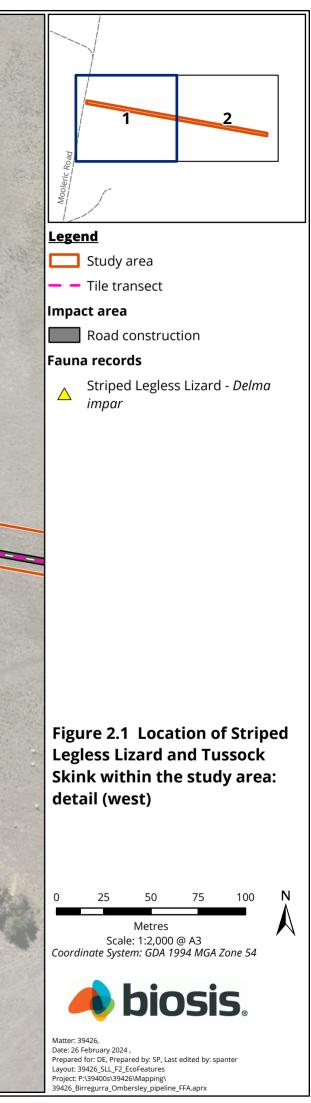
Ombersley Pipeline | Striped Legless Lizard survey | 29 January 2024

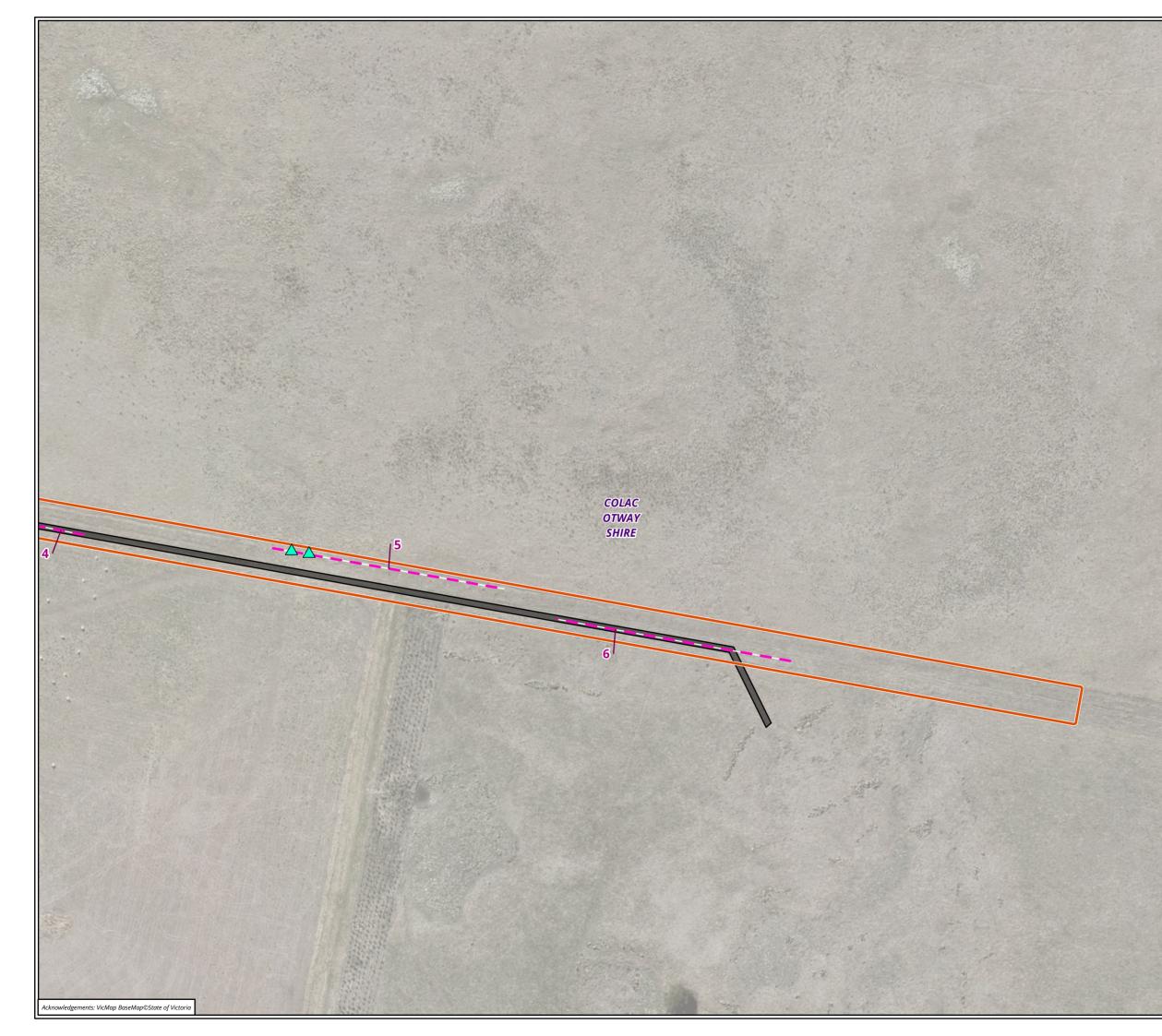
Table 2 Striped Legless Lizard targeted survey results

Check	Date	Method	Species recorded	Location	Notes
1	17/10/2023	Tile transect	Striped Legless Lizard Unidentified skink - <i>Scincidae</i> spp. Spotted Marsh Frog Southern Brown Tree Frog	Transect 3 Transect 1 Transect 5 Transect 6	Photographed Evaded capture
2	23/10/2023	Tile transect	Southern Brown Tree Frog	Transect 6	
3	2/11/2023	Tile transect	Striped Legless Lizard Eastern Three-lined Skink	Transect 3 Transect 1	Photographed
4	9/11/2023	Tile transect	Spotted Marsh Frog	Transect 4	
5	16/11/2022	Tile transect	None recorded	NA	
6	26/10/2022	Tile transect	Striped Legless Lizard	Transect 2	Evaded capture
7	28/11/2023	Tile transect	Spotted Marsh Frog X4	Transect 1 Transect 3 Transect 4 Transect 5	
8	4/12/2023	Tile transect	Spotted Marsh Frog X11	Transect 1 Transect 2 Transect 5 Transect 6	
9	13/12/2023	Tile transect	Tussock Skink X2 Spotted Marsh Frog X5	Transect 5 Transect 1 Transect 3 Transect 4 Transect 5	
10	22/12/2023	Tile transect	Striped Legless Lizard	Transect 3	Evaded capture













4. Biodiversity legislation and government policy

4.1. Commonwealth

4.1.1. Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act applies to 'actions' that have the potential to significantly impact on Matters of National Environmental Significance (MNES) protected under the Act. Under the EPBC Act, a person must not take an action that has, will have or is likely to have a significant impact on any matter of environmental significance without approval from the Australian Government Minister for the Environment.

The Striped Legless Lizard is listed as vulnerable under the EPBC Act and is therefore considered a matter of national environmental significance. The results from the targeted survey confirm that the species is present within the study area and the proposed works will therefore require the removal of habitat currently occupied by the species. It is possible that the species is present throughout the study area given the availability of suitable habitat.

Significant impact assessment

A significant impact is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts (DE 2013).

Specific referral guidelines have been prepared for the Striped Legless Lizard, therefore an assessment has been prepared using the significant impact criteria for Striped Legless Lizard outlined in *Environmental Protection and Biodiversity Conservation Act 1999 referral guidelines for the vulnerable Striped Legless Lizard, Delma impar* (DSEWPC 2011) (Table 3). An assessment has also been prepared in accordance with the *Matters of National Environmental Significance Significant impact guidelines 1.1 for vulnerable species* (DE 2013). The self-assessment process assists a proponent in determining whether a significant impact is likely and whether a project should be referred. The significant impact assessment for Striped Legless Lizard is based on the current proposed road design provided by Spirecom. Impacts can be reassessed upon the confirmation of the project impact area and construction methodologies.



Table 3 Assessment of Striped Legless Lizard Delma impar (listed vulnerable species) in relation referral guidelines for Striped Legless Lizard (flowchart in DEWHA 2011)

Referral guidelines for Striped Legless Lizard (DSEWPC 2011)	Outcome	Notes
Could the impacts of the action occur within modelled distribution of the Striped Legless Lizard?	Yes	The action occurs within modelled distribution for Striped Legless Lizard (DSEWPC 2011) and individuals have been recorded within the study area.
Could the impacts of your action affect Striped Legless Lizard individuals or habitat?	Yes	The action will affect Striped Legless Lizard habitat and/or individuals. There is extensive suitable native grassland habitat within the property directly north of the study area, and although the study area consists of less coverage of native grassland habitat, it provides additional habitat for the species. The proposed action may result in further isolation and reduced area of occupancy for Striped Legless Lizard.
Have you surveyed for the Striped Legless Lizard using the recommended methods?	Yes	Artificial shelter site survey was undertaken by suitably qualified zoologists in accordance with the <i>Survey guidelines for Australia's threatened reptiles</i> (DSEWPC 2011). Striped Legless Lizard were recorded during survey efforts on four separate occasions, determined to be at least two (but potentially three) different individuals.
Could your action impact on an important population of Striped Legless Lizard or the species as a whole?	Yes	 The EPBC Act defines an important population as one that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: Key source populations either for breeding or dispersal. Populations that are necessary for maintaining genetic diversity. Populations that are near the limit of the species range. An important population of Striped Legless Lizard must meet one of the criteria above and is considered likely to be viable in the long term. However, the subsequently approved Conservation Advice for Striped Legless Lizard under the EPBC Act (Threatened Species Scientific Committee 2016) says, "All populations of the Striped Legless Lizard are likely to be important for the species recovery". As a consequence, the population inhabiting the study site is considered to be part of an important population. The property directly north of the study area is occupied by Mount Gellibrand Windfarm which underwent a Flora and Fauna assessment before development (BL&A 2005). BL&A determined there was marginal habitat throughout the windfarm site with the exception of the high-quality grasslands in the southern part of the site, which appears to correspond to the suitable Striped Legless Lizard habitat directly north of the study area. Habitat within the study area likely forms part of the broader area of occupancy for the population. Due to much of the existing habitat for this species being highly modified and fragmented, this population is important for species conservation. The proposed methodology for the road upgrade involves removing the existing vegetation and natural surface rock in the road reserve, therefore has the potential to further reduce the area of occupancy of the population in the reserve and thus impact an important population.

Ombersley Pipeline | Striped Legless Lizard survey | 29 January 2024



		The project has potential to impact upon a six metre wide strip of habitat that is the very southern portion of a wider population extending to the north. The action is unlikely to impact on the population as a whole.
Is your impact mitigation best practice so that it may reduce the significance of your impacts?	Yes	Conditional on adherence to mitigation measures recommended in sections 5.2 and 5.3.
Could your action require a referral to the federal environment minister for significant impacts on the striped legless lizard?	Yes	The proposed works will result in decreased habitat for a population of Striped Legless Lizard. The proposed works may also limit dispersal between populations or habitat patches, through removal of vegetation or creation of a physical barrier. Biosis recommends that the project be referred to the Australian Government Minister for the Environment.



Table 4 Assessment of Striped Legless Lizard Delma impar (listed vulnerable species) in relation to Significant Impact Criteria for vulnerable species (DE 2011)

Significant impact criteria	Likelihood of significant impact	Notes
Lead to a long-term decrease in the size of an important population	Unlikely	As stated in Table 3, the approved Conservation Advice for Striped Legless Lizard under the EPBC Act (Threatened Species Scientific Committee 2016) says, "All populations of the Striped Legless Lizard are likely to be important for the species recovery". As a consequence, the population inhabiting the study site is considered to be part of an important population.
		Due to the cryptic nature of the species, the extent and nature of habitat use within the study area is unknown. At least two, but possibly three, individuals were located during surveys, which suggests that the area may provide breeding habitat. However, the area is highly modified and quality of grassland is lower than that on the property north of the study area. The habitat to the south is of poorer quality, and highly disturbed by the quarry and grazing livestock, so the road reserve represents a narrow strip of the southernmost portion of the population. Compliance with recommended mitigation and rehabilitation measures (sections 5.2 and 5.3) will ensure the project does not lead to
Reduce the area of occupancy of an important population	Likely	a long-term decrease in the size of the population. Striped Legless Lizards were identified in the study area. Although the area is highly modified and dominated by introduced flora, it is unknown whether the study area acts as primary or secondary habitat for the species. Works in the study area will result in the direct removal or modification of known habitat, including impacts on tussock-forming grasses, rocks and soil structure. Therefore, a small reduction in the area of occupancy for an important population is likely to occur.
Fragment an existing population into two or more populations	Unlikely	Striped Legless Lizards are known to have limited dispersal capability (Threatened Species Scientific Committee 2016) and significant landscape features such as rivers or roads are likely boundaries to their dispersal. The land to the south of the western end of the road reserve is occupied by the Ombersley Quarry, which is too disturbed to provide habitat for Striped Legless Lizard. The remaining land to the south of the road reserve is used for livestock grazing and the soil is highly disturbed, and much of this land has been assessed for the proposed Ombersley Poultry Farm and determined no suitable habitat for Striped Legless Lizard (Biosis 2023b). The property directly north of the study area is occupied by Mount Gellibrand Windfarm which underwent a Flora and Fauna assessment before development (BL&A 2005). BL&A determined there was marginal habitat throughout the windfarm site with the exception of the high-quality grasslands in the southern part of the site, which appears to correspond to the suitable Striped Legless Lizard habitat directly north of the study area. It is therefore apparent that the proposed project will entail the loss of a six metre-wide strip of habitat for Striped Legless Lizards that is the southern-most strip of a wider population extending substantially into adjacent land to the north of the road reserve. As such the action does not have capacity to fragment the existing population.



Adversely affect habitat critical to the survival of a species	Unlikely	It is unlikely that the proposed action would adversely affect habitat deemed critical to the survival of the species.
Disrupt the breeding cycle of an important population	Unlikely	The life history of the Striped Legless Lizard is poorly known. However, it is believed that females deposit up to two eggs every year in December to January, within a soil cavity or under rocks in communal nests. In the case that Striped Legless Lizard are distributed throughout the study area and a wider area of land to its north. All habitat suitable for the species is understood to also be suitable for the species to breed. The project may disrupt breeding of individuals utilising the small portion of the broader local distribution occupied by the study area, but loss of that portion is unlikely to affect breeding within the broader local population. To minimise disruption to the breeding cycle, works should occur outside of the breeding season (December to February).
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	Whilst the works will modify or destroy a small area of known habitat, the extent and scale of the road is unlikely to result in overall species decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	The proposed project does not include any known mechanism that would result in the establishment of invasive species harmful to Striped Legless Lizard that are not already present in the local area.
Introduce disease that may cause the species to decline	Unlikely	The proposed works do not include any known mechanism that would result in the introduction of a disease that is not already present in the local area.
Interfere with the recovery of the species	Unlikely	The proposed works will not interfere with the recovery of the species in respect to the specific objectives for recovery outlined in the in the National Recovery Plan for Striped Legless Lizard (Smith and Robertson 1999). Short-term disturbance or a very small number of mortalities are unlikely to interfere with the species' overall recovery.



4.2. State

4.2.1. Flora and Fauna Guarantee Act 1988 (FFG Act)

The FFG Act is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes.

Link for further information: <u>https://www.environment.vic.gov.au/conserving-threatened-species/victorias-framework-for-conserving-threatened-species</u>

The FFG Act defines public land as Crown land or land owned by, or vested in, a public authority, while private land is defined as any land other than public land. A public authority is defined in the FFG Act as a body established for a public purpose by or under any Act and includes:

- an Administrative Office
- a Government Department
- a municipal council
- a public entity
- a State-owned enterprise.

The study area is on public land. The proponent is not considered to meet the definition of a public authority, and there is no declared critical habitat within the study area.



5. Summary of impacts and recommendations for mitigation

5.1. Impacts

The proposed project works involve the construction of a 6-metre-wide all-weather road in the study area. Based on Biosis' understanding of the current proposed works and construction methodologies, the key impacts to Striped Legless Lizard and their habitat are summarised as follows:

- Removal and modification of habitat known to be occupied by the species.
- Direct mortality of individuals as a result of construction activities/methods.
- Increased risk of predation in the short to medium term due to exposure and loss of habitat.

5.2. Mitigation measures

Measures to reduce impacts to Striped Legless Lizard and their habitat should be considered before and during works. Mitigation measures should be applied consistently throughout the study area. Likely appropriate measures to mitigate species impacts include:

- Limit road construction to the southernmost area of the road reserve, which is where the lowest number of Striped Legless Lizards were recorded and the furthest point from the more suitable habitat to the north of the property.
- Minimise the width of disturbance when intercepting habitat.
- Restore habitat in areas of soil or habitat disturbance using indigenous grass species. Earthworks should be carried out in a manner to maintain the existing soil by stockpiling relevant layers and restoring them in sequence.
- Ensure that surface and/or embedded rocks, or other refuge sites (e.g. logs) are not removed from the site. Where possible, reintroduce or increase the cover of surface refuges outside the immediate alignment of the new all-weather road to augment existing habitat.
- Develop site-specific Conservation Management Plan and/or Construction Environmental Management Plan relating to the long-term management and monitoring of the species and associated habitat.
- Salvage and relocation of Striped Legless Lizard and Tussock Skink within impacted habitat areas prior to and during works occurring.
- During construction, especially while any trenches are open, all trenches must be checked daily for the presence of threatened fauna and an ecologist must be on call to remove any trapped animals to adjacent areas of appropriate habitat.

5.3. Next steps

The approvals pathway for this project, based on the current construction footprint, will likely require a referral to the Department of Climate Change, Energy, the Environment, and Water (DCCEEW). Minor field investigation activities such as driving on site, or minor soil disturbance associated with geotechnical and



hydrogeological investigation purposes may proceed as they are unlikely to significantly impact the species. Such activities should be avoided when the ground is wet, and non-disruptive heavy machinery (e.g. rubber tread) should be used. Driving on site should be minimised and restricted to the same paths where possible.

Biosis understands that Spirecom is seeking an EPBC Act referral for the impacts proposed to Striped Legless Li ard the construction of the six metre wide all weather road.



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APPENDICES



Appendix A. Photos of Striped Legless Lizard



Photo 1 Striped Legless Lizard recorded at transect 3 on 2 November 2023



Photo 2 Striped Legless Lizard recorded at transect 3 on 17 October 2023





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GT230516 - 320 MOOLERIC ROAD, OMBERSLEY VIC 3241

Operational Noise Impact Assessment (desktop) – Technical Report

Spirecom

Project Details

Introduction

Noise Impact Assessment for the construction of 24 x Sheds and associated infrastructure located at 320 MOOLERIC ROAD, OMBERSLEY VIC 3241. The Group 2 Acoustic Research has been commissioned to undertake and Environmental

Site. Therefore, the regulators (EPA and planning authorities) requires an environmental noise impact assessment to be undertaken. Mooleric Broiler farm seeks the development application consent to construct 24 shed Breeder

Protection Authority (EPA), the planning authorities and its regulations The Development application and planning is assessed in accordance with the Environment

Scope of Assessment

the farm and the proposed location and configuration of the development of the construction on the farm. The Mooleric Broiler Farm is proposing to build 24 x sheds . Figure A shows the location of



Figure A - the location of the farm

To determine if the proposed development would be in accordance with Noise Policy the following is required

Provide a report prepared by a suitably experienced, professional acoustic adjustment for any noise character. predicted noise Recommended Maximum noise level (listed below). The report must state what the overall consultant, demonstrating that worst case predicted noise from the proposal can meet the would be at the most noise affected premises in any direction after engineering

recommendations in the report will be implemented by the applicant The report must be accompanied by a statement from the applicant that any

2 | P a g e GT230516 - 320 MOOLERIC ROAD Operational Noise Impact Assessment



RECOMMENDED MAXIMUM NOISE LEVELS

The subject land (Generating zone) is zoned as Farming FZ and nearby sensitive receivers (receiving zone) is classified as Rural Living Zone RLZ.

Zone levels

The recommended noise level are as follows:

Period	Daytime	Evening	Night time
Recommended noise level	45	38	33

Distance-adjusted levels:

The Zone levels are adjusted to account for the distance between the zone where the noise emitter is located and the location of noise receiver (the noise sensitive receiver):

-When the noise generator and receiver are not within the same zone classification/type, subtract one decibel for every 100 meters of receiver distance.

Following this rule:

-'Receiver distance' is the shortest distance from the noise sensitive receiver to the emitting zone.

-If there is a zone for a road a railway line that divides the emitting zone, this road, railway zone would be ignored

- The maximum adjustment shall be made up to a maximum subtraction of nine decibels.

-The distance adjustment should be applied to each of the day, evening and night.

Base noise level check

The distance-adjusted levels are checked against the following 'base noise levels' for each period of the day:

Day	Evening	Night
45dB(A)	37dB(A)	32dB(A)

Taking the greater of the distance adjusted level and base noise level, we get:

Day	Evening	Night
45dB(A)	37dB(A)	32dB(A)

Note:

The background level check and adjustment has not been considered.



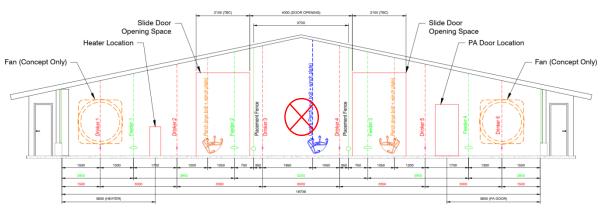
Proposed Layout and Noise Sources

Development Site

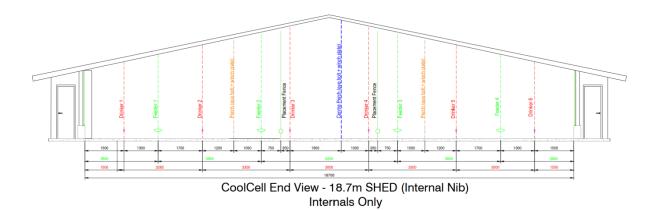
The proposed development consists of 24 buildings each serviced by 2 extraction fans.

Indicative layouts below show the location, position ,extent of equipment and building services units and location of noise sensitive receivers.

Figure B - Setting out drawings



CoolCell End View - 18.7m SHED (Internal Nib) Internals, Doors, Fans & Heater



G2A

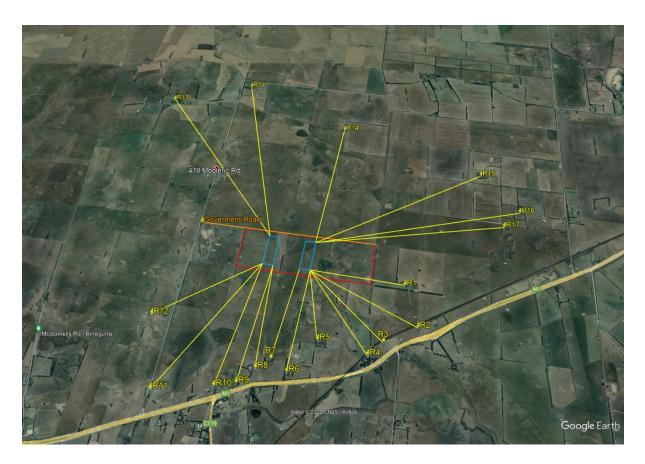


Figure C: The locations of sensitive receptors in the vicinity of the Development Site are shown and listed in Table A.

Receiver ID	Location	Receptor Type	Approximate Distance from <u>EDGE OF</u> Nearest Development Site
R1	PRICES LANE	Farm Residence	1.65 km
R2	PRINCESS HIGHWAY	Farm Residence	2.06 km
R3	PRINCESS HIGHWAY	Farm Residence	1.75 km
R4	PRICES LANE	Farm Residence	1.76 km
R5	PRINCESS HIGHWAY	Farm Residence	1.26 km
R6	PRINCESS HIGHWAY	Farm Residence	1.80 km
R7	PRINCESS HIGHWAY	Farm Residence	1.63 km
R8	PRINCESS HIGHWAY	Farm Residence	1.82 km
R9	DARCYS LANE	Farm Residence	2.09 km
R10	DARCYS LANE	Farm Residence	2.20 km
R11	Mooleric Road	Farm Residence	2.70 km

Table A	Sensitive Receptors in the Vicinity of the Development Site
---------	---



R12	Mooleric Road	Farm Residence	2.03 km
R13	Mooleric Road	Farm Residence	3.96 km
R14	Mooleric Road	Farm Residence	3.73 km
R15	Armytage Road	Farm Residence	3.49 km
R16	Armytage Road	Farm Residence	3.81 km
R17	Armytage Road	Farm Residence	3.44 km

Noise Sources

The information and data received form the client doesn't include detailed information on the noise sources, the below table lists the sources of noise typically present in such application considered in this assessment to contribute towards external environmental noise propagation. However, an update of the report could be provided if the detailed information of the noise source is specified.

Internal building services located within rooms proposed to be enclosed by block-work, or acoustically-rated enclosures with no direct path to the external environment have been considered non-contributory.

Table B – Noise Source Data

	So		ound F /8 ban			-	-	. @	No. of units per building
Item	63	125	250	500	1k	2k	4k	8k	
FAN BD-BLUE 170C-6 WITH LIGHT TRAP	84	79	74	69	64	60	59	54	2

Data Sources:

FAN BD-BLUE 170C-6: Big Dutchman Published Data

Noise Assessment

Operational Equipment

Although all equipment is unlikely to be running 24-hours per day, a detailed on-time schedule of is not possible to obtain, as equipment operation depends largely on environmental conditions inside and outside of the buildings.

As a worst-case scenario, this assessment has considered full operation of all items of equipment continuously over the daytime and night-time periods.



Model

Using data and layouts obtained from the client, and operational noise assessment model has been created using the CadnaA Environmental Noise Assessment Package (DataKustik). Measurements of building extents and distances to the nearest affected noise-sensitive property has been assessed by topographical software and used in the environmental noise mapping suite, Assuming no correction for atmospheric conditions, or ground absorption.

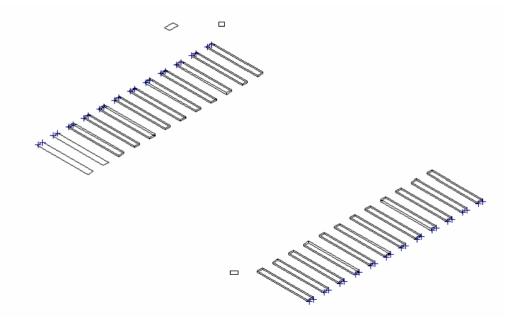


Figure D - 3D model overview

The resultant noise levels from combined operational activity, when considered at worst case full, steady-load are well below the recommended maximum noise level of 32 dB(A) night time limit, 37 dB(A) evening time limit, and 45 dB(A) day time limit

Given that an assumption of all equipment operating continuously (daytime and night-time) for each hour is likely to be a relative worst case, the resulting noise levels 15 dB L_{Aeq,t} should be considered an upper limit of the actual levels that would be expected from the operation of the site at nearest noise sensitive receivers.

The predicted noise levels satisfy the project noise trigger level by 24 dB(A) for the daytime and 22 dB(A) for the evening period and 17 dB(A) on night time. On that basis, unacceptable noise impacts are not expected. On this basis it is unlikely that the nearest noise-sensitive properties would be adversely affected by the proposed development.

Proprietary acoustic modelling software (CadnaA) has been used to calculate the likely noise propagation of the new development. This is set out in the Appendices at the end of this report.

Source levels have only been provided in terms of single overall figures. However, the calculation has been carried out over the octave band audible frequency range including low frequency (63Hz and 125Hz). Typical spectra taken from known units has been used to supplement the calculation data, and has been presented within this report.



Context

The development is currently part of a development process which seeks to construct building services units. While the specific usage is proposed to be maintained, the operation within the site is expected to make full use of the best available technology to minimize noise egress to the surrounding environment.

The current model indicates that proposed building services equipment should be largely inaudible when considered at the nearest noise-sensitive property [NOISE FROM INDUSTRY IN REGIONAL VICTORIA, NIRV]

In meeting the required prescriptive noise limits as defined by the NIRV_requirement for a baseline environmental background/ambient noise survey to justify/assess the intrusion/annoyance over and above the existing background noise climate has been negated.

Conclusions

The Group Acoustic Research has been commissioned to undertake and Environmental Noise Impact Assessment on behalf of Mooleric Broiler Farm Construction in anticipation of the construction of 24 sheds.

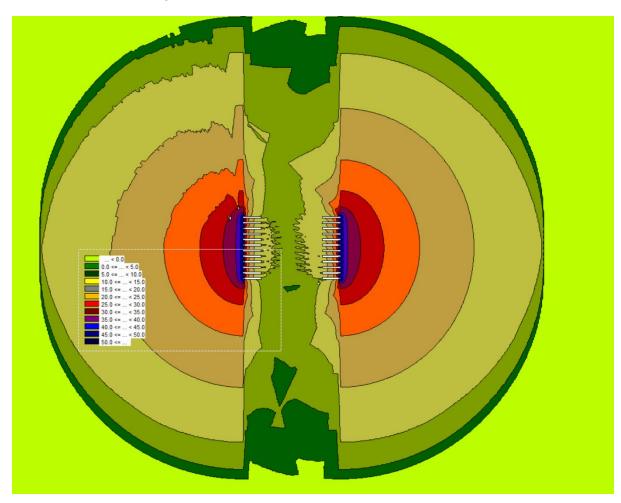
Assessments have been carried out in accordance with Local planning guidance and international assessment standards and calculation procedures.

Mitigation measures have been noted as not required, based on the current proposals resulting in noise egress levels below the prescribed intrusion noise limit.

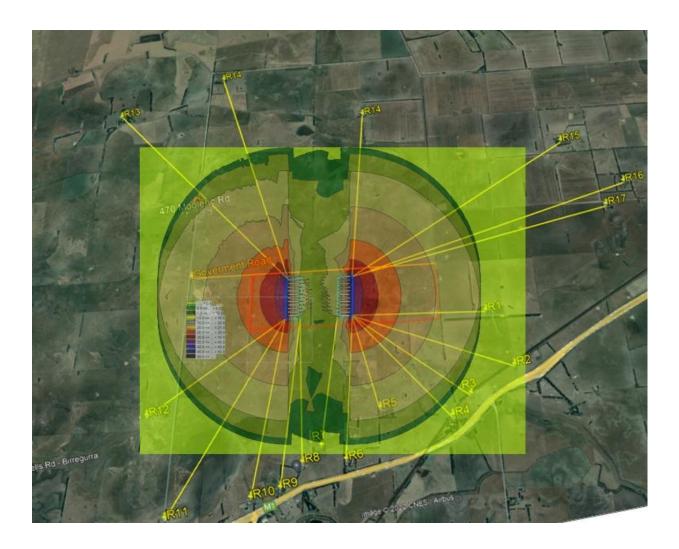
Fixed plant use are assessed to not cause an exceedance of prescriptive noise levels during operation and as a result are deemed a 'low impact' and inaudible.



Appendix – A Modelling Outputs



G2A



G**2**A

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ProTen Pty Ltd

PROJECT Mooleric Broiler Farm

PROJECT # 0132.2306

REPORT Odour Impact Assessment

11 December 2023

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Authors: Reviewed by: Project director: Version number: Version summary:	Michael Power and Grady Platz Andrew Balch Andrew Balch 4 1 - Initial draft report with a single year of modelling for client review. 2 – Updated report addressing client comments, revised farm operational assumptions and five years of modelling. 3 – Updated to address comments by EPA Victoria. 4 – Updated to address additional comments from Colac Otway Shire Council.

Report approved for issue by:

Date:

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11 December 2023

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APPENDICES

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Appendix B:	Summary of CALMET Model Configuration Parameters
Appendix C:	Evaluation of Meteorological Model Performance
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Term	Definition
Units of measurement	
Am ³ /s	actual cubic metres per second (volumetric flow rate at actual temperature and pressure)
Atm	Atmosphere (unit of air pressure)
	day
= ¥	Kelvin (unit of temperature)
km km	kilometre
km/h	kilometres per hour
Ē	metre
m/s	metres per second (velocity)
m² m3	square metres crubic metres
m³/s	cubic metres per second (volumetric flow rate)
min	minute
Nm ³ /s	normalised cubic metres per second (volumetric flow rate at 0 °C and 1 Atm)
So	degrees Celsius
ou	odour unit
rad	radians (unit of angle)
S Cm3/c	second standard a bia metres per second (volumetric flow rate at 25 °C and 1 Atm)
yr yr	אומו ממום כטטוב ווופוופי אפו זככטו מ (יטוטו וופוויב ווטיא ומופ מו בט יכי מוומ די אווון) year
Abbreviations/Definitions	
3D	three-dimensional
AWS	automatic weather station
BOM	Bureau of Meteorology
C25 C	Ine 25 th percentile concentration
C75	The 00 officiential concentration
CALMFT	A diagnostic meteorological model currently developed by Exponent Inc
CALPUFF	A Gaussian puff dispersion model currently developed by Exponent Inc.
DEM	digital elevation model
EPA	Environment Protection Authority Victoria
OER	odour emission rate
PG	Pasquill-Gifford Scheme
SRTM1	near-global 1-arc second (~30 m) Digital Elevation Model produced by the Shuttle Radar Topography Mission (SRTM1 version 3)
SRTM3	global 3-arc second (~90 m) Digital Elevation Model produced by the Shuttle Poder Tonocraphy Mission
TAPAA	The Air Pollintion Model Processific meteorological and air dispersion model
	ine All rollonomed. Trogroup Contraction and all approximates developed by the Australian Government's Commonwealth Scientific and Industrial Research Organisation (CSIRO).
Statistical terms	
IOA	Index of agreement
MAE	Mean absolute error
ME RMSE	Mean error Root Mean Sauare Frror

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AIR ENVIRONMENT 0132.2306 ProTen Pty Ltd — Mooleric Broiler Farm Odour Impact Assessment



Executive Summary

Air Environment was commissioned by ProTen Pty Ltd (ProTen) to conduct an odour impact assessment to support a Development Application for two 12 shed farm modules at the proposed Mooleric Broiler Farm.

Protection Authority (EPA) guideline, Publication 1883, Guidance for assessing odour (June 2022). This The assessment was conducted in accordance with the requirements of the Victorian Environmental guideline set outs a range of investigation pathways to provide the evidence, data and interpretation EPA requires to assess the potential of the development to cause odour nuisance in the surrounding environment. The investigation included the following:

- Level 1 odour risk assessment using the
- Duration of emissions test
- Wind direction test
- Minor source test
- Level 2 source-pathway analyses including the

.

- Hazard potential of the source
- Exposure pathway
- Sensitivity of the receiving environment
- Level 3 assessment including
- Odour dispersion modelling of the proposed development following the national Agrifutures (2021) approach
- Complaints data analyses of similar facilities
- Analysis of sensitive receptors including the distance and wind bearings from the odour sources
- Analysis of the dispersion meteorology as the site to determine the frequency of critical wind conditions.

the Oodur dispersion modelling was conducted for the five-year period 1 March 2017 to February 2022, using the well-established K-factor (Ormerod and Holmes, 2005) poultry odour emissions model, to produce using modelled was dispersion Odour shed. each TAPM/CALMET/CALPUFF model suite. fo rates emission hourly-varying

ES1. determined that predicted ground-level odour concentrations are low with impacts occurring infrequently. in Table as presented combined, sources The cumulative odour impact assessment for all

c	43800	43800	43800	43800	43800	43800
Max, ou	6.23	5.50	7.13	6.70	16.49	11.49
С99.9, ои	3.05	2.05	2.32	3.27	3.27	3.18
C ₇₅ , ou	0.01	0.00	0.00	0.00	0.00	0.00
Mean, ou	0.06	0.04	0.04	0.05	0.04	0.03
Median, ou	0.00	0.00	0.00	0.00	0.00	0.00
Receptor	RI	R2	R3	R4	R5	R6

Distribution of predicted 3-minute average ground-level odour concentrations at sensitive receptors for the Mooleric Broiler Farm, 1 March 2017 to February 2022

ESI

Table



Receptor	Median, ou	Mean, ou	С ₇₅ , ои	C _{99.9} , ou	Max, ou	c
R7	00.0	0.04	0.00	3.82	12.29	43800
R8	0.00	0.03	0.00	3.18	14.61	43800
R9	00.0	0.02	0.00	2.62	5.92	43800
R10	0.00	0.02	0.00	2.02	3.93	43800
RII	00.0	0.02	0.00	1.90	8.11	43800
R12	0.00	0.02	0.00	1.47	5.28	43800
R13	00.0	0.01	0.00	0.79	2.37	43800
R14a	00.0	0.01	0.00	1.56	5.09	43800
R14b	0.00	0.02	0.00	1.91	5.27	43800
R15	0.00	0.02	0.00	1.17	2.58	43800
R16	0.00	0.02	0.00	1.32	3.79	43800
RI7	00.0	0.02	0.00	1.81	5.10	43800
lable Notes:	C ₂₅ , C ₇₅ , and C	^{99,9} represent the 2	5 th , 75 th and 99.9	th percentile cor	C_{25} , C_{75} , and $C_{99,9}$ represent the 25 th , 75 th and 99.9 th percentile concentrations respectively.	ctively.

 C_{25} , C_{75} , and C_{999} represent the 25th, 75th and 99.9th percentile concentrations respectively. SEPP AQM is no longer in force, meaning that there is no assessment criterion for odour predictions.

introduction of cross-flow ventilation fans along the side of each shed, and also the installation of stub It is expected that under the current assumptions, the development of the two 12 shed modules at the Mooleric Broiler Farm site will cause no odour risk at nearby sensitive receptors. However, the odour detection threshold of 1 ou (not an odour impact criterion) is exceeded at all but one of the receptors with a medium or low risk of odour annoyance remaining at eight and 10 receptors respectively. Consequently, mitigation measures may be considered to help future proof the farm. Such mitigation measures may include the installation of stub stacks on the tunnel ventilation fans at the end of each shed or the stacks on the cross-flow fans. These mitigation measures have been assessed by Air Environment at other broiler farms in Victoria and determined to have a positive effect of between 15% and 62% reduction in odour impact depending upon local meteorology and distance to the receptor.

The following recommendations are made:

- the completion and commissioning of sheds at six week intevals allowing field ambient odour surveys Recommendation 1: The Mooleric 24-shed Broiler Farm would be developed in a single stage with to be conducted to assess the progressive impact of the development as sheds come online. •
- Recommendation 2: Following the field ambient odour survey program, further odour dispersion modelling would be conducted to allow the odour model to be validated (ground-truthed) against the observations.
- Recommendation 3: A detailed ambient odour assessment report, detailing the results of the ambient odour survey and model evaluation process, would be prepared for EPA and Council review. •
- Recommendation 4: In the event that the ambient odour assessment found an unacceptable level of risk of odour impact at surrounding sensitive receptor locations, the effect of installing stub stacks on the duty fans of some sheds would be modelled and assessed.
- vicinity of the farm, prior to the commissioning of the first farm module, to facilitate complaints should be Recommendation 5: An automatic weather station (AWS) be installed at a suitable location in the installed on a 10 metre mast and consider the requirements of Australian standard AS3580.14 (2014). management and provide meteorological data for ambient odour surveys. The AWS
- Recommendation 6: A further ambient odour survey program would be conducted once the entire 24-shed farm is constructed and built, to allow all impacts from the development to be assessed. •



Introduction

Development Application for the proposed Mooleric Broiler Farm. The broiler farm, which is located at 320 Mooleric Road, Ombersley, to the east of Colac in Victoria, will be comprised of two twelve-shed modules. Each broiler shed will contain 65,000 birds, providing for a total maximum number of 1,560,000 Air Environment was commissioned by ProTen to conduct an odour impact assessment to support a birds. Ventilation air from the two farm modules will be via tunnel ventilation fans located at the end of each shed. The tunnel ventilation fans for Module 1 are located on the western end of each shed, with those for Module 2 to be located on the eastern end of each shed.

Victorian Environmental Protection Authority (EPA) guideline, Publication 1883, Guidance for assessing This report details the inputs, methods and findings of an assessment of both broiler farm modules combined. The odour impact assessment was conducted in accordance with the requirements of the data and interpretation EPA requires to assess the potential of the development to cause odour nuisance in the surrounding environment. While Level 1 and 2 guideline approaches were investigated, ultimately, a Level 3 assessment was required. The key to this level 3 assessment was an odour dispersion modelling study. Notwithstanding this, other supporting evidence and data interpretation have been odour (June 2022). This guideline set outs a range of investigation pathways to provide the evidence, presented. The odour dispersion modelling followed the National AgriFutures approach and was based on the generation of a CALPUFF atmospheric dispersion model that combined the site-specific details of each developed for Australian broiler farm conditions by Ormerod and Holmes (2005), and modelled meteorology to simulate and assess the dispersion and impact of odour in the local area surrounding the site. A K-factor of 1.1 was applied to the odour emissions model, to better represent current best practice broiler shed, with odour emissions derived using the well-established K-factor odour emissions model, management and shed design for broiler sheds. This assessment has been conducted in close consultation with EPA Victoria (Principal Scientist – Odour; Senior Planning Advisor) and the Colac Otway Shire (Senior Statutory Planner).



2 Site Description

consist of twelve sheds, with each shed aligned parallel to one another in a near east – west configuration. modules' sets of fans 960 m apart and directed in opposite directions farm module, so that the Module 1 shed fans are located on the western end of each shed and the Module Each set of tunnel ventilation fans from each farm module would direct ventilation air away from the other The layout of the proposed Mooleric Broiler Farm is presented in Figure 2-1. Each farm module would 2 shed fans are located on the eastern end of each shed. This would effectively place the two farm



Figure 2-1 Proposed layout of the Mooleric Broiler Farm

infrastructure and management practices designed to reduce odour emissions The proposed ProTen Mooleric broiler farm will represent the state of the art in broiler sheds, with

This includes:

- standby generators. will be fully computer controlled and alarm monitored, with back-up power available via emergency The broiler sheds will be fully enclosed and climate controlled. The tunnel ventilation systems used
- adopted for the proposed Mooleric broiler farm provide precisely the required ventilation rate and are therefore in constant use. They do not allow odour to accumulate but rather continually emit small followed by a ventilation phase where large amounts of odour are emitted. The variable speed fans off, and therefore act in a pulsed manner, with still periods where odour can accumulate within a shed The installation of modern C170 variable speed ventilation fans. Single speed fans are either on or quantities of odour. In practice this is a significant odour mitigation measure.



- shed. In-shed humidity is therefore very well controlled, allowing relative humidity to be maintained at its 60% set point. This helps reduce the moisture content of the manure, and hence the odour accumulating at the base of the shed. Older sheds are often very humid, with relative humidities A modern cooling system will be employed, which dries air prior to cooling it and introducing it to the exceeding 90%. This leads to large odour emission rates. •
- Prior to the beginning of each growth cycle, the floor of the cleaned and disinfected shed will be covered with a six-to-eight-centimetre layer of a suitable clean and fresh bedding material such as rotavator will be used at least once a fortnight, to mix and aerate the bedding. Experience within other broiler sheds has shown that the substrate remains bone dry if it is carefully managed in this way and does not allow the conditions conducive to causing anaerobic decomposition of the poultry litter to occur. This management practice therefore significantly reduces in-shed odour concentrations and rice hulls, soft wood shavings, or chopped straw. This material acts to soak up any moisture. A subsequent odour emissions. •
 - The shed floors will be built-up above the adjacent surface level with a hard layer of compacted clay. This will ensure that moisture cannot seep into the shed from below. •
- Drinker technology equivalent to industry best practice will be installed and maintained to minimise to ensure that it is dry and drinker leakages have not occurred. Where practicable any wet areas exceeding two square metres will be removed and replaced with dry material on no less than a daily the formation of wet letter. Litter monitoring will be undertaken typically three to four times each day basis. •
- In other farms it is frequent practice to maintain a manure pile onsite. When this gets wet it often becomes a significant odour source. When manure is removed from each Mooleric broiler farm shed, at the end of each eight-week growth cycle, it will be loaded directly onto a truck using bobcats rather than being stockpiled onsite. The filled truck will be covered and the manure will immediately be transported offsite for disposal at a composting facility, or sold as a commercial raw product. This will thus remove this odour source. Wherever possible handling of poultry litter will be avoided during adverse (wet or windy) weather conditions. The shed ventilation system will not be used during the litter removal process. •
 - There will be no bio bins onsite for the disposal of bird morts, as these often become a significant odour source. Instead, morts will be collected daily and will be placed in a freezer maintained at -18 °C. Frozen morts will be removed on a weekly basis for biosecurity reasons. The freezer site will be maintained in a clean condition and is designed to be easy to clean in the event of a spill. •
 - Feed will be sourced from suppliers known to be capable of producing an assured quality and will be appropriately stored to minimise feed-sourced odour. •



Legislative Requirements, Context and Air Quality Assessment Criteria က

3.1 Draft separation distance guideline

are currently updating their separation distance guideline (Publication 1518), which provides separation distances for industrial residual air emissions. The new guideline, Publication 1949, is in draft form and is currently being revised in response to public submissions. In the case of broiler farms, the Guideline refers to national guidelines recently published by Agrifutures ("Planning and environmental guideline for establishing meat chicken farms" Guide 1 Assessment Guide, November 2021) and to a new EPAV guidance document for assessing odour (Publication 1883, Guidance for assessing odour, June 2022). Draft Separation Distance EPAV

3.2 National guideline for meat chicken farms

2021) provides detailed guidance for establishing and managing meat chicken farms. Appendix A of the report The Planning and Environment Guideline for Establishing Meat Chicken Farms (Agrifutures, establishes a three-tier approach for assessing community amenity impacts from broiler farms:

- Tier 1 provides the following minimum fixed separation distances between new or expanding farms and sensitive land uses:
- 500 m between the impact source and any land-use zone that is not compatible with the development (e.g., residential, rural residential).
- neighbouring houses) located on land that is compatible with the development (e.g. on land 250 m separation distance between the impact source and any sensitive land use (e.g., designated rural, farming or similar).

These are provided for use where state government departments and agencies, and individual local governments, do not specify other separation distances, and apply in all cases regardless of distances calculated under Tiers 2 or 3.

- Tier 2 utilises an 'S-Factor' formula to calculate an appropriate separation distance based on:
- Farm size, (number of birds/1000)
- Sensitive land-use factor (S1)
- Surface roughness factor (S2)
- Terrain weighting factor (S3)
- Locality/climate factor (S4)
- Optional wind frequency factor (S5).

The S-Factor separation distance formula only applies to farms housing less than 600,000 birds.

estimated for each hour of the modelling period using emission models. Appendix B of the guideline Tier 3 utilises a plume dispersion modelling approach, where odour and dust emissions can provides detailed guidance on the use of the emissions and dispersion models. •

3.3 EPAV guidance for assessing odour

The Guidance for Assessing Odour (EPA Victoria, 2022) presents a range of tools used to assess risks associated with offensive odour. The tools are designed to provide multiple independent lines of evidence to support a unified assessment of odour risk. Three levels of assessment are provided, with their use depending on the scale and complexity of the scenario being examined.

Level 1 assessment acts as a gateway, containing the following three tests:

	-
 Duration of emissions test 	
 Wind direction test 	
 Minor source test. 	
Proposals can be assessed at Level 1 if they have a medium or higher odour potential.	Proposals can be assessed at Level 1 if they have a low odour potential and surrounding industries have a medium or higher odour potential.
 Level 2 assessment requires the proponent to gather inform source, the effectiveness of the exposure pathway, and the using the source-pathway-receiving environment tool (SPR) 	Level 2 assessment requires the proponent to gather information on the level of hazard of the odour source, the effectiveness of the exposure pathway, and the sensitivity of the receiving environment using the source-pathway-receiving environment tool (SPR).
 Level 3 assessment provides detailed risk as where the other levels of assessment have be the level of odour risk. Where possible, the L evidence that support each other. The followi their use may be limited at greenfield sites: 	Level 3 assessment provides detailed risk assessment tools for complex industries and issues, or where the other levels of assessment have been exhausted due to insufficient evidence to determine the level of odour risk. Where possible, the Level 3 approach adopts multiple, independent lines of evidence that support each other. The following tools are available for use as appropriate, however their use may be limited at greenfield sites:
 Comparisons with similar operations. 	ons.
 Risk assessment using field odour surveillance data. 	ur surveillance data.
 An assessment of complaints. 	
 Odour complaint case study. 	
Community odour surveys/questionnaires and odour diaries.	ionnaires and odour diaries.
 The use of dispersion modelling. 	
3.4 Approach for this assessment	nt
Following the <i>Guidance for Assessing Odour</i> (EP/ conducted:	Following the <i>Guidance for Assessing Odour</i> (EPA Victoria, 2022) requirements, the investigations were conducted:
 Level 1 odour risk assessment using the 	Je
 Duration of emissions test 	
 Wind direction test 	
 Minor source test 	
 Level 2 source-pathway analyses including the 	Iding the
 Hazard potential of the source 	
 Exposure pathway 	
 Sensitivity of the receiving environment 	ironment
 Level 3 assessment including 	
 Odour dispersion modelling of the pro (2021) approach 	Odour dispersion modelling of the proposed development following the national Agrifutures (2021) approach
 Complaints data analyses of similar facilities 	imilar facilities
Analysis of sensitive receptors including the d	Analysis of sensitive receptors including the distance and wind bearings from the odour sources
 Analysis of the dispersion meteorology as conditions. 	igy as the site to determine the frequency of critical wind
	18
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4 Existing Environment

4.1 Modelling domain

The TAPM and CALMET meteorological models, and the CALPUFF dispersion model, each require the spatial variation in terrain height and land use classification to be defined over their respective modelling domains.

Terrain data for the region was extracted from the near-global 1-arc second (~30 m) Digital Elevation Model (DEM) produced by the Shuttle Radar Topography Mission (SRTM1 version 3). This data was resampled onto the 200 m CALMET meteorological grid. The DEM, covering the entire CALMET modelling domain is illustrated in Figure 4-1.

The Mooleric Broiler Farm site is located 21 km east-northeast of Colac in Victoria, at a height of approximately 120 m above sea level. The region is predominantly defined by flat grassland and paddock, with one hill (Mt Gellibrand) to the north-northwest of the site, which rises to 250 m above sea level.

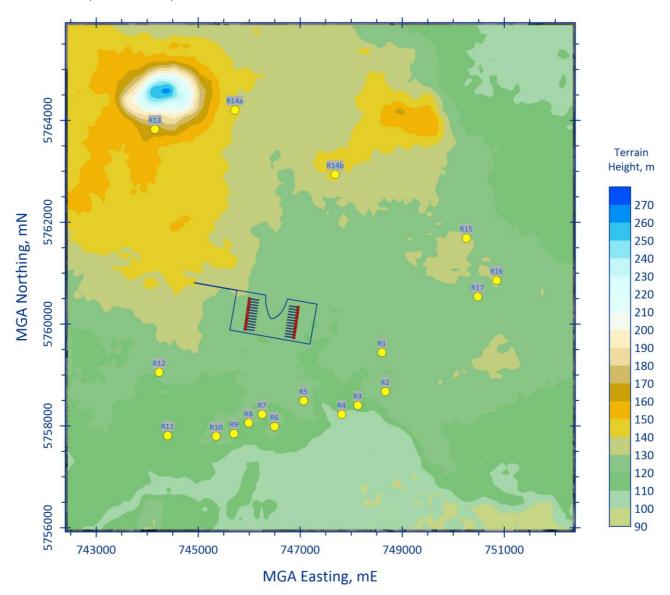


Figure 4-1 Digital elevation model of the region surrounding the Mooleric broiler farm



The land use classification for the region, illustrated in Figure 4-2, was extracted from the Australian Collaborative Land Use and Management Program (ACLUMP). The predominant land use of the region is cropland and pasture.

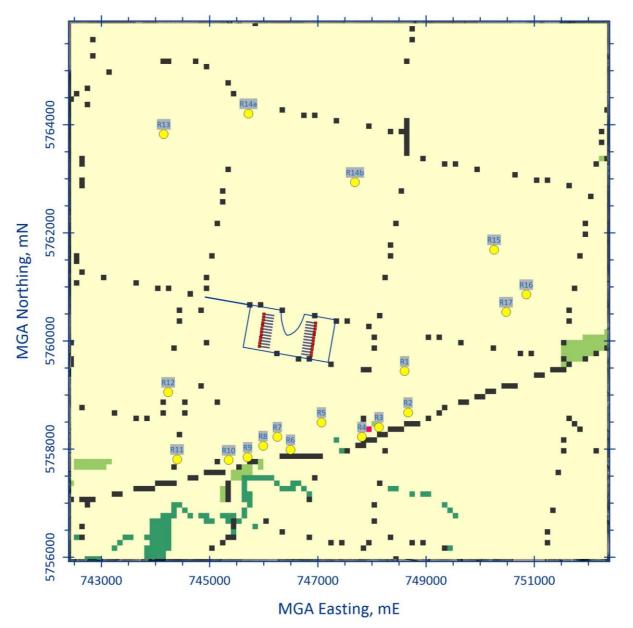




Figure note: Land use is defined for each 200 m grid cell using the United States Geological Survey (USGS) classification system, where: Red = Residential (USGS Class 11)

Grey = Transportation, Communications, and Utilities (USGS Class 14) Pale Yellow = Cropland and Pasture (USGS Class 21) Light Green = Mixed Rangeland (USGS Class 33) Dark Green = Mixed Forest (USGS Class 43)



5 Emissions Inventory

5.1 The K-factor odour emissions model

model developed by Pacific Air and Environment (PAE) and described in Ormerod & Holmes (2005) and PAE Holmes (2011). The model is based on relationships between a standardised odour emission rate Odour emissions were developed for the modelling assessment using the poultry farm odour emissions (OER), shed ventilation rate (V), and a shed design and management scaling factor (K), that was developed through a series of odour emission measurements from poultry farms. Equation 1, referred to as the K-factor odour emissions model, which is derived from these relationships, allows shed OER to be determined at any point in the growth cycle, where:

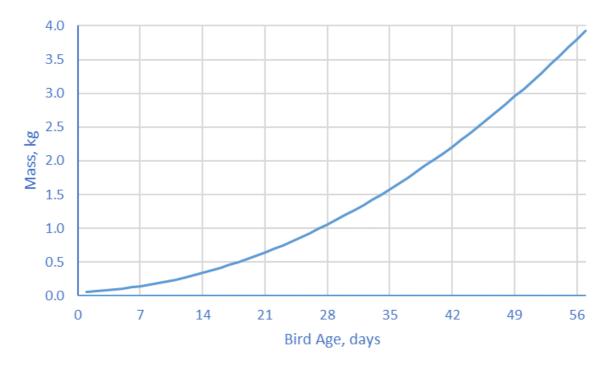
- OER is the predicted odour emission rate for a poultry farm shed (ou.m³/s)
- K is a scaling factor between zero and six representing the shed's design and management
- A is the shed floor area (m²)
- D is the average bird density (kg/m^2) and
- V is the shed ventilation rate (m³/s).

$$ER = 0.025 * K * A * D * V^{0.5}$$
 Eq. 1

of these can influence odour emissions. The K-factor represents an attempt to quantify this effect. At the time the K-factor odour emissions model was developed, new broiler farms conforming to best practice Broiler farms can vary markedly in relation to shed design, infrastructure, and management practices. All were attributed a K-factor of 2 ± 10% as appropriate (Ormerod & Holmes, 2005; PAE Holmes, 2011). In consultation with the project proponent and development planning consultant, and based on the modern design and management practices of the proposed farm modules, a K-factor value of 1.1 was adopted to more closely reflect the lower odour risk.

the floor area (m^2). Total bird mass is given as the product of the number of birds in the shed at any given point in the growth cycle, and the estimated mean bird weight according to batch age. The Ross 308 performance tables, shown in Figure 5-1 and Equation 2, provide the growth function used in this study, The average bird density, D, is calculated at any given time based on the total bird mass (kg), divided by where weight is in kilograms and age is in days.







Weight,
$$kg = \frac{(1.1118 * age^2 + 4.6295 * age + 55.6)}{1000}$$
 Eq. 2

The shed ventilation, as a percentage of the maximum ventilation rate, is calculated using the data in Table 5-1. It is calculated based on the bird age and the difference between the ambient and target shed temperatures. Ventilation rate increases with both bird age and temperature difference. PAE Holmes (2011, p.23) provide an indicative maximum ventilation rate for meat chicken farms of 10 m³/hr/bird.

Table 5-1 Shed ventilation as a percentage of maximum ventilation

Bird age (weeks)	1	2	3	4	5	6	7	8
Temperature above target (°C)1		Ventilo	ation rate	(as a perc	entage o	f the max	imum)	
< 1	1.28	2.55	5.11	7.66	9.79	11.49	17.03	17.03
1	1.28	12.50	12.50	25.00	25.00	25.00	25.00	25.00
2	1.28	25.00	25.00	37.50	37.50	37.50	37.50	37.50
3	1.28	37.50	37.50	50.00	50.00	50.00	50.00	50.00
4	1.28	37.50	37.50	50.00	50.00	50.00	50.00	50.00
5	1.28	37.50	37.50	50.00	50.00	50.00	50.00	50.00
6	1.28	37.50	37.50	62.50	75.00	75.00	75.00	75.00
7	1.28	37.50	37.50	62.50	75.00	75.00	87.50	100.00
8	1.28	62.50	62.50	62.50	75.00	75.00	100.00	100.00

Table note:

¹Ambient temperature minus the target effective temperature within the shed.



The target effective temperature within each shed is calculated using bird age. Typical target temperature relationships are presented in Figure 5-2.

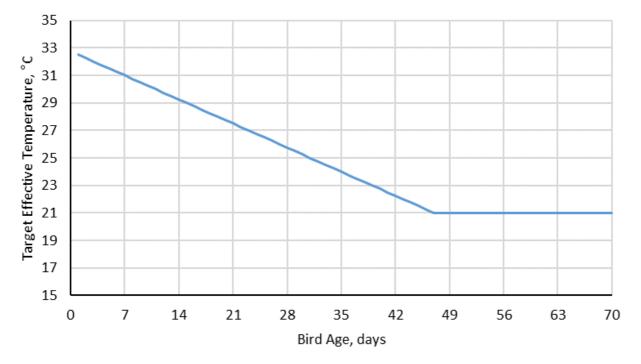


Figure 5-2 Typical target shed temperature with batch age (PAE Holmes, 2011)

The K-factor odour emissions model for broiler farms was coded into a versatile Python script allowing hourly varying odour emission files to be developed for each odour source in response to detailed model configuration options. The script was configured to direct all odour emissions to the tunnel ventilation fan sources for each shed.

The following generic information was configured for each scenario:

- Odour emissions from each source estimated in ou/s
- Application of a 1.821 scaling factor to convert emissions (and therefore model predictions) from an hourly basis to a 3-minute peak basis
- Use of hourly-varying temperatures extracted from the TAPM/CALMET meteorological model for the closest CALMET grid cell between Modules 1 and 2
- Shed width of 18.7.0 m
- Shed length of 176 m
- Shed separation of 36 m
- Shed height of 4.57 m
- Configuration of a single volume source per shed to simulate tunnel ventilation fan emissions, located 7.5 m from the west (Module 1) or east (Module 2) of each shed
- Volume source release height of 2.285 m (half shed height)
- Initial horizontal plume spread for volume sources (sigma Y₀) of 4.349 m
- Initial vertical plume spread for volume sources (sigma Z₀) of 1.063 m
- All sheds aligned at an angle of 8.3° from True North

1	

- 65,000 birds placed per shed
- Cycle length of 53 days comprising 42 days of rearing followed by an 11-day shed cleanout and disinfection period
- Four adjacent sheds filled per day
- Bird weights calculated using the Ross 308 Performance Tables
- 50% of birds removed on Day 32 and the remainder removed on Day 42 of each shed's respective cycle
- Maximum shed ventilation rate of 10 m^3 /hour/bird
- K-factor scenario of 1.1 for modern broiler farms.
- Selection of the 'typical' target temperature profile.

The odour emissions model was configured to characterise emissions from a total of twenty-four sheds with twelve sheds per module.

5.2 Bird numbers

Each of the 24 sheds, spread across the two farm modules, can hold 65,000 birds. The capacity of each 12-shed module is therefore 780,000 birds, with the entire farm able to accommodate 1,560,000 birds.

are presented in Figure 5-4. Total bird numbers for each module and for the entire two-module farm are It was assumed that four sheds are filled per day, taking three days to fill each farm module. A further assumption is that the two farm modules are offset from one another in the 53-day cycle. Sheds 1 to 4 of Module 1 were assumed to be filled on Day 1, with the equivalent Module 2 sheds commencing filling on Day 27. Each shed within a given module is therefore at a similar stage of the cycle, however the two modules will each differ markedly in stage. The total number of birds present in the entire two-module farm varies over time from 780,000 to 1,556,000, with an average of 1,093,965 birds. The time varying bird numbers for Module 1 are presented in Figure 5-3 and the time varying bird numbers for Module 2 presented in Figure 5-5. Careful examination of Figure 5-3 to Figure 5-5 shows how Module 1 and 2 bird numbers are staggered in time. The five-year modelling period commences on Day 1 for Module 1, Sheds 1 to 4, with the Module being fully filled after three days. In contrast, Sheds 1 to 4 of Module 2 commence their first full cycle on Day 27.

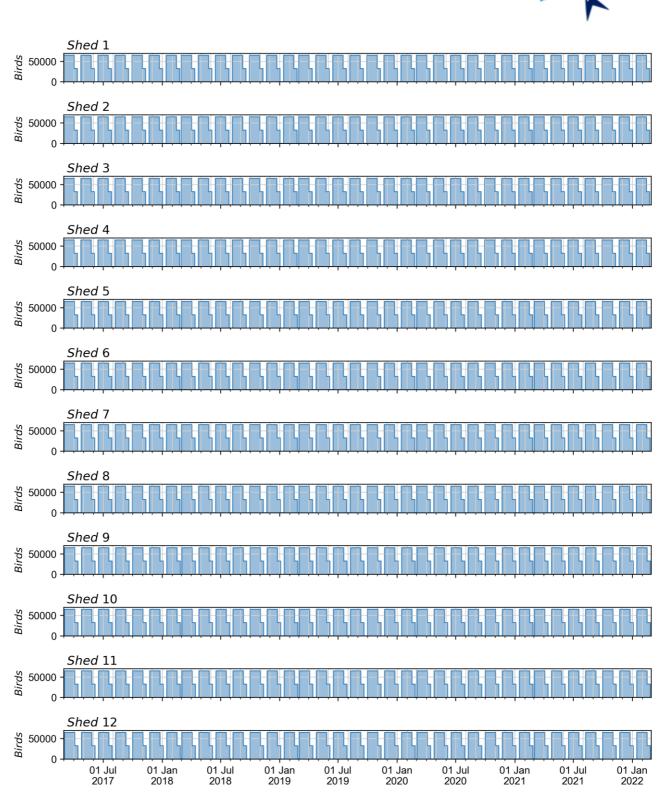


Figure 5-3 Time varying bird numbers for Module 1 (65,000 birds placed per shed)

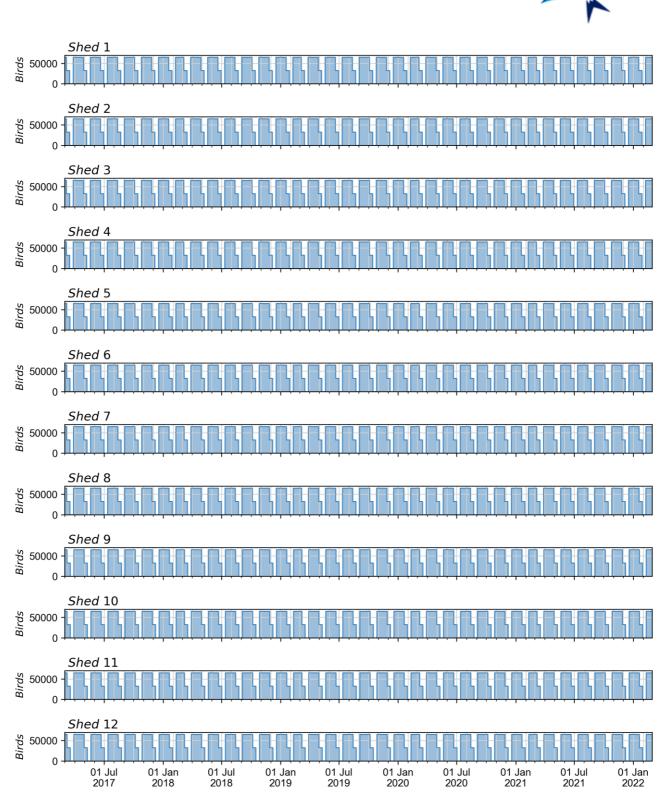


Figure 5-4 Time varying bird numbers for Module 2 (65,000 birds placed per shed)



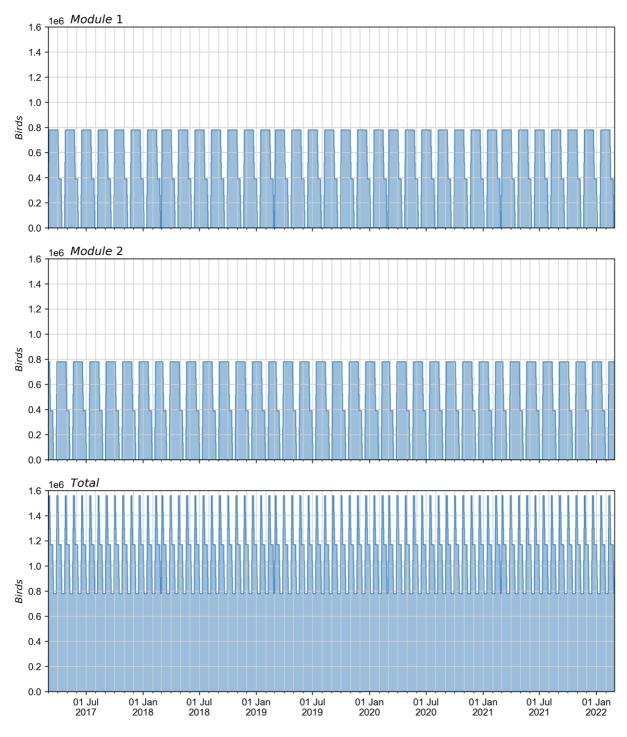


Figure 5-5 Time varying total bird numbers for Modules 1 and 2, and the entire farm



5.3 Odour emission rates

The range of total odour emission rates for all sources combined are summarised in Table 5-2.

Range of total odour emission rates for all sources 5-2 Table

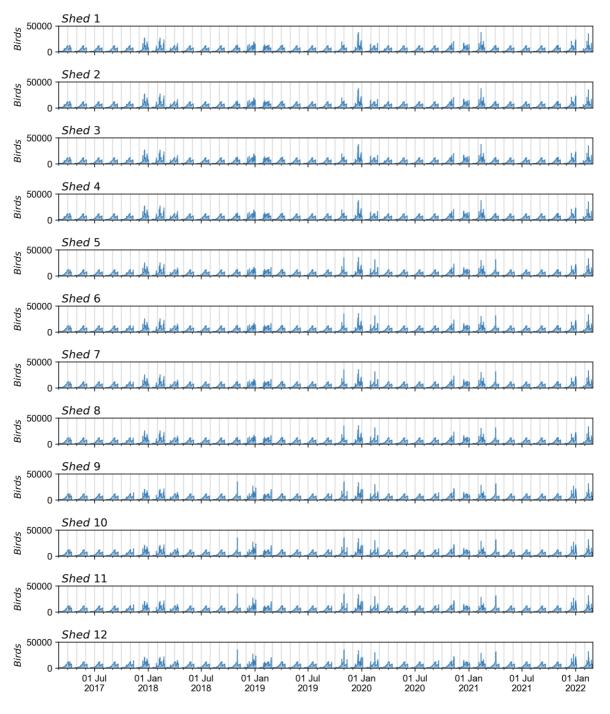
Ċ	Одог	Odour emission rate, ou.m ³ /s	m³/s
source	Minimum	Average	Maximum
Module 1 Shed 1	0	3803	37559
Module 1 Shed 2	0	3803	37559
Module 1 Shed 3	0	3803	37559
Module 1 Shed 4	0	3803	37559
Module 1 Shed 5	0	3804	35618
Module 1 Shed 6	0	3804	35618
Module 1 Shed 7	0	3804	35618
Module 1 Shed 8	0	3804	35618
Module 1 Shed 9	0	3811	35078
Module 1 Shed 10	0	3811	35078
Module 1 Shed 11	0	3811	35078
Module 1 Shed 12	0	3811	35078
Module 2 Shed 1	0	3735	31743
Module 2 Shed 2	0	3735	31743
Module 2 Shed 3	0	3735	31743
Module 2 Shed 4	0	3735	31743
Module 2 Shed 5	0	3741	41505
Module 2 Shed 6	0	3741	41505
Module 2 Shed 7	0	3741	41505
Module 2 Shed 8	0	3741	41505
Module 2 Shed 9	0	3752	41505
Module 2 Shed 10	0	3752	41505
Module 2 Shed 11	0	3752	41505
Module 2 Shed 12	0	3752	41505
Total	30897	90585	452011

the time of the first pick (Day 32), gradually rising again with time until the final pick (Day 42) when the The respective time-varying odour emissions from each broiler shed are shown in Figure 5-6 and Figure 5-7. The total time-varying odour emissions released from Modules 1 and 2, and the combined emissions from both modules are shown in Figure 5-8. Odour emissions are shown to follow a regular 53-day cycle, with just over six full cycles per year. Odour emissions gradually build up over time, suddenly reducing at remaining birds are removed. Odour emissions are zero during the shed cleanout/disinfection period.

The PEL K-factor method assumes that the required shed ventilation rate increases with the difference between the target in-shed temperature and ambient air temperature, with greater ventilation rates required during hot days. It is assumed that the odour concentration within each shed remains relatively constant, changing only with day number and bird mass, with increases in ventilation rate consequently



increasing shed odour emissions. It may be that increasing shed ventilation rate serves to dilute the ambient air within each shed, meaning that the "hot day spikes" are less pronounced in reality. Either way, the plots show that the Publication 1883 odour guideline Level 1 duration of emissions test is not met, as all farm sheds emit odour for more than 200 hours per year.







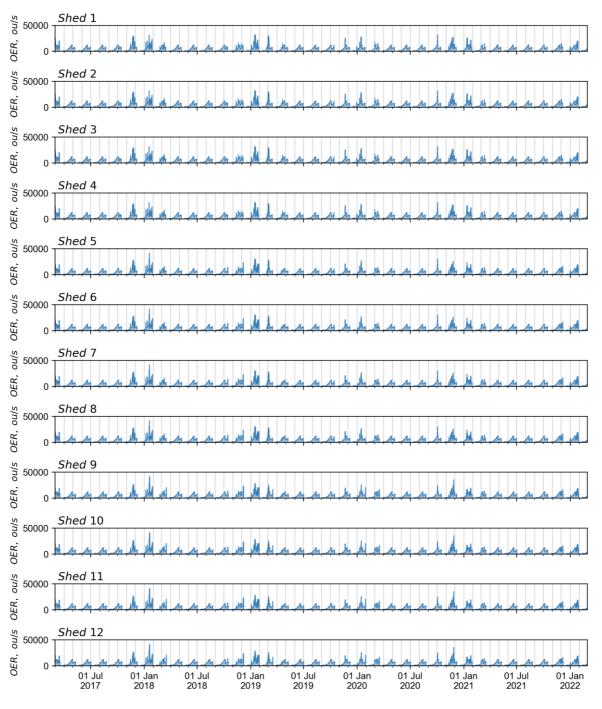


Figure 5-7 Time varying odour emission rates for Module 2 sheds



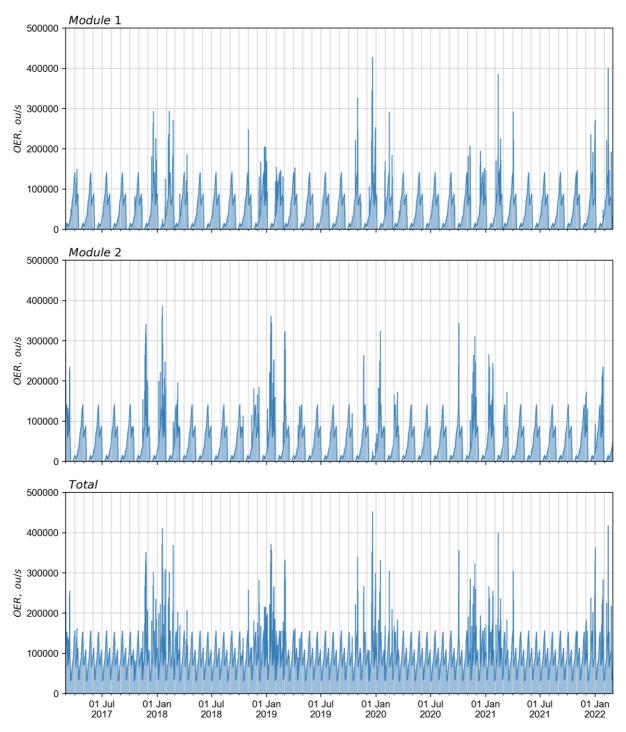


Figure 5-8 Time varying total odour emission rates for Modules 1 and 2, and the entire farm

A cumulative frequency distribution plot (Figure 5-9) was prepared showing the distribution of odour emission rates at three different scales:

- Odour emissions from a single shed (Shed 1, Module 1)
- Odour emissions from a single module (Module 1), and
- Odour emission from the entire two-module farm.



Regardless of scale, each distribution has a long tail indicating the rarity of peak emission events. These infrequent events occur when the maximum total bird mass within a shed coincides with hot weather conditions.

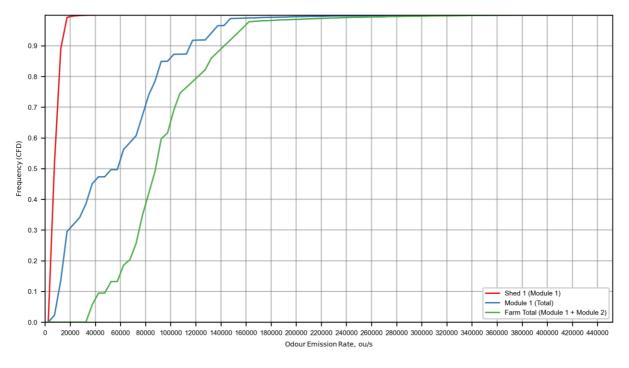


Figure 5-9 Cumulative frequency distribution of odour emissions from a single shed; a single module; the entire ProTen Mooleric Broiler Farm



Dispersion Modelling and Impact Assessment Method •

Selection of a representative period of meteorology 6.1

modelling assessment. A detailed inter-annual meteorological variability analysis of the data used in the The five-year period 1 March 2017 to 28 February 2022 was selected by Air Environment for use in the model simulation was conducted and is presented in full in Appendix A. Meteorological observations were obtained for the Bureau of Meteorology (BOM) automatic weather station (AWS) located at Mt Gellibrand. The BoM Mt Gellibrand station (site number 090035) is located approximately 4.9 km to the north-northeast of the broiler farm site.

cyclic climatic phenomenon, e.g., the El Niño Southern Oscillation (ENSO), significantly affects the meteorology of consecutive summer seasons. The use of the March to February sequence of months The selection of months based on a conventional calendar year (1 January to 31 December) separates the summer season into two periods, nine months apart. This can be critical in some instances where provides for the inclusion of complete seasonal periods and acknowledges that the ENSO trend tends to build annually from approximately June through to March. During the autumn period between March and May, ENSO tends to transition towards the neutral state before the next cycle begins.

6.2 Meteorological modelling

region for direct input to the CALMET model. CALMET was then used to downscale the three-dimensional regional meteorological profile developed by TAPM incorporating the local geophysical environment, i.e., topography and land use variables. The CALMET output file is formatted for use in the CALPUFF stage model suite. TAPM was run to develop a three-dimensional simulation of the atmosphere in the The meteorological file used in the air dispersion model was developed using the TAPM-CALMET twodispersion model.

the CALPUFF Modeling System for Inclusion into the Approved Methods for the Modeling and All models were configured in consideration of the Generic Guidance and Optimum Model Settings for Assessment of Air Pollutants in NSW, Australia (TRC Environmental Group, 2011).

6.2.1 TAPM prognostic meteorological model

The Air Pollution Model (TAPM) was developed by CSIRO for use in simulating regional meteorological and air pollution events. TAPM is a coupled mesoscale prognostic meteorological and air dispersion modelling system designed to operate on a standard desktop computer. The model requires synoptic meteorological information inputs for the region of interest that are generated analysed and validated synoptic weather forecast data at a resolution of approximately 75 km and at elevations of between 100 m and 5,000 m above the surface, with regionally-specific terrain, land use, soil moisture content and soil type to simulate the meteorology of a region as well as at a specific location. by a global model similar to the large-scale models used to forecast the weather. TAPM incorporates reLandcover data for TAPM are sourced from the US Geological Survey, Earth Resources Observation 30-second at Center Distributed Active Archive Center (EDC DAAC) (approximately 1 km) grid spacing. Systems (EROS) Data

TAPM (version 4.0.5) was configured as follows:

- Modelling for the five-year period 1 March 2017 to 28 February 2022, with each month being modelled within a separate TAPM simulation
- 49 x 49 grid point domain



- Outer grid of 30 km (Nest 1) and nesting grids of
- 10 km (Nest 2)
- 3 km (Nest 3)
- 1 km (Nest 4)
 300 m (Nest 5)
- 30 vertical levels from the surface up to 8,000 m above the ground
- Grid centred over the Mooleric Broiler Farm (Latitude 38° 27' 30" S, Longitude 143° 81' 9" E; 746393 mE, 5759919 mN MGA)
- Terrain and land use data for Nests 1 to 3 based on Geoscience Australia 9 second (approximately 300 m) terrain and land use data (TAPM default terrain and land use)
- Terrain heights for the inner 1000 m nest (Nest 4) and 300 m nest (Nest 5) downloaded from SRTM3 global 90 m (3 arc-second) dataset
- Land cover data for the inner 1000 m nest (Nest 4) and 300 m nest (Nest 5) was customised using the Australian Collaborative Land Use and Management Program (ACLUMP) database
- Default options selected for advanced meteorological inputs
- No assimilation of surface or upper air meteorological data.

The data generated by TAPM was processed and formatted by the CALTAPM post-processor to produce a meteorological dataset (3D.DAT) suitable for direct use within CALMET.

CALMET diagnostic meteorological pre-processor 6.2.2

the initialised with the gridded three-dimensional prognostic output from other meteorological models such CALMET is an advanced non-steady-state diagnostic three-dimensional meteorological model with read hourly meteorological data as data assimilation from multiple sites within the modelling domain but can also be <u>.</u> micro-meteorological modules for overwater and overland boundary layers. The model CALMET can system. for the CALPUFF modelling pre-processor meteorological as TAPM. CALMET (version 6.5.0) was used to simulate meteorological conditions in the region. The TAPM prognostic grid data was used by the CALMET diagnostic model as 'initial guess' fields, which were then adjusted to account for the kinematic effects of terrain, slope flows, blocking effects and three-dimensional divergence minimisation. The TAPM-CALMET coupled approach improves the mesoscale prognostic The CALMET output provides a complete set of three-dimensional wind fields, temperature profiles and other important meteorological variables throughout the atmosphere for application in the simulation of simulation generated by TAPM with the refined local-scale land use and terrain capabilities of CALMET plume dispersion.

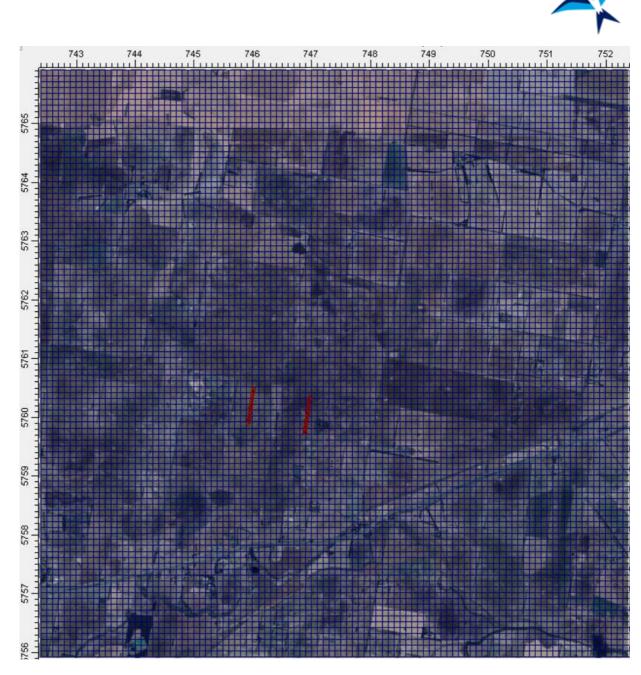
CALMET was configured as follows:

- Domain area of 100 by 100 grid points at 100 m spacing, centred over the Mooleric Broiler Farm (Figure 6-1).
- by the Shuttle Radar Topography Mission (SRTM), a project of the National Aeronautics and Space Terrain data was based on the near-global 3-second (~90 m) Digital Elevation Model (DEM) produced Administration (NASA) Jet Propulsion Laboratory (JPL) program

7-

- Land use information was based on the ACLUMP database. Geographic Information Systems (GIS) Techniques, using QGIS, were used to calculate the dominant land use for each CALMET grid for inclusion within the CALMET geo.dat file. •
- Modelling for the five-year period 1 March 2017 to 28 February 2022, as modelled with TAPM, with each year (1 March to 28 February) being modelled within a separate CALMET simulation. •
- Twelve vertical levels set at 20 m, 60 m, 100 m, 150 m, 200 m, 250 m, 350 m, 500 m, 800 m, 1600 m, 2600 m and 4600 m.
- No Obs mode. Prognostic wind fields generated by TAPM input as 3D.DAT file for use as initial guess fields. No local surface weather station observations were used as data inputs.
- Mixing height parameters all set as default.
- No extrapolation of surface wind observations.
- Step 1 wind field options include: divergence minimisation, Froude adjustment to a critical Froude number of 1, and slope flows.
- Coriolis parameter set to 0.00009 rad/s, as calculated for the region.
- Terrain radius of influence set at 9 km, based on the method defined in the Generic Guidance and Optimum Model Settings for CALPUFF (TRC Environmental Group, 2011).
- CALMET parameters set based on recommendations from the Generic Guidance and Optimum Model Settings for CALPUFF.
- All other options set to default.

A summary of the CALMET configuration options selected is provided in Appendix B.





6.2.3 Meteorological model performance evaluation

To assess model performance, observations collected at the BOM AWS site at Mt Gellibrand during the selected modelling period were compared with the meteorological data generated for that location by the TAPM meteorological modelling system. The model performance evaluation shows that the meteorological datasets generated by TAPM are considered to be mostly representative and are suitable for use in dispersion modelling. Details of the model evaluation are presented in full in Appendix C.

Air temperature and relative humidity were each well-predicted, meeting their respective statistical evaluation benchmarks. The distribution of each meteorological parameter was also well-simulated on both TAPM grids, and their respective Quantile-Quantile plots each falling within the $\pm 50\%$ criteria for acceptable model performance. However, wind speed and direction were less well-predicted, with the model over-predicting the frequency of light winds when compared to the observations. This means that the model has the potential to over-predict ground-level odour concentrations and can be considered conservative.



The TAPM 300 m predictions were therefore determined to be non-ideal but acceptable for use within a refined CALMET (no observations [NOOBS]) simulation.

6.3 Analysis of dispersion meteorology

CALMET meteorological predictions were extracted from the closest model grid point between the This section describes the meteorology used in the CALPUFF model that is important to the dispersion of air pollutants and the generation of air quality impacts in the region surrounding the broiler farm. proposed sheds (grid point 41, 43; 746452 mE, 5760165 mN).

6.3.1 Wind speed and direction

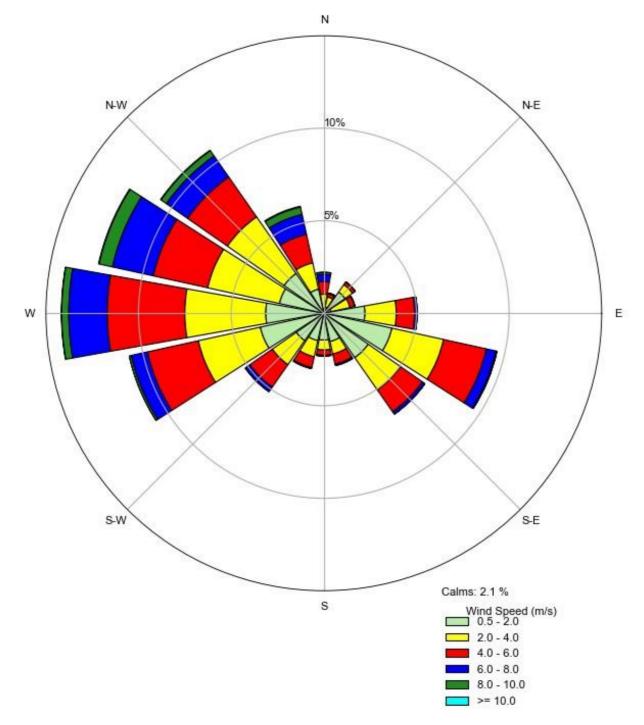
Wind speed and wind direction are important meteorological parameters that influence the dispersion of air pollutants. The annual, diurnal and seasonal distributions of winds predicted at the broiler farm by the TAPM/CALMET meteorological modelling system for the five-year period 1 March 2017 to 28 February 2022 are presented as wind rose diagrams in Figure 6-2, Figure 6-3, and Figure 6-4, respectively. The total wind rose (Figure 6-2) shows that the prevailing winds arrive from the west and east sectors. Winds within the southwest to northwest guadrant account for 53% of all winds, whilst winds within the northeast to southeast quadrant account for a further 25% of winds.

occurring on only 2.4% of occasions. They almost exclusively arrive from the west to north-northwest The lightest winds, those between 0.5 and 2 m/s, occur with a frequency of 31% and may occur from any direction. The strongest winds, those greater than 8 m/s (a fresh breeze and above), are infrequent, sectors (1.6%) and never arrive from the easterly quadrants.

morning, afternoon, evening, and night with the exception of a slight increase in south-easterly winds during the evening and night. In addition, the average wind speed reduces noticeably during the evening The diurnal wind distribution is presented in Figure 6-3 and shows little variation in direction between the and nighttime.

from the west-northwest section (53%). Winds during the other three months are more broadly distributed The seasonal wind distributions displayed in Figure 6-4 shows wintertime winds arriving predominantly around the east and west sectors. Winds arriving from the north or the south are infrequent in all seasons.









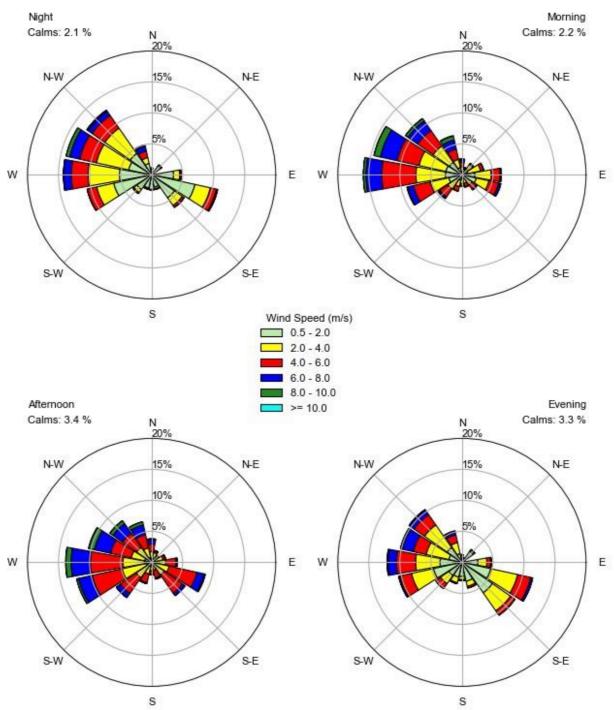


Figure 6-3 Diurnal distribution of winds at the broiler farm, 1 March 2017 to 28 February 2022



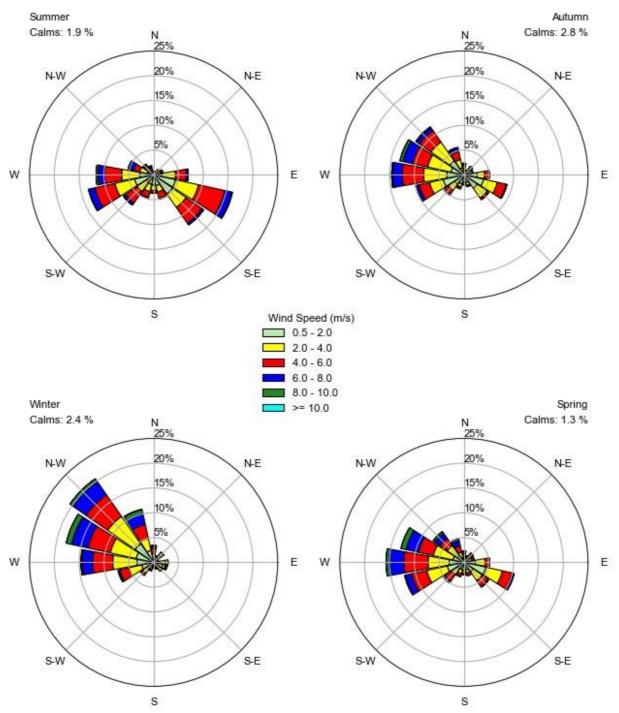


Figure 6-4 Seasonal distribution of winds at the broiler farm, 1 March 2017 to 28 February 2022

The mean annual, seasonal and diurnal wind speeds and proportion of calms are presented in Table 6-1.



Annual, seasonal and diurnal mean wind speeds at the broiler farm, 1 March 2017 to 28 February 2022 Table 6-1

peed Calms (%)	2.1	1.9	2.8	2.4	1.3	3.4	3.3	1.0	0.9
Mean Wind Speed (m/s)	3.4	3.4	3.0	3.5	3.5	2.6	3.7	4.4	2.8
Period	Annual	Summer	Autumn	Winter	Spring	Night: Midnight to 6am	Morning: 6am to Midday	Afternoon: Midday to 6pm	Evening: 6pm to midnight

The modelled profiles of wind speed and direction have also been presented graphically as heat maps in Figure 6-5, to illustrate the monthly and hourly trends in wind conditions.



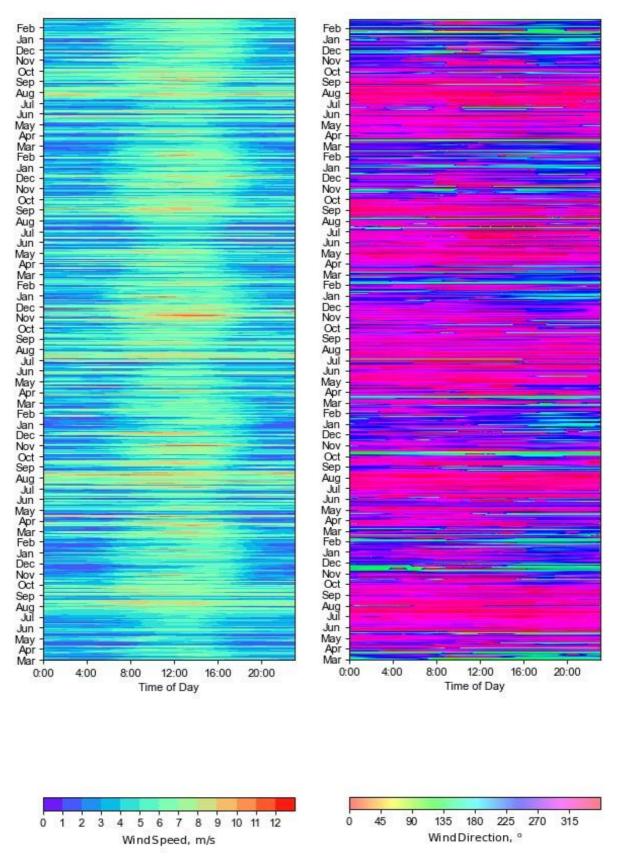


Figure 6-5 Predicted monthly and hourly profiles of wind speed and direction at the broiler farm, 1 March 2017 to 28 February 2022



6.3.2 Atmospheric stability

The flow of air in the planetary boundary layer (lowest one kilometre of the atmosphere) is an important turbulence, which in turn affects the dispersion of the plume. Turbulence describes the vertical and horizontal motion of air and how a plume may be spread out and diffused. As turbulence increases, so does the rate of plume diffusion. As turbulence decreases, this diffusion is limited resulting in higher factor in the dispersion of air pollutants and their effect on the population. This flow is affected by pollutant concentrations in the plume.

above it is warmed, causing it to rise. Mechanically driven turbulence is generated by frictional effects as wind passes over the surface or by wind shear, produced at the boundary of two coinciding layers of wind Turbulence is driven by thermal and mechanical influences as the atmosphere interacts with the land surface. Thermally driven turbulence is generated by convection as the sun heats the ground and the air or two different air masses.

a term applied to the properties of the atmosphere that govern the acceleration of the vertical motion of an air parcel. The acceleration is positive in an unstable atmosphere (turbulence increases), zero when the atmosphere is neutral, and negative (deceleration) when the atmosphere is stable (turbulence is plume, released into it will rise, fall, disperse or remain relatively still. If the plume is warmer than the surrounding air, it will tend to rise, while a plume that is cooler than the atmosphere will sink. Wind, or horizontal air movement, affects mechanical turbulence and therefore also affects atmospheric stability. measured by the environmental lapse rate or vertical temperature profile of the atmosphere. Stability is suppressed). The vertical temperature gradient in the atmosphere governs whether a parcel of air, or A key indicator of thermally driven turbulence (or convection) in the atmosphere is stability, which is As the wind speed increases, atmospheric stability will tend toward neutral conditions.

A (highly unstable or convective), B (moderately unstable), C (slightly unstable), D (neutral), E (slightly stable) and F (stable). his is known as the Pasquill-Gifford stability classification and is widely used to Atmospheric stability is commonly defined in terms of six main stability classifications designated as describe the turbulent state of the atmosphere.

.± Unstable conditions (Classes A-C) are characterised by strong solar heating of the ground that induces turbulent mixing in the atmosphere close to the ground, and usually results in material from a plume reaching the ground closer to the source than for neutral or stable conditions. This turbulent mixing is the main driver of dispersion during unstable conditions. Dispersion processes for neutral conditions (Class D) are dominated by mechanical turbulence generated as the wind passes over irregularities in the local surface, such as terrain features and building structures. During the night, the atmospheric conditions are neutral or stable (Class D, E and F). During stable conditions, plumes from short stacks or fugitive during stable conditions, that has insufficient vertical momentum or thermal buoyancy to penetrate the inversion, will be trapped beneath it and result in elevated ground-level concentrations. Conversely, a plume that is hotter than its surroundings and is emitted above, or is able to penetrate the nocturnal releases will be subject to minimal atmospheric turbulence. A plume released below an inversion layer inversion through momentum, will remain relatively undiluted, and will not reach the ground unless encounters elevated terrain.

are presented in Figure 6-6. The distribution of Pasquill-Gifford stability classes by hour of day is illustrated The frequencies of Pasquill-Gifford stability classes based on the CALMET model predictions in Figure 6-7.



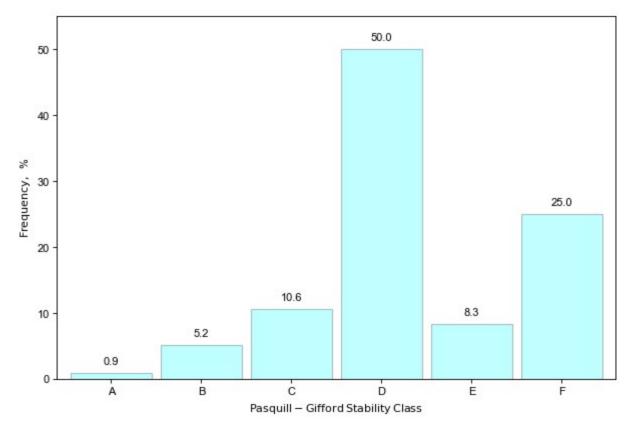


Figure 6-6 Frequency distribution of hourly atmospheric stability classifications at the broiler farm, 1 March 2017 to 28 February 2022

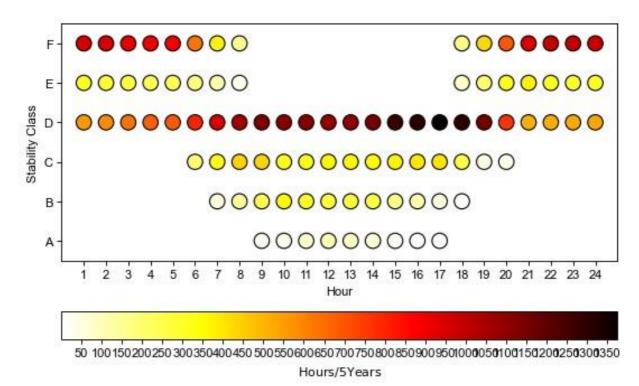


Figure 6-7 Hourly distribution of atmospheric stability at the broiler farm, 1 March 2017 to 28 February 2022

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In more complex air dispersion models, such as CALPUFF, turbulence in the boundary layer is parameterised by Monin-Obukhov Similarity Theory. One measure, the Monin-Obukhov length (L), approximates the height at which thermally and mechanically driven turbulence are in equilibrium. In other words, it is a ratio of thermal and mechanical turbulence in the atmosphere.

Values of the Monin-Obukhov length can be difficult to conceptualise as they diverge to positive (+) and negative (-) infinity as stability approaches neutral from a stable or unstable atmosphere, respectively. Consequently, the inverse of the Monin-Obukhov length (1/L) is typically used to describe stability. The hourly profile of the inverse Monin-Obukhov length (1/L) over the modelled year is presented in Figure 6-8 based on the CALMET model output. The plot shows that the atmosphere ranges from neutral to unstable during the day (i.e. 1/L is between 0 (neutral) and increasingly negative), while at night the atmosphere is more stable (i.e. 1/L is positive).

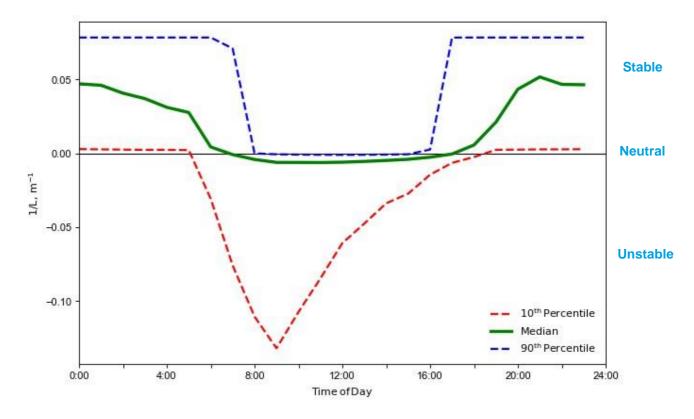


Figure 6-8 Hourly profile of the inverse Monin-Obukhov length (1/L) at the broiler farm, 1 March 2017 to 28 February 2022

The relationship between atmospheric stability and wind direction is explored as the annual distribution in Figure 6-9 and diurnal distribution in Figure 6-10. Stable (E and F-class) winds, associated with poor dispersion from ground level sources, are shown to arrive from the west to north-west sectors. Unstable flows (PG Classes A to C) may arrive from any direction. Stable conditions are shown to commence during the evening and are most frequent during the nighttime.



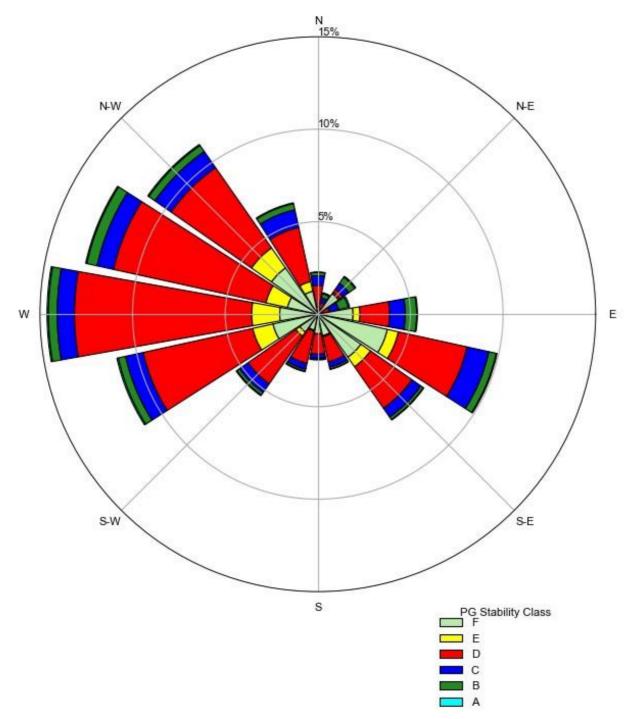


Figure 6-9 Stability rose diagram illustrating the relationship between hourly wind direction and Pasquill-Gifford stability class at the broiler farm, 1 March 2017 to 28 February 2022



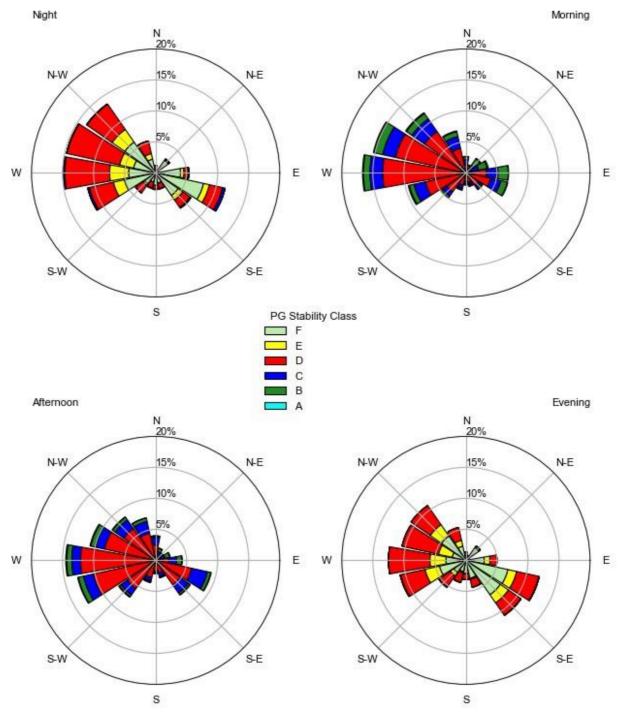


Figure 6-10 Stability rose diagram illustrating the relationship between hourly wind direction and Pasquill-Gifford stability class at the broiler farm, 1 March 2017 to 28 February 2022



6.3.3 Mixing Height

The mixing height refers to the height above ground within which the plume can mix with ambient air. During stable atmospheric conditions at night, the mixing height is often quite low. During the day, incoming short-wave solar radiation from the sun heats the ground, which in turn re-radiates long wave radiation back into the atmosphere, heating the air above it. The heating of the air near the ground generates the growth of convection cells causing the air, and hence the mixing height, to rise. The air above the mixing height during the day is generally cooler. The growth of the mixing height is dependent on how well the air can mix with the cooler upper levels of air and therefore depends on turbulence, i.e. meteorological factors such as the intensity of solar radiation and wind speed. During strong wind speed conditions, the air will be well mixed resulting in a large mixing height.

The hourly distributions of mixing height predicted by the CALMET model for the Mooleric Broiler Farm site are presented as a box and whiskers plot in Figure 6-11. Predicted mixing height range between 50 and 2,804 m, with mean and median mixing heights of 556 and 419 m respectively. The highest mixing heights occur during the late afternoon, and the lowest mixing heights during the late evening and nighttime period.

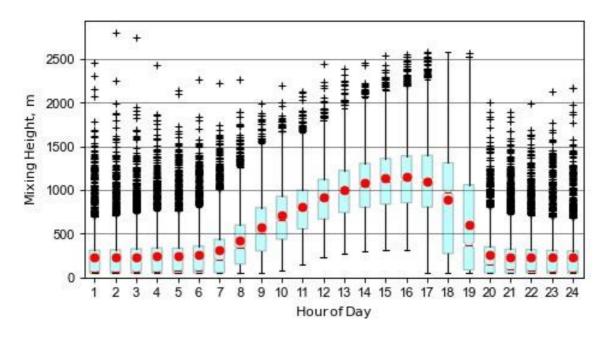


Figure 6-11 Distribution of hourly mixing heights at the rearer farm, 1 March 2017 to 28 February 2022



CALPUFF model and odour emission source configuration 6.4

6.4.1 Model configuration

Source characteristics and pollutant emission rates were incorporated into the CALPUFF atmospheric dispersion model. Developed by Earth Tech in the United States, CALPUFF (version 7.2.1) is a standard regulatory puff dispersion model accepted for use by all Australian state government environmental regulators and the model recommended by the AgriFutures Australia Planning and environment guideline for establishing meat chicken farms (2021). CALPUFF is an advanced non-steady-state air quality modelling system. Sixty months of modelled meteorological data, generated from the TAPM/CALMET modelling system, was used as input for the dispersion model, to include all weather conditions likely to be experienced in the region during the selected modelling years. The modelling has been used to predict ground-level odour concentrations across a Cartesian grid and at sensitive receptors. CALPUFF simulates the dispersion of odour to predict ground-level concentrations across a network of receptors spaced at regular intervals and at identified discrete locations. CALPUFF is a non-steady-state Gaussian puff model containing parameterisations for complex terrain effects, overwater transport, coastal interaction effects, building downwash, and wet and dry removal processes. CALPUFF employs the three-dimensional meteorological fields generated from the CALMET model by simulating the effects CALPUFF considers the geophysical features of the study area that affects dispersion of pollutants and ground-level concentrations of those pollutants in identified regions of interest. CALPUFF contains partial plume penetration, sub-grid scale terrain interactions, as well as the long-range effects of removal, transformation, vertical wind shear, overwater transport and coastal interactions. Emission sources can be characterised as arbitrarily-varying point, area, volume and lines or any combination of those sources algorithms that can resolve near-source effects such as building downwash, transitional plume rise, of time and space varying meteorological conditions on plume transport, transformation and depletion. within the modelling domain.

The model was configured following recommended settings defined in the NSW Modelling Guidance document (TRC, 2011). Key features of CALPUFF used to simulate dispersion:

- Computational domain area of 100 by 100 grids at 100 m spacing corresponding to the CALMET domain,
- Sampling domain area of 100 by 100 grid cells covering a 10 km by 10 km extent at 100 m spacing (nesting factor of 1) centred over the Broiler farm,
- 1826 days (five years) modelled corresponding to the CALMET modelling period, with each year being modelled within a separate CALPUFF simulation and the resulting data appended together,
- Gridded 3D hourly-varying meteorological conditions generated by CALMET,
- Partial plume path adjustment for terrain modelled,
- Dispersion coefficients calculated internally from sigma-v and sigma-w using micrometeorological variables,
- CALPUFF parameters set based on recommendations from the Generic Guidance and Optimum Model Settings for CALPUFF, and
- All other options set to default.

A summary of the CALPUFF configuration options selected is provided in Appendix D.



6.4.2 Configuration of emission sources

Twenty-four volume sources, each simulating the tunnel ventilation fans for the shed, were configured in CALPUFF as shown in Figure 6-12.

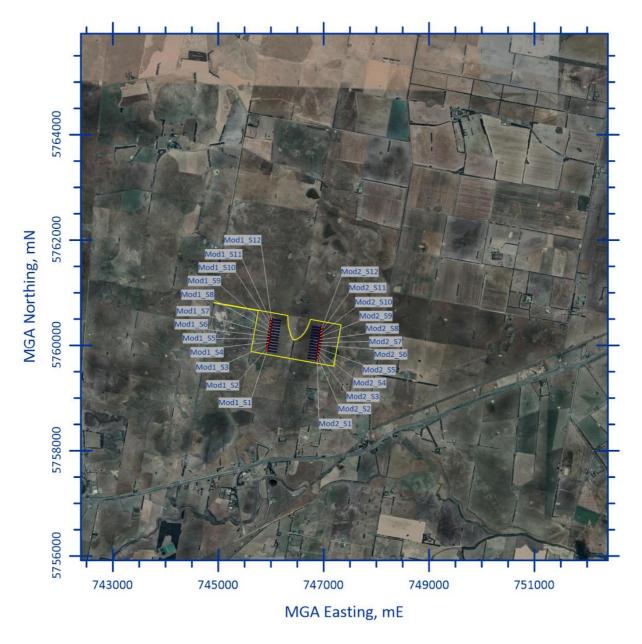


Figure 6-12 Sources included in the model

Figure Note: The volume sources simulating odour emissions from the tunnel ventilation fans are shown in red.

The configuration parameters for the Module 1 and Module 2 volume sources are provided in Table 6-2.



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Table 6-2

Volume source configuration for the proposed broiler sheds

Source ID in model	Description	Effective height (m)	α Y _° (m)	σ Z₀ (m)	Easting (mE, GDA20)	Northing (mN, GDA20)	Base elevation (m)
Mod1_S1	Module 1, Shed 1 fan	2.3	4.4	-	745922	5759901	123.9
Mod1_S2	Module 1, Shed 2 fan	2.3	4.4	-	745930	5759955	124.4
Mod1_S3	Module 1, Shed 3 fan	2.3	4.4	-	745938	5760009	124.5
Mod1_S4	Module 1, Shed 4 fan	2.3	4.4	-	745946	5760063	125.1
Mod1_S5	Module 1, Shed 5 fan	2.3	4.4	-	745954	5760118	125.3
Mod1_S6	Module 1, Shed 6 fan	2.3	4.4	-	745961	5760172	126.1
Mod1_S7	Module 1, Shed 7 fan	2.3	4.4	-	745969	5760226	126.2
Mod1_S8	Module 1, Shed 8 fan	2.3	4.4	-	745977	5760280	126.7
Mod1_S9	Module 1, Shed 9 fan	2.3	4.4	-	745985	5760334	126.9
Mod1_S10	Module 1, Shed 10 fan	2.3	4.4	1	745993	5760388	127.0
Mod1_S11	Module 1, Shed 11 fan	2.3	4.4	-	746001	5760442	127.0
Mod1_S12	Module 1, Shed 12 fan	2.3	4.4	-	746009	5760496	127.2
Mod2_S1	Module 2, Shed 1 fan	2.3	4.4	-	746878	5759735	122.2
Mod2_S2	Module 2, Shed 2 fan	2.3	4.4	-	746886	5759789	121.9
Mod2_S3	Module 2, Shed 3 fan	2.3	4.4	-	746894	5759843	122.1
Mod2_S4	Module 2, Shed 4 fan	2.3	4.4	-	746902	5759897	122.1
Mod2_S5	Module 2, Shed 5 fan	2.3	4.4	Г	746909	5759951	121.8
Mod2_S6	Module 2, Shed 6 fan	2.3	4.4	1	746917	5760005	121.4
Mod2_S7	Module 2, Shed 7 fan	2.3	4.4	-	746925	5760059	120.7
Mod2_S8	Module 2, Shed 8 fan	2.3	4.4	-	746933	5760113	120.9
Mod2_S9	Module 2, Shed 9 fan	2.3	4.4	1	746941	5760168	120.4
Mod2_S10	Module 2, Shed 10 fan	2.3	4.4	-	746949	5760222	120.5
Mod2_S11	Module 2, Shed 11 fan	2.3	4.4	-	746957	5760276	120.1
Mod2_S12	Module 2, Shed 12 fan	2.3	4.4	Г	746965	5760330	120.6



6.4.3 Modelling scenarios

Each volume source was configured with hourly-varying emission rates as described in Section 5. A single scenario was modelled that included all proposed sources.

6.4.4 Model receptors

Gridded receptors

100 m grid resolution covering a region of 10 km by 10 km. The receptor grid is fully described in Table The CALMET meteorological model was configured for terrain and land use features on a Cartesian grid at a grid cell resolution of 100 m by 100 m. The CALPUFF dispersion model was then configured to predict ground-level pollutant concentrations using grid receptors covering a subset of the CALMET domain, with a nesting factor of one. The CALPUFF receptor grid is therefore spaced at a 100 m by 6-3.

5,765,919 5,755,919 752,393 10,000 742,393 10,000 Value 100 100 100 Maximum Northing (mN, GDA94) Minimum Northing (mN, GDA94) Maximum Easting (mE, GDA94) Minimum Easting (mE, GDA94) Parameter South-North Extent (m) West-East Extent (m) Grid Resolution (m) Columns Rows

Characteristics of the CALPUFF sampling (receptor) grid Table 6-3



Sensitive Receptors

Eighteen locations surrounding the broiler farm were identified as sensitive receptors. These are presented in Table 6-4, and are shown in Figure 6-13.

Description	Prices Lane	Princess Highway	Princess Highway	Prices Lane	Princess Highway	Princess Highway	Princess Highway	Princess Highway	Darcys Lane	Darcys Lane	Mooleric Road	Armytage Road	Armytage Road	Armytage Road				
Northing (mN, GDA2020)	5759440	5758678	5758407	5758225	5758494	5757990	5758224	5758058	5757849	5757795	5757811	5759052	5763825	5764207	5762935	5761689	5760859	5760535
Easting (mE, GDA2020)	748603	748666	748128	747813	747066	746494	746250	745987	745703	745352	744398	744234	744152	745716	747687	750257	750850	750478
Receptor	RI	R2	R3	R4	R5	R6	R7	R8	R9	RIO	R11	R12	R13	R14a	R14b	R15	R16	R17

Table 6-4 Discrete receptor locations

to the "lower" and "upper" edges of the envelope of broiler farm sources, to define the $\pm 0^{\circ}$ critical wind side by five degrees (the ±5° critical wind direction arcs) and ten degrees (the ±10° critical wind direction An analysis was made of the critical wind directions directing flows from the proposed broiler farm sheds to each of the identified sensitive receptor locations. Bearings were taken from each sensitive receptor direction arcs. Straight-line winds arriving from within a ±0° critical wind direction arc will travel directly from broiler farm sources to the identified sensitive receptor location. Each arc was widened on either arcs) to account for the varying effect of meandering winds. The critical wind direction arcs surrounding sensitive receptor locations are illustrated in Figure 6-14. The bounding wind direction bearings for each arc are provided in Table 6-5, which also provides the source to receptor distances for the closest and furthest parts of the envelope of broiler farm sources. Receptor R5, to the south-southeast of farm Module 2, was found to be the nearest of the eighteen identified sensitive receptors to the broiler farm, with the closest part of the envelope of odour sources being 1246 m and the furthest being 2271 m from R5. The most distant of the identified sensitive receptors was R16, located 3524 m to the east of farm module 2.



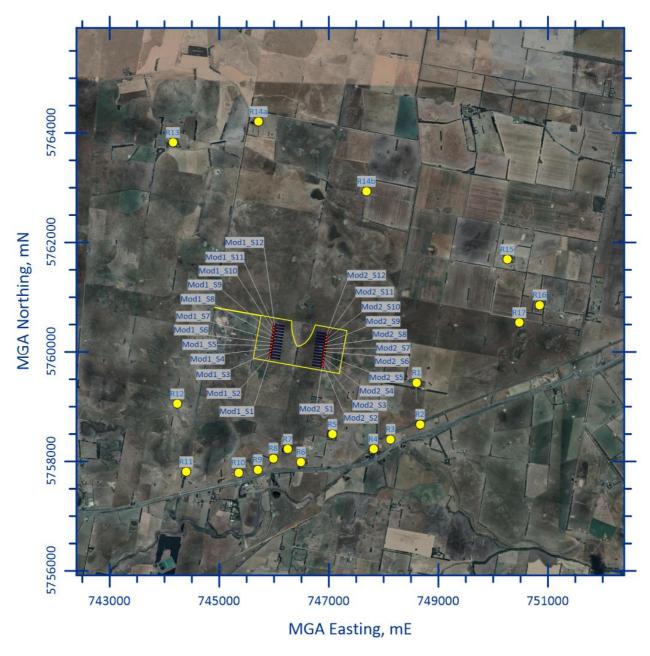


Figure 6-13 Nearest sensitive receptors to the broiler farm site





Figure 6-14 An example of critical wind direction arcs directing broiler farm odour to a sensitive receptor location

Figure note: The $\pm 0^{\circ}$ wind direction arc (pink) shows the range of wind directions necessary to transport the odour plume from the broiler farm directly to the sensitive receptor. The $\pm 5^{\circ}$ (green) and 10° (blue) arcs show the effect of widening the range of wind directions beyond the extent of the odour source envelope to account for plume meander on its journey from source to receptor.

Table 6-5 Source-receptor distances and critical wind direction arcs

Receptor		Receptor Ice, m	Lower S	ource to Re Bearing, °	eceptor	Upper S	ource to R Bearing, °	eceptor
	Closest source	Furthest source	-10°	-5°	0 °	0 °	+5°	+10°
R1	1753	2795	269.4	274.4	279.4	298.9	303.9	308.9
R2	2080	3218	284.0	289.0	294.0	314.5	319.5	324.5
R3	1823	2977	294.0	299.0	304.0	329.0	334.0	339.0
R4	1771	2900	301.5	306.5	311.5	338.1	343.1	348.1
R5	1246	2271	310.9	315.9	320.9	356.9	1.9	6.9
R6	1777	2567	333.4	338.4	343.4	12.2	17.2	22.2
R7	1592	2297	339.0	344.0	349.0	22.4	27.4	32.4
R8	1808	2485	348.1	353.1	358.1	27.9	32.9	37.9
R9	2054	2794	356.2	1.2	6.2	31.9	36.9	41.9
R10	2173	3010	3.8	8.8	13.8	38.2	43.2	48.2
R11	2581	3600	21.0	26.0	31.0	52.2	57.2	62.2
R12	1894	3015	40.7	45.7	50.7	75.5	80.5	85.5
R13	3807	4924	130.8	135.8	140.8	155.4	160.4	165.4
R14a	3719	4623	151.7	156.7	161.7	176.8	181.8	186.8
R14b	2690	3517	184.5	189.5	194.5	214.8	219.8	224.8
R15	3569	4695	230.1	235.1	240.1	254.5	259.5	264.5
R16	3927	5019	244.3	249.3	254.3	266.0	271.0	276.0
R17	3524	4599	247.5	252.5	257.5	269.8	274.8	279.8
Minimum	1246	2271	-	-	-	-	-	-
Maximum	3927	5019	-	-	-	-	-	-



determine the frequency of winds, departing from the proposed broiler farm site, within the relative critical wind direction arcs for each sensitive receptor location (Table 6-6). Winds arriving at receptor R9, the least exposed receptor, from the broiler farm were found to occur on only 1.4 % of hours over the fiveyear period. This frequency increases to 2.5% for the ±5° critical wind direction arc, and to 3.7% for the ±10° critical wind direction arc. The sensitive receptor most frequently exposed to winds from the broiler The modelled winds for the five-year period 1 March 2017 to 28 February 2022 were analysed to farm was R3, located 1.8 km to the southeast of Module 2. R3 received wind from the direction of the proposed broiler farm during 12.3% of hours, rising to 16.8% and 21.0% respectively as the critical wind direction arc is expanded from $\pm 0^{\circ}$ to $\pm 5^{\circ}$ and $\pm 10^{\circ}$.

R11; R13; and R14b to R17 all receiving winds from within the ±0° Critical Wind Direction Arc on more The Publication 1883 odour guideline Level 1 wind direction test is not met, with Receptors R1 to R7; than 2% of occasions.

±10° Critical Wind **Direction Arc** 18.5 23.2 21.6 21.0 15.6 16.5 19.8 3.8 7.0 4.4 6.4 4.3 3.9 3.5 6.4 5.1 3.7 Wind **Direction Arc** ±5° Critical 17.0 16.4 16.8 14.8 12.7 12.2 14.0 2.5 3.0 2.5 4.3 4.5 4.0 2.6 3.0 3.1 4.8 ±0° Critical Wind **Direction Arc** 11..1 11.0 12.3 11.4 3.3 1.8 1.8 <u>4</u>. 2.6 2.4 1.9 3.2 7.5 7.3 9.9 2.9 1.7 Receptor R14a R14b R13 R15 RIO R12 R16 RIJ R2 R3 R4 R5 R6 RЛ R8 R9 R

Frequency of winds (%) arriving from within the critical wind direction arcs at each sensitive receptor, 1 March 2017 to 28 February 2022 Table 6-6

20.5

14.5

23.2

17.0

12.3

Minimum Maximum

-7

7.9

R17

2.5

3.5



7 Odour Risk Assessment

Multiple lines of evidence have been reviewed to assess the odour risk of the proposed farm, with Level 1, 2 and 3 assessment tools, as described in the EPAV Guidance for Assessing Odour publication (EPAV 2022) being utilised for completeness and to provide as wide a range of supporting evidence as possible.

7.1 Level 1assessment Tools

There are three Level 1 assessment tools that act as a gateway assessment process. If the criteria contained in any of the three tools are met then the risk of odour is deemed to be low and no further odour assessment is required. The three Level 1 assessment tools are:

- Duration of emissions test
- Wind direction test
- Minor source test.

7.1.1 Duration of emissions test

The odour emissions inventory in Section 5.3 demonstrates that the duration of emissions test is not met, as all farm sheds emit odour for more than 200 hours per year.

7.1.2 Wind direction test

The wind direction test is not met, as demonstrated in Table 6-6, with sensitive receptors R1 to R7; R11; R13; and R14b to R17 each receiving winds directly from the proposed Mooleric broiler farm on more than 2% of occasions.

7.1.3 Minor source test

In order for a site to qualify as a minor source it must meet all of the requirements shown in Table 7-1. The table shows that the proposed Mooleric broiler farm does not qualify as a minor source, and further would not qualify with the addition of stub stacks.

would be stub stacks with a likely height of are assumed to release odour emissions at height of 7.8 m. The tunnel ventilation fans All broiler farm's sources are stationary, stacks were to be employed then they however in the current proposed configuration there will be no stacks. If Mooleric broiler farm assessment providing a required minimum source The regional terrain is flat as shown in The broiler sheds are 4.6 m in height, 5.6 m (1 m above ridgeline height) half the building height (2.3 m). **Criterion not met Criterion not met Meets** criterion The source is stationary with a stack height of at that could influence stack dispersion (including The emission source is situated on level terrain relevant building height(s), meaning there aren't any obstructions within a 15 m radius The source height is at least 1.7 times the Minor source criterion (free of terrain effects). building wake effects). least 10 m.

Table 7-1 Determination of minor source status

Figure 4-1.



Minor source criterion	Mooleric broiler farm assessment
The distance between the emission source and the receiving environment occupied by people is ≥100 m.	Meets criterion The closest identified sensitive receptor location is R5, located approximately 1,246 m to the south-southeast of Module 2.
At the source location, average wind speeds of < 1 m/s occur less than 20 % of the year.	Meets criterion The frequency of winds less than 1 m/s in speed at the broiler farm site is 9.7% as shown in Figure 7-1.
The odour emission rate lies under the odour flow rate vs stack height plot (Figure 5) for the proposed stack height.	N/A In the current proposed configuration, there will be no stacks fitted to broiler sheds.

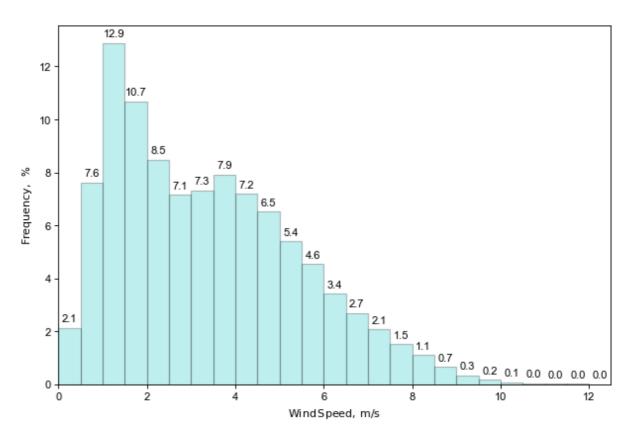




Figure note: CALMET model predictions extracted at a model grid point located between Modules 1 and 2.

7.1.4 Level 1 risk assessment

The Mooleric broiler farm does not meet any of the three Level 1 assessment criteria, meaning that a Level 2 risk assessment should be conducted.

	1
1	

Level 2 source-pathway-receiving environment tool 7.2

The Level 2 source-pathway-receiving environment tool assesses odour risk using the following three attributes:

- Hazard potential of the source (odour source score OSS)
- Exposure pathway between the source and sensitive locations (odour pathway score OPS)
- ORS). Sensitivity of the receiving environment (odour receiving environment score -

Overall risk score is assigned using the sum of each the three attribute scores.

Hazard potential of the source (odour source score – OSS) 7.2.1

odour) which identifies intensive farming, specifically including chicken farms, as being of very high odour Guideline for assessing EPA have provided a table of industrial sources by odour potential (Appendix A, potential with an initial OSS score of 4.

An odour control effectiveness weighting of 0 (moderate effectiveness of odour controls) is applicable as there are tangible odour mitigation measures in place, however significant residual odour still remains.

A final OSS score of 4 therefore applies.

Exposure pathway between the source and sensitive locations (odour pathway score- OPS) 7.2.2

The OPS score is calculated using the highest score of separate:

- Distance
- Meteorology
- Terrain and built form, and
- Hours of operations scores.

Distance Score

of 1, as the receiving environment is hundreds of metres or kilometres from the source. The closest ð The Mooleric broiler farm is considered to be a "Long distance" odour source, attracting a distance score identified sensitive receptor location is R5, located approximately 1246 m to the south-southeast Module 2.

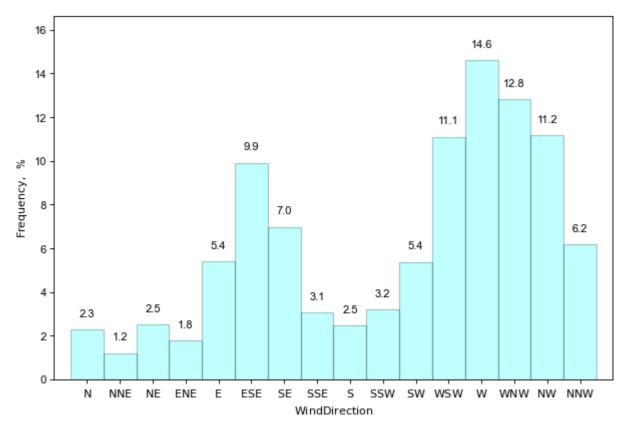
Meteorology score:

The Mooleric broiler farm is considered to have unfavourable meteorology, attracting a meteorology score of 3. The farm site is located within a sparsely populated region, with isolated residences at variable the south, encompassing sensitive to northeasterly winds (see Figure 6-13). The wind direction frequency histogram shown in Figure 7-2 receptors R1 to R12. This region would be impacted by broiler farm emissions under west-northwesterly indicates that winds from these directions would occur at a frequency of: surrounding the site. The most populated region is to distances

12.8% (WNW) + 11.2% (NW) + 6.2% (NNW) + 2.3% (N) + 1.2% (NNE) + 2.5% (NE) = 36.2%.

The meteorology is therefore considered to be unfavourable, attracting a meteorology score of 3, as the frequency of winds from source to receiving environment is greater than 20%.







Terrain and built form score:

The Mooleric broiler farm is considered to have unfavourable terrain and build form, attracting a score of 3. This is caused by the site and its surrounding region being on flat cleared land, with isolated dwellings.

Hours of Operation score:

The Mooleric broiler farm is considered to have a high frequency of emissions, attracting an hours of operation score of 3. This is caused by odour being continually emitted for long periods of time on a 24/7 basis.

Final OPS score

The final OPS score was determined to be the highest of the distance, meteorology, terrain and built form, and hours of operations scores. An OPS score of 3 was therefore assigned.

7.2.3 Sensitivity of the receiving environment (odour receiving environment score – ORS)

The receiving environment sensitivity (ORS) score is determined using:

- the landuse of the surrounding environment, and
- the historical context of the industry.



Land use

EPA have provided a table scoring land use classes in terms of odour sensitivity (Table 4, Guidance for assessing odour). The assessment uses the most sensitive land use within the separation distance or a distance of 2 km. A land use score of 3 was selected due to the most sensitive land use within a distance of 2 km being rural residential.

Historical context

A historical context score of +1 was selected due to a history of odour complaints relating to intensive chicken farming operations and the existence of facilities with histories of non-compliance.

Final ORS score

The sum of the land use score (3) and historical context score (1) was used to determine the ORS score. An ORS score of 4 was therefore assigned.

7.2.4 Level 2 risk assessment

into a high-risk category. At this level of risk, it is recommended that a Level 3 assessment be completed The Level 2 source/pathway/receiving environment tool, comprising the OSS; OPS; and ORS scores, assigned an overall risk score of 11, as shown in Table 7-2. This places the Mooleric broiler farm proposal to fully understand the risk.

Overall risk calculated using the source/pathway/receiving environment tool Table 7-2

Mooleric broiler farm assessment	4	Э	4	11 (high risk)	
Minor source criterion	Odour source score (OSS)	Odour pathway score (OPS)	Odour receiving environment score (ORS)	Overall risk score	

7.3 Level 3 assessment tools

The Level 3 assessment relies on the following strands of evidence:

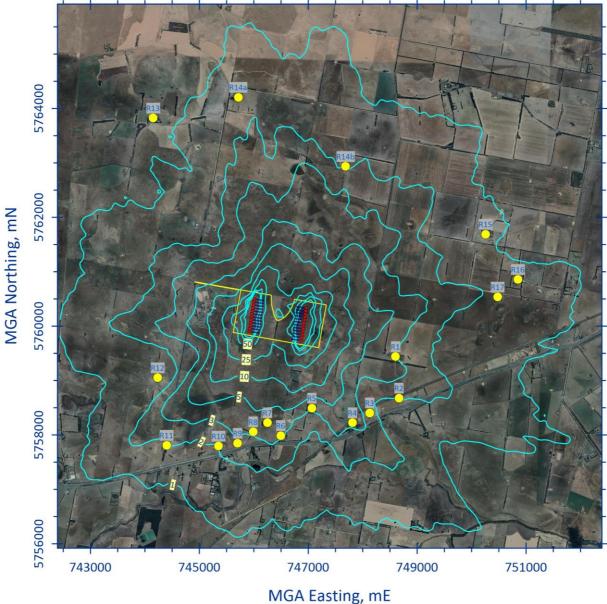
- CALPUFF odour prediction isopleths and model predictions at sensitive receptor locations
- An analysis of complaints received by EPA and local government relating to broiler farms
- Field odour intensity surveys to be conducted in the surrounding community on the commissioning of Module 1, with Module 2 only being constructed if there are favourable survey results. In the event that survey results are unfavourable then additional mitigation measures such as releasing emissions from stub stacks may be retrofitted to Module 1 and installed on Module 2 sheds.

7.3.1 CALPUFF odour prediction isopleths

east The predicted 3-minute average, 99.9th percentile isopleth map for ground-level odour concentrations is presented in Figure 7-3. There is surprisingly little skew in the isopleths, with odour being dispersed in all and southeast than to the west and northwest. This reflects the prevalence of winds with a westerly directions surrounding the site. The low concentration isopleths tend to extend slightly further to the component.



The highest 3-minute average, 99.9th percentile odour concentration of 364 ou occurs onsite. The equivalent highest offsite value is 189 ou, occurring at the site boundary to the south of the Module 2 fans.



Predicted 3-minute average, 99.9th percentile odour concentrations for the Figure 7-3 Mooleric broiler farm, 1 March 2017 to February 2022

Assessment scenario : All sources — 3-minute average 99.9 th percentile odour concentrations	Contours : 1; 2; 3; 5; 10; 25; 50; 75; 100 ou
Data source: CALPUFF	Prepared by: M Power
Location: Mooleric Broiler Farm	Date: 7/11/2023



Odour predictions at sensitive receptor locations 7.3.2

Distribution of results

Predicted 3-minute ground-level odour concentrations for the proposed shed modules at sensitive receptor locations are presented in Table 7-3. The maximum predicted concentration over the five-year modelling period ranged between 2.4 ou (R13) and 16.5 ou (R5). At the 75th percentile, the only non-zero odour concentration (0.01 ou, which is below the odour detection threshold) occurred at R1.

c	43800	43800	43800	43800	43800	43800	43800	43800	43800	43800	43800	43800	43800	43800	43800	43800	43800	43800	•	ı
Max, ou	6.23	5.50	7.13	6.70	16.49	11.49	12.29	14.61	5.92	3.93	8.11	5.28	2.37	5.09	5.27	2.58	3.79	5.10	2.37	16.49
C _{99.9} , ou	3.05	2.05	2.32	3.27	3.27	3.18	3.82	3.18	2.62	2.02	1.90	1.47	0.79	1.56	1.91	1.17	1.32	1.81	0.79	3.82
C ₇₅ , ou	0.01	00.0	00.0	00.0	00.0	0.00	00.0	00.0	00.0	00.0	00.0	00.0	00.0	00.0	00.0	00.0	00.0	0.00	00.0	0.01
Mean, ou	0.06	0.04	0.04	0.05	0.04	0.03	0.04	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.01	0.06
Median, ou	00.0	00.0	00.0	00.0	00.0	0.00	00.0	00.0	00.0	00.0	00.0	00.0	00.0	00.0	00.0	00.0	00.0	0.00	0.00	00.0
C ₂₅ , ou	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Min, ou	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Receptor	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14a	R14b	R15	R16	R17	Min.	Max.

Distribution of predicted 3-minute average ground-level odour concentrations at sensitive receptors for the Mooleric Broiler Farm, 1 March 2017 to February 2022 Table 7-3

 C_{25} , C_{75} , and $C_{99,9}$ represent the 25th, 75th and 99.9th percentile concentrations respectively. SEPP AQM is no longer in force, meaning that there is no assessment criterion for odour predictions.

Table Notes:

These results are illustrated as a box and whiskers plot ("box plot") in Figure 7-4. Box plots provide a way of graphically summarising the distribution of an array of values using five key descriptive statistics:

- The minimum value
- The "first quartile", Q1 (25th percentile)
- The median (50th percentile)
- The "third quartile", Q3 (75th percentile)
- The maximum value.



The distribution is summarised as a horizontally or vertically-aligned box with a whisker extending beyond each end, and outlier values extending beyond the whiskers. The box extends between the 25th (Q1) and 75th (Q3) percentiles, with a line and/or notch within the box showing the median value. The mean value is often plotted as well using a discrete symbol such as a diamond.

The box length shows the interquartile range (Q3-Q1). The whiskers extend beyond the box to either the minimum/maximum value or to 1.5 times the interquartile range (whichever is the least value). Individual values beyond each whisker are considered to be outliers and are plotted separately to show these extreme values.

Distributions for multiple datasets can be compared using separate box plots within the same figure.

The box plot in Figure 7-4 is unusual, showing only outliers and the mean concentration marker. This indicates that odour from the broiler farm would be experienced as occasional spikes in odour concentration rather than frequent occurrences. The highest predicted odour concentrations are found at R3 to R8 and R11, all of which are located to the south of the broiler farm site.

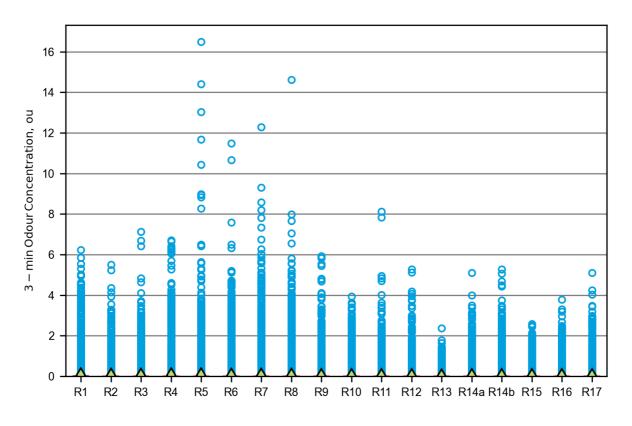


Figure 7-4 Box and whiskers analysis of 3-minute average ground-level odour concentrations at sensitive receptors for the Mooleric Broiler Farm, 1 March 2017 to February 2022

Diurnal variation in predicted odour concentrations

The modelling predictions for each sensitive receptor were closely reviewed to determine whether the diurnal variation in odour concentration was related to the position of each receptor in relation to the proposed broiler farm. This would test, for example, whether the odour plume is directed towards the east in the morning and the west during the afternoon, meaning that the bearing of each receptor in relation to the farm has a strong influence on the timing of peak emissions. Diurnal box plots were therefore created for all eighteen sensitive receptor locations. Each of the plots showed a similar pattern in diurnal concentrations, indicating that any bearing-related influence on odour dispersion from the broiler farm is small.



Rather than present all eighteen plots, four figures were selected for sensitive receptors located at the cardinal points of the compass in relation to the farm (Figure 7-5). Each plot showed that the highest odour concentrations at sensitive receptor locations occur during the evening and nighttime hours, with the lowest concentrations occurring between 9 am and 3 pm.

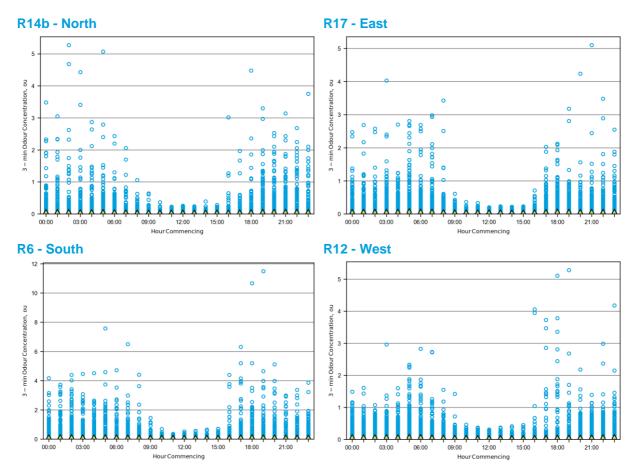


Figure 7-5 Diurnal variation in odour concentrations at sites surrounding the proposed farm

Odour environmental risk assessment

EPAV Publication 1643 (EPAV, 2017) provides guidance on developing Odour Environmental Risk Assessments (OERAs) for broiler farms. This guideline was made under SEPP (AQM), which is no longer in force. The preparation of an OERA is therefore not currently required for broiler farm assessments in Victoria.

The EPAV risk assessment matrix for broiler farm odour is provided in Figure 7-6. This approach recognises the fact that chronic low-level odour concentrations (6 to 9 ou) at a site would post a high level of risk, as well as infrequent high odour concentrations. Use of an OERA therefore balances the competing impacts of odour frequency and concentration, providing an additional strand of evidence to aid the assessment of odour impact from the proposed ProTen Mooleric broiler farm project.



Frequency	0	dour concentrati	on
Odour events per year	10+ OU	6–9 OU	1–5 OU
0–9		see note below	
10-44	Н	М	L
45-175	н	н	М
>175	Н	Н	М

Key:

L = low risk (compliant with SEPP (AQM))

M = medium risk

H = high risk

Source: Table 1, EPAV (2018).

Figure 7-6 EPAV broiler farm odour risk assessment matrix

An OERA was therefore prepared using the five-year modelling results, for each sensitive receptor location, as a means of gaining a more nuanced understanding of the odour risk at each site. The results are presented in Table 7-4, showing a low risk level for Receptors R2 and R10 to R17, with medium risk levels at all other identified sensitive receptor locations.

Table 7-4Predicted OERA risk level at sensitive receptors for the proposed Mooleric Broiler
Farm

Receptor	Frequency (1 ≤ ou > 6)	Frequency (6 ≤ ou > 10)	Frequency (ou ≥ 10)	Risk Level
R1	92	0	0	Medium
R2	41	0	0	Low
R3	78	1	0	Medium
R4	111	1	0	Medium
R5	80	2	1	Medium
R6	69	1	0	Medium
R7	90	2	0	Medium
R8	74	1	0	Medium
R9	59	0	0	Medium
R10	39	0	0	Low
R11	32	0	0	Low
R12	23	0	0	Low
R13	4	0	0	Low
R14a	21	0	0	Low
R14b	31	0	0	Low
R15	14	0	0	Low
R16	17	0	0	Low
R17	24	0	0	Low

Table Note: As the modelling results extend over a 5-year period, the total frequency was divided by 5 to align with OREA requirements.



7.4 Complaints analysis

Given that the Mooleric Broiler Farm has only been proposed and therefore has not been constructed, there can be no existing complaints history for the farm. A review of the EPA pollution reporting system (IBIS) for poultry farm odour complaints reveals a single complaint against a 24 shed broiler farm (CRM number 200452582), located near Prairie in northern Victoria. The odour complaints database contains 520 broiler farm complaints in total, with the majority being received by EPA between August 2014 and February 2021, with additional complaint data for this period being supplied by local councils.

The complaint, which was received on 23 October 2020 stated (sic):

"It Smells Like To Chooks, Like From A Chook Farm. Very Pungent Smell."

The complainant address was located 1,140 m away from the farm. The closest identified sensitive receptor to the proposed ProTen Mooleric broiler farm, Receptor R5, located to the south-southeast of farm Module 2 is at a slightly greater distance of 1246 m.

(32 sheds), an additional six complaints were found. These all related to the abovementioned 24-shed commissioned with four six-shed modules (24 sheds) with an additional two sheds being added later to When the odour complaint database search was expanded to include the next highest farm size category broiler farm. Further investigation by Air Environment revealed that the farm in question was originally each module. Five of the 32-shed farm complaints originated from a single complainant located 2,830 m from the farm with:

- A single complaint in January 2017
- Two complaints a fortnight apart in February 2019
- Two complaints nine days apart in November 2020.

The final 32-shed farm complaint occurred in May 2018 from a complainant located 7,710 m from the farm.

and Air Environment has discussed this farm with a professional closely involved in its design management. He offers the following explanations for the odour complaint history:

- trucks passing close to the complainant's residence. In particular, he disputes that odour from a complaints being received from closer residences. It is recommended that EPA investigate this further In each case many birds perished. The May 2018 complaint was most likely caused by mortuary broiler farm could travel a distance of 7.7 km and still cause complaints, particularly without additional The farm involved is sited on a flood plain. The farm was flooded on two occasions (2009 and 2018). with the aim of amending the complaint record if necessary.
- that will be adopted at the Mooleric site. It is therefore naturally more odorous than the proposed, more modern, Mooleric broiler farm will be and does not provide a fair and representative comparison The farm involved is old and does not have the variable speed ventilation fans or humidity controls of the potential odour footprint. •
- At the time of the complaints, the farm involved maintained a large manure stockpile, which was allowed to get wet when it rained, thereby creating a significant odour source, which could account for some of the complaints. This is no longer a common practice. The Mooleric broiler farm proposes to adopt state-of-the-art drinker technology and careful management practices to ensure that manure stays dry throughout its entire time on the farm, with any wet manure that is created being swiftly removed from site. •



• The farm involved had the practice of burying or burning bird mortalities. This practice will not occur at the Mooleric broiler farm, with dead birds being swiftly identified during daily shed walkthroughs and being immediately frozen. Frozen birds will be removed from site on a weekly basis.

EPA have conducted an analysis of the complaints dataset (Bydder & He, 2022), relating broiler farm size and the complaint distance (see Figure 7-7). The mean complaint distance and the upper range of complaint distances was found to increase with the number of broiler sheds with 25th and 75th percentile complaint distances of approximately 2,400 m and 3,900 m respectively for 16-shed farms. These values increase to approximately 2,900 m and 4,000 m for 32-shed farms.

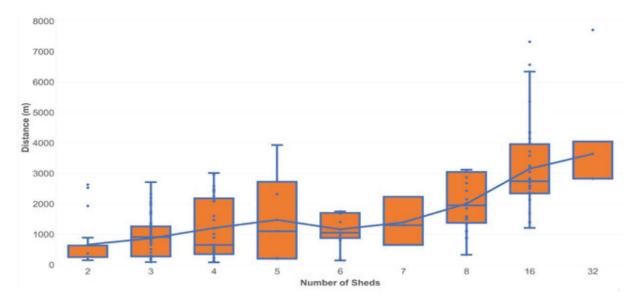


Figure 7-7 The relationship between the broiler farm size and the distance to complainants Figure 1, Bydder and He, 2022, p. 50.

Whilst the overall number of EPA-recorded complaints about broiler farms is high, it appears that complaints relating to specific large farms are sporadic and infrequent.

The EPA complaints dataset provides useful indicative information relating to broiler farm complaints, however it is difficult to make firm comparisons with well managed modern state-of-the-art broiler farms, such as the ProTen Mooleric Broiler farm, as the complaint records:

- Do not provide the time that the odour was experienced.
- Do not provide information relating to the meteorology at the time of the complaint.
- Do not provide any information relating to the number of birds housed in the farm at the time of the complaint and the mix of bird ages present.
- Do not describe the farm infrastructure and management practices in enough detail to allow appropriate comparisons to be made.
- Do not record the complaints handling process in enough detail to identify the reason for the complaint and any resolution. In particular it is uncertain whether any unvalidated or vexatious complaints are contained within the complaints dataset.

The complaints dataset in its current form should therefore be treated with great care, particularly for extreme events. It is recommended that a more nuanced (detailed) dataset be extracted from the EPA IBIS system, where possible, and that this be augmented with additional information relating to farm infrastructure and management processes. This approach would increase its utility significantly, allowing accurate comparisons to be made.



7.5 Community surveys

Air Environment has not conducted any community surveys in relation to the proposed Mooleric broiler farm and is unaware of any surveys that may have been conducted. We do not have any survey data collected in relation to broiler farm development proposals or existing farms.

7.6 Field odour intensity surveys

Air Environment has not conducted any field odour intensity surveys in the vicinity of any broiler farms to It is therefore recommended that an ambient odour survey program be conducted as each shed is date, and the only surveys that we are aware of are commercial-in-confidence and cannot be used here. constructed and commissioned with birds placed. This will provide time for a series of field odour intensity surveys to be conducted around the newly commissioned farm module. A detailed ambient odour assessment report would be prepared for Council and EPA review. Further odour dispersion modelling would be conducted to allow the performance of the odour model to be evaluated (ground-truthed). This would provide more confidence in the model's ability to predict odour impacts.

Survey results would also be used to inform the need for any additional odour mitigation measures on either or both farm modules. The most likely of these would be the retrofitting of stub stacks to some of the shed duty fans. It is recommended that a further ambient odour survey program would be conducted once the entire farm is constructed and commissioned to enable the impacts from the development to be assessed.



8 Conclusions and Recommendation

8.1 Conclusions

Air Environment was commissioned by ProTen Pty Ltd to conduct an odour impact assessment to support a development application for two 12 shed modules at the proposed Mooleric Broiler Farm.

Neither of the criteria for the Level 1 Odour Risk Assessment and Level 2 Source-pathway Analyses were met, and consequently, a Level 3 Assessment was conducted. The key focus of the Level 3 Assessment was the odour dispersion modelling study and OERA. The modelling study was designed to characterise the dispersion of odour emissions from the two modules. Hourly varying emission rates were calculated based upon bird age, mass, and count in each shed as well as the ambient temperature at the site.

It was determined that the most affected sensitive receptor was R7, with a 3-minute average 99.9th percentile ground level odour concentration of 3.8 ou.

It is expected that under the current assumptions, the development of the two 12 shed modules at the Mooleric Broiler Farm site will cause no odour risk at nearby sensitive receptors. However, the odour detection threshold of 1 ou is exceeded at all but one of the receptors with a medium or low risk of odour annoyance remaining at eight and 10 receptors respectively. Consequently, mitigation measures may be considered to help future proof the farm. Such mitigation measures may include the installation of stub stacks on the tunnel ventilation fans at the end of each shed or the introduction of cross-flow ventilation fans along the side of each shed, and also the installation of stub stacks on the cross-flow fans. Examples of such stub-stacks are presented in Figure 8-1. These mitigation measures have been assessed by Air Environment at other broiler farms in Victoria and determined to have a positive effect of between 15% and 62% reduction in odour impact depending upon local meteorology and distance to the receptor.



Figure 8-1 Example of stub-stack tunnel ventilation



8.2 Recommendations

The following recommendations are made:

- the completion and commissioning of sheds at six week intevals allowing field ambient odour surveys Recommendation 1: The Mooleric 24-shed Broiler Farm would be developed in a single stage with to be conducted to assess the progressive impact of the development as sheds come online.
- Recommendation 2: Following the field ambient odour survey program, further odour dispersion modelling would be conducted to allow the odour model to be validated (ground-truthed) against the observations.
- Recommendation 3: A detailed ambient odour assessment report, detailing the results of the ambient odour survey and model evaluation process, would be prepared for EPA and Council review.
- Recommendation 4: In the event that the ambient odour assessment found an unacceptable level of risk of odour impact at surrounding sensitive receptor locations, the effect of installing stub stacks on the duty fans of some sheds would be modelled and assessed.
- Recommendation 5: An automatic weather station (AWS) be installed at a suitable location in the vicinity of the farm, prior to the commissioning of the first farm module, to facilitate complaints management and provide meteorological data for ambient odour surveys. The AWS should be installed on a 10 metre mast and consider the requirements of Australian standard AS3580.14 (2014). •
- Recommendation 6: A further ambient odour survey program would be conducted once the entire 24-shed farm is constructed and built, to allow all impacts from the development to be assessed. •

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Appendix A Meteorological Inter-annual Variability Analysis



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1 Methodology for the Assessment of Meteorological Inter-annual Variability

1.1 Review and selection of regional meteorological observations

The location of the closest Bureau of Meteorology (BoM) automatic weather station (AWS) in relation to the Mooleric Broiler Farm is provided in Table 1-1, and shown in Figure 1-1. The closest AWS site is located north-northwest at the summit of Mt Gellibrand, approximately 4.9 km from the site.

Table 1-1 Location of the closest AWS site in relation to the Mooleric Broiler Farm

BoM Station Number	BoM Station Name	Latitude/ Northing (GDA 2020)	Longitude/ Easting (GDA 2020)	Distance from the Site	Bearing from the Site
090035	Colac (Mount Gellibrand)	-38.2333 °S (744418 mN)	143.7925 °E (5764612 mE)	4.9 km	334 ° (N-NW)



Figure 1-1 Location of the Mount Gellibrand BoM AWS site in relation to the Mooleric Broiler Farm



Analysis of regional meteorological observations 1.2

against the five-year mean to determine its representativeness of long-term conditions. Rather than using as the twelve-month period commencing in March (the beginning of autumn) each year and ending in February (the end of summer) the following year. If a calendar year had been selected, it would commence with the end of one year's summer season and end with the beginning of another. The adopted approach therefore ensures that a single summer season will be modelled in its entirety. The analysis period spans between 1 March 2017 Five years of data were selected for analysis at the Mt Gellibrand site, with each year being compared calendar years, Air Environment have defined the 'meteorological year' and 28 February 2022. The meteorological parameters analysed, dataset time interval, and analyses conducted are summarised in Table 1-2.

(20040)			
Parameter	Time period assessed	Data	Analysis
Wind speed			Comparisons of:
			 Frequency distributions (as
Wind direction			probability density
Wind vector U			functions) as year- on-vear and each
component			vear against the
Wind vector V	1 March 2017 to	30-minute data	mean of all five
component	28 February 2022	points from BoM AWS	years
Air temperature			 Frequency distribution
Dew noint			anomaly (as a
temperature			percentage) from
Surface atmospheric			five years
pressure			 Correlation statistics (R²)
Rainfall	1 March 2017 to 28 February 2022	Annual and monthly totals (mm)	Comparison of monthly and annual rainfall totals
El Niño Southern Oscillation	1 March 2017 to 28 February 2022	Monthly Southern Oscillation Index	SOI classification and strength

Meteorological data assessed for BoM Mt Gellibrand site (BoM station number 0900351

Table 1-2

speed. The anaysis was based on determining which years provided the closest representation of the average state of the climate based on the variation of each meteorological parameter from the mean and each other year. For meteorological modelling and air quality assessment purposes, the key parameters that influence pollutant dispersion are wind speed, wind direction, atmospheric stability and mixing height, Notwithstanding this, these parameters can be strongly influenced by the overall state of the climate including the El Niño Southern Oscillation (ENSO), solar exposure, cloud cover and rainfall and the atmosphere's vertical temperature profile and the wind resulting soil and atmospheric moisture content. with stability a function of the



In general, the analysis considered the following:

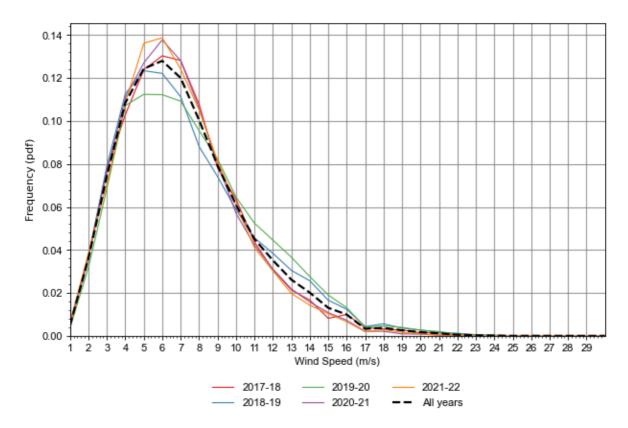
- A year with a moderate or strong ENSO classification should be avoided, where possible.
- A year with anomalously low or high rainfall should be avoided, where possible.
- The distributions of wind speed and direction should be as close to the mean distribution as possible, both in terms of the frequencies of low, moderate and high wind speeds, and in the overall correlation statistics. This includes the analysis of wind in its U and V vector components.
- The distributions of temperature should be as close to the mean distribution as possible, in terms of low nocturnal and daytime high temperatures.
- The distributions of dew point temperature should be as close to the mean distribution as possible.
- The distributions of mean sea level atmospheric pressure should be as close to the mean distribution as possible.



2 Analysis of Meteorological Inter-annual Variability

2.1 Wind speed

The annual and mean frequency distributions (probability density function [PDF]) of wind speed recorded at the BoM Mt Gellibrand site for the five-year period, 1 March 2017 to 28 February 2022, are provided in Figure 2-1. The anomaly of each year to the mean of the five-year period is plotted in Figure 2-2.





The probability distribution for each year at Mt Gellibrand closely follows that of the five-year mean. The most noticeable deviations from the mean occur in the 4 to 9 ms⁻¹ range.

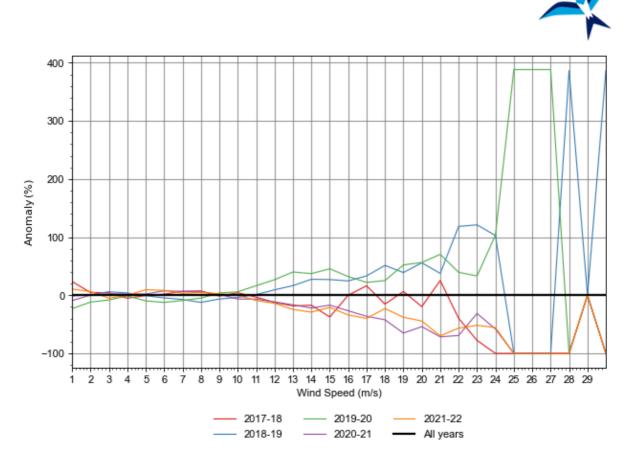


Figure 2-2Annual observed wind speed frequency distribution anomaly from the meanFigure Note:BoM Mt Gellibrand (Station number 090035)

The R² correlation statistics for each year on year, and each year versus the mean of all years, are summarised in Table 2-1.

Table 2-1Correlation coefficients matrices of the distributions of wind speed at Mt
Gellibrand (BoM station number 090035)

Year	2017-18	2018-19	2019-20	2020-21	2021-22	All years
2017-18	1					
2018-19	0.9913	1				
2019-20	0.9872	0.9938	1			
2020-21	0.9986	0.9933	0.9872	1		
2021-22	0.9974	0.9918	0.985	0.9987	1	
All years	0.998	0.997	0.9935	0.9987	0.9977	1



2.2 Wind direction

The annual and five-year mean wind direction PDFs and the anomaly of each year to the mean of the five-year period (March 2017 to February 2022), are similarly presented in Figure 2-3 and Figure 2-4, respectively.

Each year's distribution is similar to that of the five-year mean, showing that the wind direction distribution remains relatively constant over time. However, there is noticeable variation between each year and the five-year mean in both the PDF and the anomaly plots indicating that whilst the general trend is consistent, there is noticeable variation between the years. This variation is most obvious in year 2019-2020.

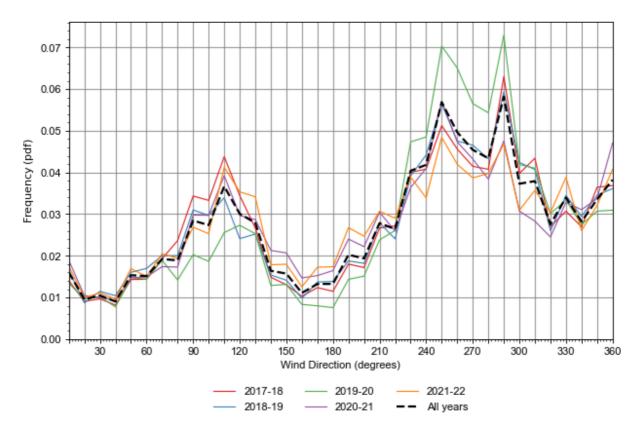


Figure 2-3 Comparison of annual observed wind direction frequency distributions to the mean

Figure Note: BoM Mt Gellibrand (Station number 090035)

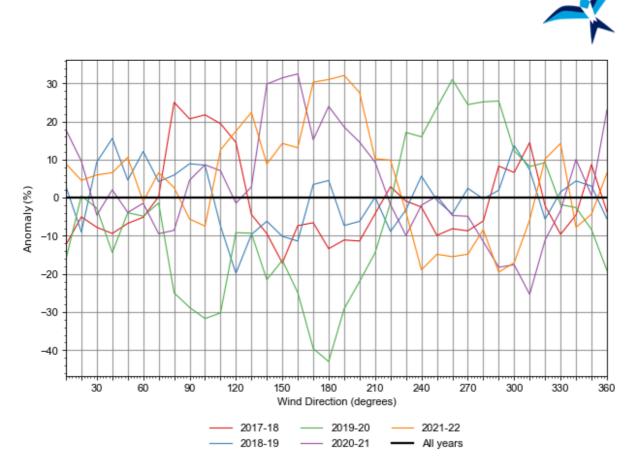


Figure 2-4Annual observed wind direction frequency distribution anomaly from the meanFigure Note:BoM Mt Gellibrand (Station number 090035)

The R² correlation statistics for each year on year, and each year versus the mean of all years, are summarised in Table 2-2.

Table 2-2Correlation coefficients matrices of the distributions of wind direction at Mt
Gellibrand (BoM station number 090035)

Year	2017-18	2018-19	2019-20	2020-21	2021-22	All years
2017-18	1					
2018-19	0.9688	1				
2019-20	0.9066	0.9587	1			
2020-21	0.9152	0.9313	0.8841	1		
2021-22	0.93	0.9127	0.8686	0.9449	1	
All years	0.974	0.9888	0.9636	0.9592	0.9527	1



2.3 Wind U component

The annual and mean wind U-component (easterly component positive) PDF, and the anomaly of each year to the mean of the five-year period (March 2017 to February 2022), are presented in Figure 2-5 and Figure 2-6, respectively.

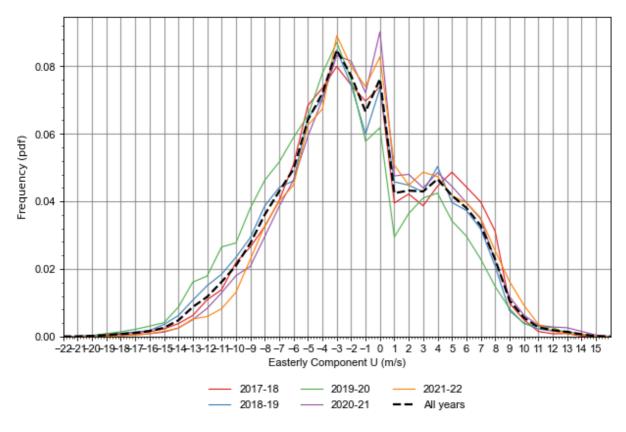


Figure 2-5 Comparison of annual observed wind U-component frequency distributions to the mean

Figure Note: BoM Mt Gellibrand (Station number 090035)

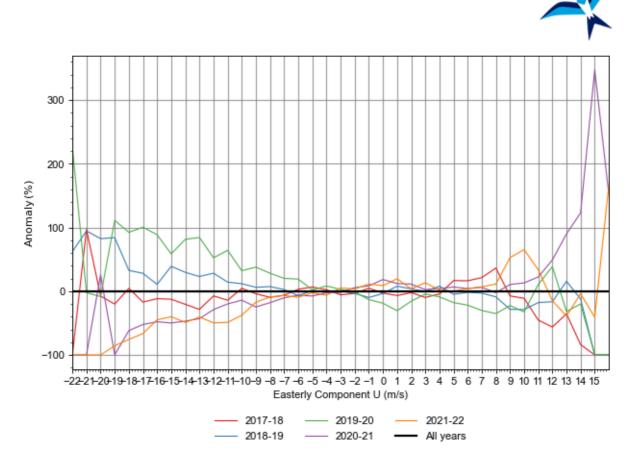


Figure 2-6 Annual observed wind U-component frequency distributions anomaly from the mean

Figure Note: BoM Mt Gellibrand (Station number 090035)

The R² correlation statistics for each year on year, and each year versus the mean of all years, are summarised in Table 2-3.

Table 2-3Correlation coefficients matrices of the distributions of the wind U-component
at Mt Gellibrand (BoM station number 090035)

Year	2017-18	2018-19	2019-20	2020-21	2021-22	All years
2017-18	1					
2018-19	0.9873	1				
2019-20	0.9556	0.9749	1			
2020-21	0.9863	0.9851	0.9382	1		
2021-22	0.985	0.9843	0.9381	0.9953	1	
All years	0.9937	0.9971	0.9717	0.9918	0.9913	1



2.4 Wind V component

The annual and mean wind V-component (northerly component positive) PDF, and the anomaly of each year to the mean of the five-year period (March 2017 to February 2022), are presented in Figure 2-7 and Figure 2-8, respectively. All years analysed closely follows the five-year average V-component wind distribution.

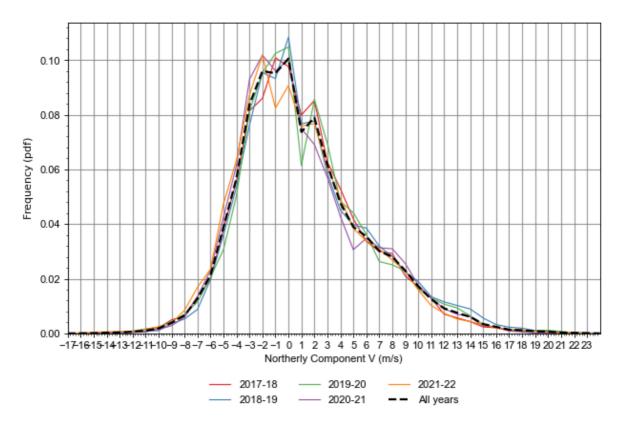


Figure 2-7 Comparison of annual observed wind V-component frequency distributions to the mean

Figure Note: BoM Mt Gellibrand (Station number 090035)

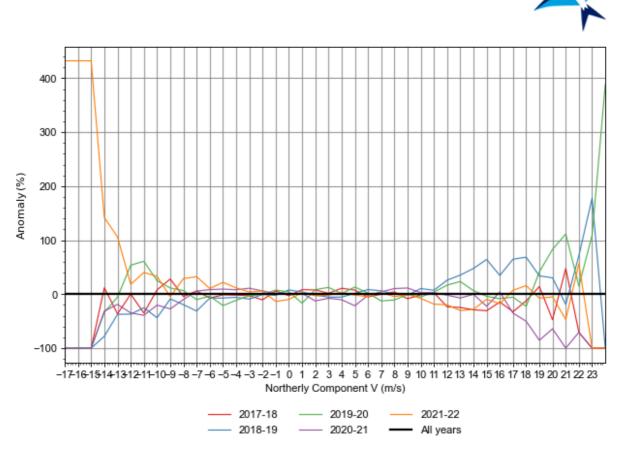


Figure 2-8 Annual observed wind V-component frequency distributions anomaly from the mean

Figure Note: BoM Mt Gellibrand (Station number 090035)

The R² correlation statistics for each year on year, and each year versus the mean of all years, are summarised in Table 2-4.

Table 2-4Correlation coefficients matrices of the distributions of the wind V-component
at Mt Gellibrand (BoM station number 090035)

Year	2017-18	2018-19	2019-20	2020-21	2021-22	All years
2017-18	1					
2018-19	0.9929	1				
2019-20	0.9912	0.9917	1			
2020-21	0.9872	0.9907	0.9829	1		
2021-22	0.9881	0.9867	0.9802	0.9933	1	
All years	0.9965	0.9971	0.994	0.9953	0.994	1



2.5 Temperature

The annual and mean temperature PDF and anomaly of each year to the mean of the five-year period, March 2017 to February 2022, are presented in Figure 2-9 and Figure 2-10, respectively. All years analysed closely follows the five-year average Temperature distribution. Despite this, years 2017-18 and 2018-19 tend to have more extreme temperatures outside of the 8-16 °C range.

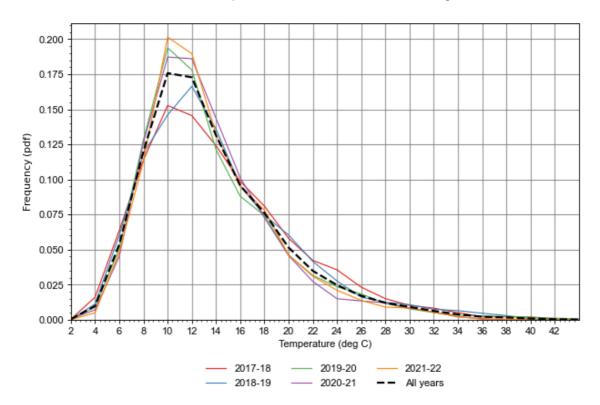
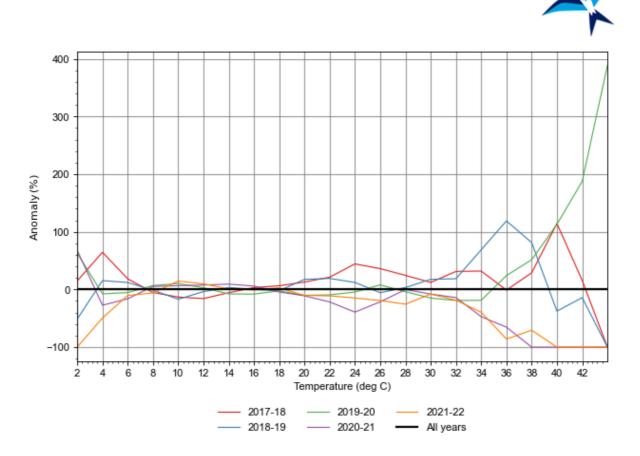


Figure 2-9 Comparison of annual observed temperature frequency distributions to the mean

Figure Note: BoM Mt Gellibrand (Station number 090035)





The R² correlation statistics for each year on year, and each year versus the mean of all years, are summarised in Table 2-5.

Table 2-5Correlation coefficients matrices of the distributions of temperature at Mt
Gellibrand (BoM station number 090035)

Year	2017-18	2018-19	2019-20	2020-21	2021-22	All years
2017-18	1					
2018-19	0.9938	1				
2019-20	0.9823	0.9813	1			
2020-21	0.9835	0.9884	0.9948	1		
2021-22	0.9802	0.9811	0.9968	0.996	1	
All years	0.9922	0.9934	0.9962	0.9977	0.996	1



2.6 Dew point temperature

The annual and mean dew point temperature PDF and the anomaly of each year to the mean of the five-year period (March 2017 to February 2022), are presented in Figure 2-11 and Figure 2-12 respectively. The yearly distributions of dew point temperature broadly follow the five-year mean however there is more annual variability in the distributions than experienced for the other meteorological parameters.

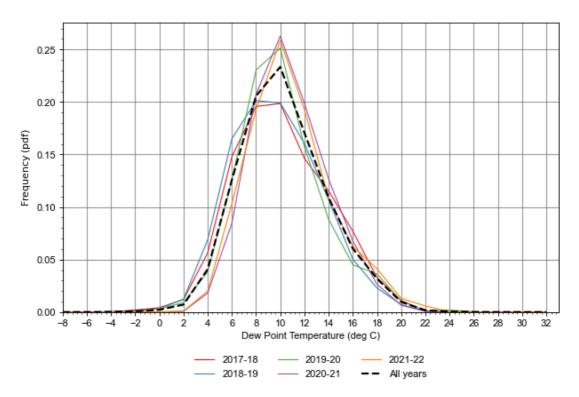


Figure 2-11 Comparison of annual observed dew point temperature frequency distributions to the mean at Mt Gellibrand (BoM station number 090035)

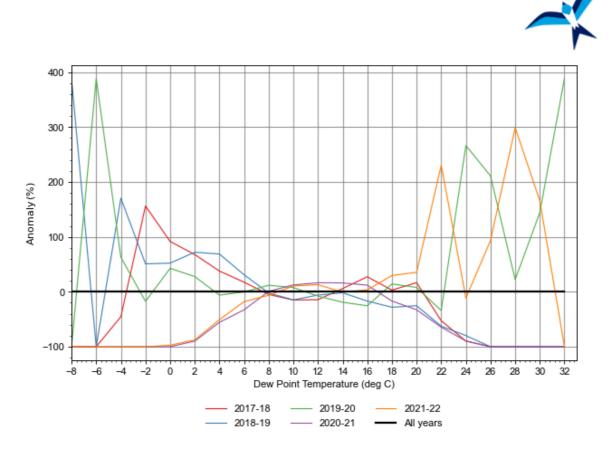


Figure 2-12 Annual observed dew point temperature frequency distribution anomaly from the mean

Figure Note: BoM Mt Gellibrand (Station number 090035)

The R² correlation statistics for each year on year, and each year versus the mean of all years, are summarised in Table 2-6 for the BoM Mt Gellibrand AWS site.

Table 2-6Correlation coefficients matrices of the distributions of dew point temperature at
Mt Gellibrand (BoM station number 090035)

Year	2017-18	2018-19	2019-20	2020-21	2021-22	All years
2017-18	1					
2018-19	0.9929	1				
2019-20	0.9756	0.9734	1			
2020-21	0.9554	0.9416	0.9748	1		
2021-22	0.9626	0.9521	0.9821	0.9959	1	
All years	0.9884	0.9829	0.9931	0.9858	0.9907	1



2.7 Surface atmospheric pressure

The annual and mean sea level pressure PDFs and the anomaly of each year to the mean of the fiveyear period (March 2017 to February 2022), are presented in Figure 2-13 and Figure 2-14. The pressure distributions for each year broadly follow their respective five-year means at the Bom AWS site.

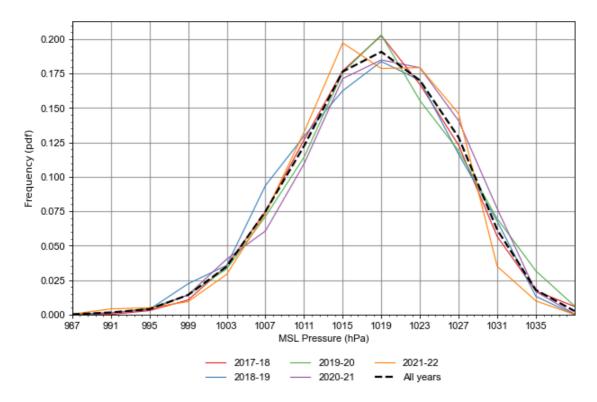


Figure 2-13 Comparison of annual observed mean sea level pressure frequency distributions to the mean

Figure Note: BoM Mt Gellibrand (Station number 090035)

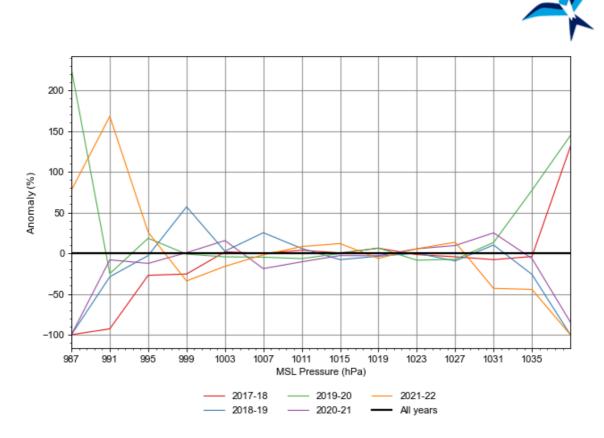


Figure 2-14 Annual observed mean sea level pressure frequency distribution anomaly from the mean

Figure Note: BoM Mt Gellibrand (Station number 090035)

The R² correlation statistics for each year on year, and each year versus the mean of all years, are summarised in Table 2-7 for the Mt Gellibrand BoM AWS site.

Table 2-7Correlation coefficients matrices of the distributions of mean sea level pressure
at Mt Gellibrand (BoM station number 090035)

Year	2017-18	2018-19	2019-20	2020-21	2021-22	All years
2017-18	1					
2018-19	0.9918	1				
2019-20	0.9957	0.9846	1			
2020-21	0.9873	0.982	0.986	1		
2021-22	0.9858	0.9777	0.9733	0.9793	1	
All years	0.9984	0.9934	0.9942	0.9931	0.9895	1



2.8 Rainfall

Monthly rainfall totals for the five-year period, March 2017 to February 2022, are presented in Figure 2-15 for the Mt Gellibrand BoM AWS site.

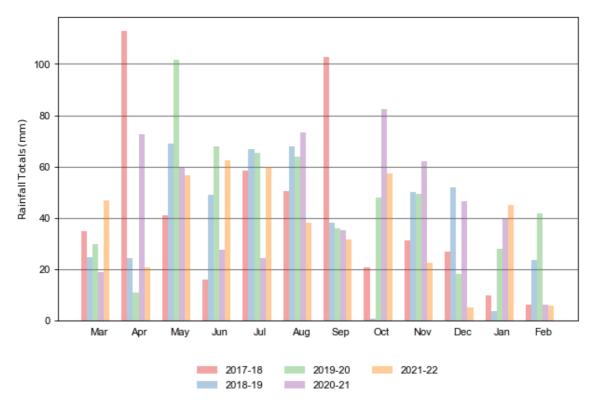


Figure 2-15 Monthly rainfall totals during the period March 2017 to February 2022

Figure Note: BoM Mt Gellibrand (Station number 090035)



2.9 El Niño Southern Oscillation

The Southern Oscillation Index (SOI), as provided by the Bureau of Meteorology, indicates the development and intensity of El Niño or La Niña events in the Pacific Ocean. Sustained values of the SOI below -7 are indicative of El Niño events causing a reduction in winter and spring rainfall over eastern Australia. Likewise sustained positive values above +7 indicate La Niña events characterised by wetter than normal conditions.

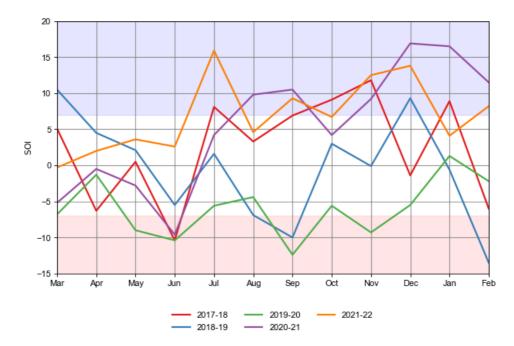


Figure 2-16 shows the monthly SOI for the period from March 2017 to February 2022.

Figure 2-16 Monthly SOI for the period from March 2017 to February 2022



3 Analysis of annual variability by BoM Site

3.1 Correlation statistical analyses

The analysis of correlation statistics between individual years and the five-year mean found that:

- The wind speed for each individual modelling year was well correlated against the mean speed of all five years at both sites, with each year having an R² correlation of 0.99 or greater. Consequently, wind speed was not highly variable. The year 2020-21 was the highest ranked for wind speed correlation with an R² correlation coefficients of 0.9987.
- There was more noticeable variability between years for wind direction, however each year was reasonably well correlated against the mean of all years with the exception of year 2019-20. The correlations varied between 0.9363 (2019-20) and 0.9888 (2018-19)
- Air temperature was well correlated against the mean temperature of all five years. The R² correlations ranged between 0.9922 (2017-18) and 0.9977 (2020-21).
- Dew point temperature, which is an indicator of humidity, did not correlate as well against the long-term means, however, it was still acceptable with R² correlations ranging between 0.9829 (2018-19) and 0.9931 (2019-20).
- Mean sea level pressure had similar correlates to Dew point temperature against the mean of all years at the BoM AWS site. The most typical year for mean sea level pressure was found to be 2017-18 (R² = 0.9984).
- The Southern Oscillation Index was found to be most neutral during 2018-19, with this year ranging between La Niña, neutral and El Niño conditions. Neutral conditions occurred for eight of the twelve months.
- Annual rainfall totals were closest to the five-year mean during 2017-18.



3.2 Correlation statistic rankings

each parameter were weighted according to the weightings provided in Table 3-1. Wind speed and The correlation statistics for each meteorological parameter assessed were ranked and aggregated to determine the most typical year of the five year period. Prior to aggregation the correlation statistics for direction each attracted a 30% weighting, whilst air temperature was weighted by 10%. All other parameters were left unweighted. These weightings were selected to reflect the relative importance of wind and temperature upon atmospheric dispersion.

Rain	_
SOI	-
MSL pressure	L
Dew point temperature	1
Air temperature	1.1
Wind direction	1.3
Wind speed	1.3
Meteorological parameter	Weighting
	al Wind Wind Air Dew point MSL pressure SOI speed direction temperature temperature

Weightings applied to the meteorological parameter aggregation Table 3-1

The statistic rankings for the Mt Gellibrand BoM site are presented in Table 3-2.

speed (m/s) direction (m/s) (°C) point (°D) pressure (°D) raintall 1B 2.6 5.5 3 1 2 1 1B 2.6 5.5 3 1 2 1 2 19 5.2 1.3 4.4 5 3 1 2 1 20 6.5 3.9 1 2 3 1 2 1 20 6.5 3.9 2.2 1 2 4 4 4 21 1.3 5.2 1.1 4 4 3 3 3	Year	Wind	d Wind Temp Dew MSL SOI Annual Aggregate	Temp	Dew	WSL	SOI	Annual	Aggregate	ate
2.6 5.5 3 1 2 1 5.2 1.3 4.4 5 3 1 2 1 6.5 3.9 2.2 1 2 4 4 2 1.3 5.2 1.1 2 1 2 4 4 1.3 5.2 1.1 4 4 3 3 3		speed (m/s)	direction (degrees)	Ç,	point temp °C)	pressure (hPa)		rainfall	La La	king
5.2 1.3 4.4 5 3 1 2 6.5 3.9 2.2 1 2 4 4 4 1.3 5.2 1.1 4 4 3 3 3	2017-18		2.6	5.5	e	-	2	-	17	Ŀ.
6.5 3.9 2.2 1 2 4 4 1.3 5.2 1.1 4 4 3 3 3	2018-19		1.3	4.4	5	e	-	2	21.9	6
1.3 5.2 1.1 4 4 3 3 3	2019-20	6.5	3.9	2.2	-	2	4	4	23.6	9
	2020-21	1.3	5.2	1.1	4	4	ю	e	21.6	20

Weighted rankings of correlation statistics for meteorological parameters Table 3-2

Based on the assessment of meteorological inter-annual variability the one-year interval between 1 March 2017 to 28 February 2018 identified as the most typical year of meteorology within the Mooleric Broiler Farm's model.

S

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3.9

2021-22

Appendix B Summary of CALMET Model Configuration Parameters

CALMET Parameters

0132.2306_ProTen_Mooleric CALMET 2017-2018 100m resolution, 10x10 km

INPUT GROUP: 0 Input and Output File Names						
Parameter	Description	Value				
GEODAT	Input file of geophysical data (GEO.DAT)	GEO.DAT				
METLST	Output file name of CALMET list file (CALMET.LST)	CALMET.LST				
METDAT	Output file name of generated gridded met files (CALMET.DAT)	CALMET.DAT				
LCFILES	Lower case file names (T = lower case, F = upper case)	F				
NUSTA	Number of upper air stations	0				
NOWSTA	Number of overwater stations	0				
NM3D	Number of prognostic meteorological data files (3D.DAT)	12				
NIGF	Number of IGF-CALMET.DAT files used as initial guess	0				

INPUT GROUP: 1 General Run Control Parameters						
Parameter	Description	Value				
IBYR	Starting year	2017				
IBMO	Starting month	3				
IBDY	Starting day	1				
IBHR	Starting hour	0				
IBSEC	Starting second	0				
IEYR	Ending year	2018				
IEMO	Ending month	3				
IEDY	Ending day	1				
IEHR	Ending hour	0				
IESEC	Ending second	0				
ABTZ	Base time zone	UTC+1000				
NSECDT	Length of modeling time-step (seconds)	3600				
IRTYPE	Output run type (0 = wind fields only, 1 = CALPUFF/CALGRID)	1				
LCALGRD	Compute CALGRID data fields (T = true, F = false)	Т				
ITEST	Flag to stop run after setup phase (1 = stop, 2 = run)	2				
MREG	Regulatory checks (0 = no checks, 1 = US EPA LRT checks)	0				

INPUT GRO	UP: 2 Map Projection and Grid Control Parameters	
Parameter	Description	Value
PMAP	Map projection system	UTM
FEAST	False easting at projection origin (km)	0.0
FNORTH	False northing at projection origin (km)	0.0

INPUT GRO	INPUT GROUP: 2 Map Projection and Grid Control Parameters					
Parameter	Description	Value				
IUTMZN	UTM zone (1 to 60)	54				
UTMHEM	Hemisphere of UTM projection (N = northern, S = southern)	S				
RLAT0	Latitude of projection origin (decimal degrees)	0.00N				
RLON0	Longitude of projection origin (decimal degrees)	0.00E				
XLAT1	1st standard parallel latitude (decimal degrees)	30S				
XLAT2	2nd standard parallel latitude (decimal degrees)	60S				
DATUM	Datum-Region for the coordinates	WGS-84				
NX	Meteorological grid - number of X grid cells	100				
NY	Meteorological grid - number of Y grid cells	100				
DGRIDKM	Meteorological grid spacing (km)	0.1				
XORIGKM	Meteorological grid - X coordinate for SW corner (km)	742.3930				
YORIGKM	Meteorological grid - Y coordinate for SW corner (km)	5755.9190				
NZ	Meteorological grid - number of vertical layers	12				
ZFACE	Meteorological grid - vertical cell face heights (m)	0.00,20.00,60.00,100. 00,150.00,200.00,250 .00,350.00,500.00,80 0.00,1600.00,2600.00 .4600.00				

INPUT GRO	OUP: 3 Output Options	
Parameter	Description	Value
LSAVE	Save met fields in unformatted output file (T = true, F = false)	Т
IFORMO	Type of output file (1 = CALPUFF/CALGRID, 2 = MESOPUFF II)	1
LPRINT	Print met fields (F = false, T = true)	F
IPRINF	Print interval for output wind fields (hours)	1
STABILITY	Print gridded PGT stability classes? (0 = no, 1 = yes)	0
USTAR	Print gridded friction velocities? (0 = no, 1 = yes)	0
MONIN	Print gridded Monin-Obukhov lengths? (0 = no, 1 = yes)	0
MIXHT	Print gridded mixing heights? (0 = no, 1 = yes)	0
WSTAR	Print gridded convective velocity scales? (0 = no, 1 = yes)	0
PRECIP	Print gridded hourly precipitation rates? (0 = no, 1 = yes)	0
SENSHEAT	Print gridded sensible heat fluxes? (0 = no, 1 = yes)	0
CONVZI	Print gridded convective mixing heights? (0 = no, 1 = yes)	0
LDB	Test/debug option: print input met data and internal variables (F = false, T = true)	F
NN1	Test/debug option: first time step to print	1
NN2	Test/debug option: last time step to print	1
LDBCST	Test/debug option: print distance to land internal variables (F = false, T = true)	F
IOUTD	Test/debug option: print control variables for writing winds? (0 = no, 1 = yes)	0

INPUT GRC	OUP: 3 Output Options	
Parameter	Description	Value
NZPRN2	Test/debug option: number of levels to print starting at the surface	1
IPR0	Test/debug option: print interpolated winds? (0 = no, 1 = yes)	0
IPR1	Test/debug option: print terrain adjusted surface wind? (0 = no, 1 = yes)	0
IPR2	Test/debug option: print smoothed wind and initial divergence fields? (0 = no, 1 = yes)	0
IPR3	Test/debug option: print final wind speed and direction? (0 = no, 1 = yes)	0
IPR4	Test/debug option: print final divergence fields? (0 = no, 1 = yes)	0
IPR5	Test/debug option: print winds after kinematic effects? (0 = no, 1 = yes)	0
IPR6	Test/debug option: print winds after Froude number adjustment? (0 = no, 1 = yes)	0
IPR7	Test/debug option: print winds after slope flow? (0 = no, 1 = yes)	0
IPR8	Test/debug option: print final winds? (0 = no, 1 = yes)	0

INPUT GRO	OUP: 4 Meteorological Data Options	
Parameter	Description	Value
NOOBS	Observation mode (0 = stations only, 1 = surface/overwater stations with prognostic upper air, 2 = prognostic data only)	2
NSSTA	Number of surface stations	0
NPSTA	Number of precipitation stations	-1
ICLDOUT	Output the CLOUD.DAT file? (0 = no, 1 = yes)	0
MCLOUD	Method to compute cloud fields (1 = from surface obs, 2 = from CLOUD.DAT, 3 = from prognostic (Teixera), 4 = from prognostic (MM5toGrads)	4
IFORMS	Surface met data file format (1 = unformatted, 2 = formatted)	2
IFORMP	Precipitation data file format (1 = unformatted, 2 = formatted)	2
IFORMC	Cloud data file format (1 = unformatted, 2 = formatted)	1

INPUT GRO	OUP: 5 Wind Field Options and Parameters	
Parameter	Description	Value
IWFCOD	Wind field model option (1 = objective analysis, 2 = diagnostic)	1
IFRADJ	Adjust winds using Froude number effects? (0 = no, 1 = yes)	1
IKINE	Adjust winds using kinematic effects? (0 = no, 1 = yes)	0
IOBR	Adjust winds using O'Brien velocity procedure? (0 = no, 1 = yes)	0
ISLOPE	Compute slope flow effects? (0 = no, 1 = yes)	1
IEXTRP	Extrapolation of surface winds to upper layers method (1 = none, 2 = power law, 3 = user input, 4 = similarity theory, - = same except layer 1 data at upper air stations are ignored)	1
ICALM	Extrapolate surface winds even if calm? (0 = no, 1 = yes)	0
BIAS	Weighting factors for surface and upper air stations (NZ values)	0.0,0.0,0.0,0.0,0.0,0.0,0.0, ,0.0,0.0,0.
RMIN2	Minimum upper air station radius of influence for surface extrapolation exclusion (km)	4

Deremeter	Description	Value
Parameter	Description	Value
IPROG	Use prognostic winds as input to diagnostic wind model (0 = no, 13 = use winds from 3D.DAT as Step 1 field, 14 = use winds from 3D.DAT as initial guess field, 15 = use winds from 3D.DAT file as observations)	14
ISTEPPGS	Prognostic data time step (seconds)	3600
IGFMET	Use coarse CALMET fields as initial guess? (0 = no, 1 = yes)	0
LVARY	Use varying radius of influence (F = false, T = true)	F
RMAX1	Maximum radius of influence in the surface layer (km)	0
RMAX2	Maximum radius of influence over land aloft (km)	0
RMAX3	Maximum radius of influence over water (km)	0
RMIN	Minimum radius of influence used in wind field interpolation (km)	0.1
TERRAD	Radius of influence of terrain features (km)	9
R1	Relative weight at surface of step 1 fields and observations (km)	0
R2	Relative weight aloft of step 1 field and observations (km)	0
RPROG	Weighting factors of prognostic wind field data (km)	0
DIVLIM	Maximum acceptable divergence	5E-006
NITER	Maximum number of iterations in the divergence minimization procedure	50
NSMTH	Number of passes in the smoothing procedure (NZ values)	2,11*4
NINTR2	Maximum number of stations used in each layer for interpolation (NZ values)	12*99
CRITFN	Critical Froude number	1
ALPHA	Empirical factor triggering kinematic effects	0.1
NBAR	Number of barriers to interpolation of the wind fields	0
KBAR	Barrier - level up to which barriers apply (1 to NZ)	10
IDIOPT1	Surface temperature (0 = compute from obs/prognostic, 1 = read from DIAG.DAT)	0
ISURFT	Surface station to use for surface temperature (between 1 and NSSTA)	-1
IDIOPT2	Temperature lapse rate used in the computation of terrain-induced circulations (0 = compute from obs/prognostic, 1 = read from DIAG.DAT)	0
IUPT	Upper air station to use for the domain-scale lapse rate (between 1 and NUSTA)	-1
ZUPT	Depth through which the domain-scale lapse rate is computed (m)	200
IDIOPT3	Initial guess field winds (0 = compute from obs/prognostic, 1 = read from DIAG.DAT)	0
IUPWND	Upper air station to use for domain-scale winds	-1
ZUPWND	Bottom and top of layer through which the domain-scale winds are computed (m)	1.0, 1.00
IDIOPT4	Read observed surface wind components (0 = from SURF.DAT, 1 = from DIAG.DAT)	0
IDIOPT5	Read observed upper wind components (0 = from UPn.DAT, 1 = from DIAG.DAT)	0
LLBREZE	Use Lake Breeze module (T = true, F = false)	F
NBOX	Lake Breeze - number of regions	0

INPUT GRO	OUP: 6 Mixing Height, Temperature and Precipitation Parameters	
Parameter	Description	Value
CONSTB	Mixing height constant: neutral, mechanical equation	1.41
CONSTE	Mixing height constant: convective equation	0.15
CONSTN	Mixing height constant: stable equation	2400
CONSTW	Mixing height constant: overwater equation	0.16
FCORIOL	Absolute value of Coriolis parameter (1/s)	9E-005
IAVEZI	Spatial mixing height averaging? (0 = no, 1 = yes)	1
MNMDAV	Maximum search radius in averaging process (grid cells)	1
HAFANG	Half-angle of upwind looking cone for averaging (degrees)	30
ILEVZI	Layer of winds used in upwind averaging (between 1 and NZ)	1
IMIXH	Convective mixing height method (1 = Maul-Carson, 2 = Batchvarova-Gryning, - for land cells only, + for land and water cells)	1
THRESHL	Overland threshold boundary flux (W/m**3)	0
THRESHW	Overwater threshold boundary flux (W/m**3)	0.05
ITWPROG	Overwater lapse rate and deltaT options (0 = from SEA.DAT, 1 = use prognostic lapse rates and SEA.DAT deltaT, 2 = from prognostic)	0
ILUOC3D	Land use category in 3D.DAT	16
DPTMIN	Minimum potential temperature lapse rate (K/m)	0.001
DZZI	Depth of computing capping lapse rate (m)	200
ZIMIN	Minimum overland mixing height (m)	50
ZIMAX	Maximum overland mixing height (m)	3000
ZIMINW	Minimum overwater mixing height (m)	50
ZIMAXW	Maximum overwater mixing height (m)	3000
ICOARE	Overwater surface fluxes method	10
DSHELF	Coastal/shallow water length scale (km)	0
IWARM	COARE warm layer computation (0 = off, 1 = on)	0
ICOOL	COARE cool skin layer computation (0 = off, 1 = on)	0
IRHPROG	Relative humidity read option (0 = from SURF.DAT, 1 = from 3D.DAT)	1
ITPROG	3D temperature read option (0 = stations, 1 = surface from station and upper air from prognostic, 2 = prognostic)	2
IRAD	Temperature interpolation type $(1 = 1/R, 2 = 1/R^{*2})$	1
TRADKM	Temperature interpolation radius of influence (km)	500
NUMTS	Maximum number of stations to include in temperature interpolation	5
IAVET	Conduct spatial averaging of temperatures? (0 = no, 1 = yes)	1
TGDEFB	Default overwater mixed layer lapse rate (K/m)	-0.0098
TGDEFA	Default overwater capping lapse rate (K/m)	-0.0045
JWAT1	Beginning land use category for temperature interpolation over water	999
JWAT2	Ending land use category for temperature interpolation over water	999
NFLAGP	Precipitation interpolation method (1 = $1/R$, 2 = $1/R^{**2}$, 3 = EXP/R**2)	2
SIGMAP	Precipitation interpolation radius of influence (km)	100.
CUTP	Minimum precipitation rate cutoff (mm/hr)	0.01

Appendix C

Evaluation of Meteorological Model Performance



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1 Available Observations

The location of the closest Bureau of Meteorology (BoM) automatic weather station (AWS) in relation to the Mooleric Broiler Farm is provided in Table 1-1, and shown in Figure 1-1. The closest AWS site is located North-northwest at the summit of Mt Gellibrand, approximately 4.9 km from the site.

Table 1-1 Location of the closest AWS site in relation to Mooleric Broiler Farm

BoM Station Number	BoM Station Name	Latitude/ Northing (GDA 2020)	Longitude/ Easting (GDA 2020)	Distance from the Site	Bearing from the Site
090035	Colac (Mount Gellibrand)	-38.2333 °S (744418 mN)	143.7925 °E (5764612 mE)	4.9 km	334 ° (N-NW)



Figure 1-1 Location of the Mt Gellibrand BoM AWS site in relation to Mooleric Broiler Farm



2 Methodology for Model Performance Evaluation

Observations collected at the BoM Mt Gellibrand AWS, during the period selected for modelling (1 March 2017 to 28 February 2022), were compared with meteorological data generated by the TAPM meteorological modelling system for the same time period and approximate location. Model predictions were selected from the 300 m grid (Grid 5) at the closest respective model grid point to the BoM Mt Gellibrand AWS site, for evaluation analysis.

The model predictions were validated against observations using the following statistical measures. Details about these measures are discussed in Section 3.

- Root Mean Square Error (RMSE)
- Systematic Root Mean Square Error (RMSEs)
- Unsystematic Root Mean Square Error (RMSE_U)
- Mean Error (ME)
- Mean Absolute Error (MAE)
- Index of Agreement (IOA)
- Skill E
- Skill V
- Skill R

In addition to these measures, basic descriptive statistics such as the minimum, mean, maximum, and standard deviation were also derived.



Statistics used in the Evaluation

provide a means to quantify the magnitude of the difference between predictions and observations. These provide a useful guide to performance benchmarks of what should be expected from a model. These There are no defined standards for numerical weather model performance. Statistical scores simply values are guidelines and are not absolute values of pass or fail.

3.1 Root mean square error (RMSE)

$$\text{RMSE} = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (P_i - O_i)^2}$$

Where:

N = number of observed and predicted hours in analysis (i.e. one year)

P = hourly prediction

O = hourly observation

The RMSE can be described as the standard deviation of the difference for hourly predicted and observed pairings at a specific point. The RMSE is a quadratic scoring rule, which measures the average magnitude of the error. The difference between predicted and corresponding observed values are each squared and squared before they are averaged, the RMSE gives a relatively high weight to large errors. This means the RMSE is most useful when large errors are particularly undesirable. Overall, the RMSE is a good overall measure of model performance, but since large errors are weighted heavily (due to squaring), its then averaged over the sample. Finally, the square root of the average is taken. Since the errors are value can be distorted. The units of RMSE are the same those of the values being analysed. An appropriate benchmark for acceptable model performance for wind speed predictions is an RMSE value of 2 m/s or lower.

3.2 Systematic root mean square error (RMSEs)

$$\text{RMSE}_{\text{S}} = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (\hat{P}_i - O_i)^2}$$

Where:

- N = number of observed and predicted hours in analysis (i.e. one year)
- \hat{P} = mean of predictions
- O = hourly observation

The RMSEs is calculated as the square root of the mean square difference of hourly predictions from the regression formula and observation pairings, at a specific point. The regressed predictions are taken from the least squares formula. The RMSEs estimates the model's linear (or systematic) error. The systematic error is a measure of the bias in the model due to user input or model deficiency, i.e., data input errors, assimilation variables, and choice of model options. The RMSEs is a metric for the model's accuracy.



3.3 Unsystematic root mean square error (RMSE_u)

$$\text{RMSE}_{\text{U}} = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (\hat{P}_i - P_i)^2}$$

Where:

N = number of observed and predicted hours in analysis (i.e. one year)

- \hat{P} = mean of predictions
- O = hourly prediction

The RMSE^u is calculated as the square root of the mean square difference of hourly predictions from the regression formula and model prediction value pairings, at a specific point. The RMSE^u is a measure of how much of the difference between predictions and observations result from random processes or influences outside the legitimate range of the model. This error may require model refinement, such as new algorithms or higher resolution grids, or that the phenomena being simulated cannot be fully resolved by the model. The RMSE^u is a metric for the model's precision. Ultimately, for good model performance, the RMSE should be a low value, with most of the variation explained in the observations. Here, the systematic error RMSEs should approach zero and the unsystematic error, RMSE $_{u_i}$ should approach the RMSE since:

 $RMSE^{2} = RMSE_{S}^{2} + RMSE_{u}^{2}$

3.4 Mean error and mean absolute error

The Mean Error (ME) is simply the average of the hourly modelled values minus the hourly observed values. It contains both systematic and unsystematic errors and is heavily influence by high and low errors.

Specific mean error benchmarks denoting acceptable model performance have been developed for:

- wind speed ≤ ±0.5 m/s
- wind direction $\leq \pm 10^{\circ}$
- temperature ≤ ±0.5 °C
- relative humidity ≤ ±1 g/kg.

corresponding observation. The MAE is a linear score, which means that all the individual differences are 8 The Mean Absolute Error (MAE) measures the average magnitude of the errors in a set of predictions, without considering their direction. It measures accuracy for continuous variables. Expressed in words, between predictions and the weighted equally in the average. The MAE and the RMSE can be used together to diagnose the variation in the errors in a set of predictions. The RMSE will always be larger or equal to the MAE; the greater difference between them, the greater the variance in the individual errors in the sample. If the RMSE MAE, then all the errors are of the same magnitude. Both the MAE and RMSE can range from 0 to of the differences They are negatively-oriented scores, i.e., lower values are better. absolute values is the average of the the MAE

Specific mean absolute error benchmarks denoting acceptable model performance have been developed for:

- wind direction ≤ 30 °
- temperature ≤ 2 °C



relative humidity — ≤ 2 g/kg.

3.5 Index of agreement

The Index of Agreement (IOA) is defined as:

$$OA = 1 - \frac{\sum_{i=1}^{N} (P_i - O_i)^2}{\sum_{i=1}^{N} (|P_i - O_{mean}| + |O_i - O_{mean}|]}$$

 $)^2$

Where:

N is the number of observations,

- Pi are the hourly model predictions,
 - Oi are the hourly observations,

 $= a + bO_i$ is the linear regression fitted with ¢ط. Omean is the observed observation mean, and intercepts a and slope b.

between each observation and observed mean. From another perspective, the IOA is a measure of the The IOA is calculated using a method described in Willmott (1982). The IOA can take a value between 0 to the sum of two differences, i.e., the difference between each prediction and the observed mean, and the difference match between the departure of each prediction from the observed mean and the departure of each observation from the observed mean. In general, a value of 0.5 is considered acceptable and >0.6 is considered good performance for time and space predictions. Specific index of agreement benchmarks and 1, with 1 indicating perfect agreement. The IOA is the ratio of the total RMSE denoting acceptable model performance have been developed for:

- wind speed ≥ 0.6
- air temperature ≥ 0.8
- relative humidity \geq 0.6.

3.6 Skill measures

Skill measure statistics are given in terms of a score, rather than in absolute terms. A model's skill can be measured by the difference in the standard deviation of the modelled and observed values (Chang and Hanna, 2004).

... ... The Skill_E (se) is indicative of how much of the standard deviation in the observations is predicted to layer. turbulence/chaos. For good model performance, the value for Skill_E should be less than one, i.e.: in the atmospheric boundary (unsystematic) processes random/natural **ç** due be

SKILL_E = (RMSE_U/ STDEV OBS) < 1 shows skill

Skill V (sv) is ratio of the standard deviation of the model predictions to the standard deviation of the observations. For good model performance, the value for Skill_V should be close to one, i.e.:

SKILL_V = (STDEV_MOD/ STDEV_OBS) close to 1 shows skill

SKILL_R (sr) takes into account systematic and unsystematic errors in relation to the observed standard deviation. For good model performance, the value for Skill_E should be less than one, i.e.:

SKILL_R = (RMSE/ STDEV_OBS) < 1 shows skill



Model Performance Evaluation

Descriptive statistics 4.1

The basic statistics for TAPM predictions and observations at the BoM Mt Gellibrand AWS for the period modelled are compared in Table 4-1. Table 4-1 shows that the distribution of observations and model predictions are very similar.

Descriptive statistics for meteorological observations and TAPM model predictions at the BoM Mt Gellibrand AWS Table 4-1

Descriptive	Wind	Wind speed	U Vecto	U Vector wind	V Vect	V Vector wind	Tempe	Temperature	Hum	Humidity
Statistics	AWS OBS	TAPM MOD	AWS OBS	TAPM MOD	AWS OBS	TAPM MOD	AWS OBS	TAPM MOD	AWS OBS	TAPM MOD
Average	6.5	4.0	-1.8	-1.4	0.6	-0.1	12.8	13.0	83.3	78.1
Standard deviation	3.3	2.0	5.2	3.4	4.7	2.5	5.7	5.3	20.5	18.8
Minimum	0.0	0.0	-19.4	-12.8	-16.4	-9.6	0.2	1.4	5.0	12.4
Maximum	22.4	12.8	14.3	9.5	21.8	11.2	43.2	41.2	100	100
C	43304	43498	43254	43498	43254	43498	43305	43498	43305	43498

Table note:

U component is the east-west component of the wind. V component is the north-south component of the wind.

Statistical model evaluation measures 4.2

their respective benchmarks, with the exception of the Root Mean Square Error for the East-West (U) Evaluation statistics for wind speed and U and V wind components are detailed in Table 4-2. The statistical measures used to evaluate model performance show that the TAPM model predicted winds well, performing within acceptable limits. In particular, all predicted wind parameters easily met each of vector wind component and the Mean Error (Bias) for the North-South (V) vector wind component.

Statistic	Ideal score	Benchmark	Wind speed score	U wind component score	V wind component score
RMSE	0 m/s	≤ 2 m/s	3.3 m/s	2.6 m/s	2.9 m/s
RMSEs	0 m/s	≤ 2 m/s	3.0 m/s	2.1 m/s	2.6 m/s
RMSEU	0 m/s	≤ 2 m/s	1.2 m/s	1.4 m/s	1.3 m/s
Mean Error (Bias)	0 m/s	≤ ±0.5 m/s	-2.5 m/s	0.4 m/s	-0.7 m/s
MAE (Gross error)	0 m/s	≤ 2 m/s	2.6 m/s	2.1 m/s	2.2 m/s
IOA		≥ 0.6	0.7	0.9	0.8
Skille	$\overline{\vee}$		0.4	0.3	0.3
Skillv	-	~	0.6	0.7	0.5
Skill	~ V	< - 1	1.0	0.5	0.6
Table note: U compo	U component is the east-west component of the wind.	U component is the east-west component of the wind.	the wind.		

Evaluation statistics for TAPM wind predictions at the BoM Mt Gellibrand AWS Table 4-2

V component is the north-south component of the wind. Benchmarks were conservatively selected for simple terrain. Statistics meeting their respective benchmarks are highlighted in green, with those not meeting their benchmark being highlighted in red.



measures used to evaluate model performance show that the TAPM model predicted air temperature and relative humidity well, meeting their respective benchmarks for all evaluation statistics with the Evaluation statistics for air temperature and relative humidity are detailed in Table 4-3. The statistical exception of the mean Error (Bias) and MAE (Gross Error) for Temperature.

Statistic	Ideal score	Air Temperature, °C	rature, °C	Relative Humidity, $\%$	umidity, %
		Benchmark	Score	Benchmark	Score
RMSE	0	I	1.8	I	13.9
RMSEs	0	I	0.7	I	7.7
RMSEU	0	I	1.7	I	11.6
Mean Error (Bias)	0	≤ ±0.5	0.2	≤±10	-5.2
MAE (Gross Error)	0	< 2	1.3	< 20	10.4
IOA	-	≥ 0.8	1.0	≥ 0.6	0.9
Skille	V		0.3		0.6
Skillv	-	- ~	0.9	- ~	0.9
Skillr	~	- v	0.3		0.7

Evaluation statistics for TAPM air temperature and relative humidity predictions at the BoM Mt Gellibrand AWS Table 4-3

Table note:

Benchmarks were conservatively selected for simple terrain. Statistics meeting their respective benchmarks are highlighted in green, with those not meeting their benchmark being highlighted in red.

Wind 4.3

The wind speed probability density function (PDF) for the TAPM 300 m grid is presented in Figure 4-1. The corresponding PDFs for the easterly (U) and northerly (V) components of winds are shown in Figure 4-2 and Figure 4-3 respectively. Quantile-Quantile (Q-Q) plots for wind speed are shown in Figure 4-4. Wind roses for TAPM and observed wind distributions at the BoM Mt Gellibrand AWS site are presented in Figure 4-5.

nearest to the hill to provide an accurate representation of the meteorology was difficult, as the AWS on Statistical comparisons of the predicted and observed winds at the BoM Mt Gellibrand AWS site are presented in Figure 4-1 to Figure 4-4. This statistical evaluation proved difficult due to the situation of the AWS on Mt Gellibrand. The location of the AWS atop the hill caused localised effects that the model was unable to accurately replicate. Furthermore, the extraction of the meteorological data from a grid cell the hill was situated near the intersection of four model grid cells. These factors have affected the accuracy of the model evaluation.

degree of conservatism to the dispersion model predictions for fugitive emission sources, which tend to wind speed with a predicted mean value of 4 m/s compared to the observed mean value of 6.5 m/s. It also significantly over-predicted the frequency of light winds. This too could be an artefact of the comparison of the observed data from an elevated AWS with modelled data dominated by relatively flat terrain with a hill that is not well resolved in the model. This over-prediction of the light winds will add a generate the highest ground level concentrations during light wind, stable conditions. In addition, TAPM predicted lower frequencies of winds above 5 m/s, which tend to be the conditions in which emissions are well dispersed. Model predictions do fall within the ± 50% criterion for acceptable model performance for wind speed under 19 m/s, and overall show general agreements with the observed wind speed distribution. However, several of the statistical measures do not meet the benchmark, such as the RSME Notwithstanding this, the model performance evaluation indicated that TAPM underpredicted the mean



and systematic RMSE, which is an indication that the model did not resolve the effect of the hill. The model is therefore considered not to be ideal, but is acceptable due to this conservatism and its potential to over-predict ground-level odour concentrations.

The wind rose diagram (Figure 4-5) shows that TAPM predicts the overall wind direction distribution quite well, with the exception of a noticeable reduction in northerly winds in the predicted data and the aforementioned inaccuracy in the distribution of wind speed in each direction.

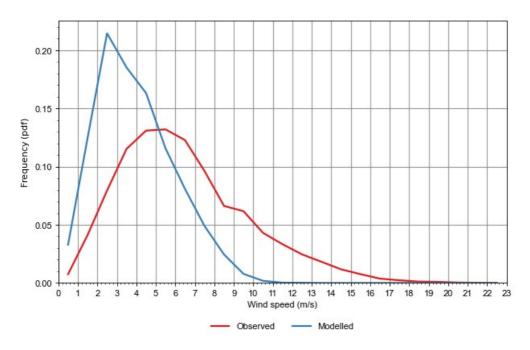


Figure 4-1 Distribution of wind speeds at the BoM Mt Gellibrand AWS

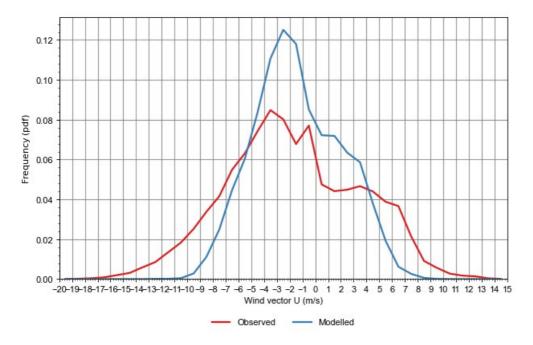
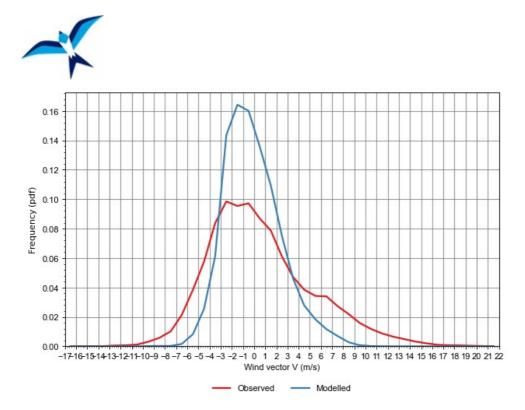


Figure 4-2 Distribution of easterly (U) component of wind at the BoM Mt Gellibrand AWS





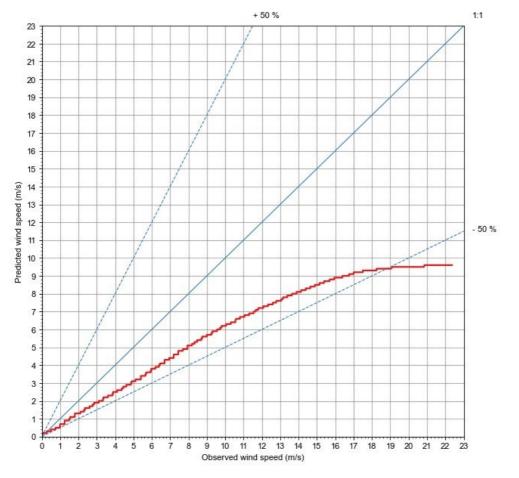


Figure 4-4 Quantile-quantile (Q-Q) plot of wind speeds at the BoM Mt Gellibrand AWS

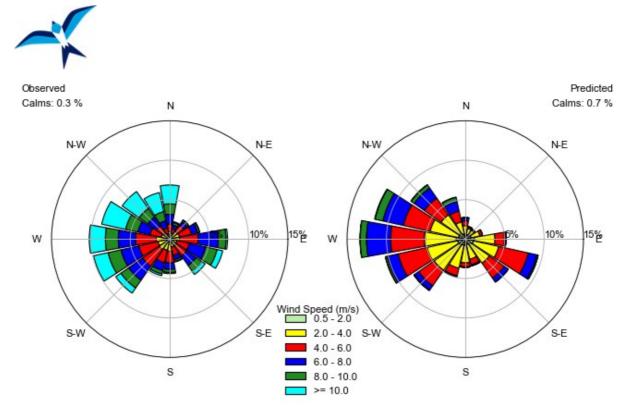
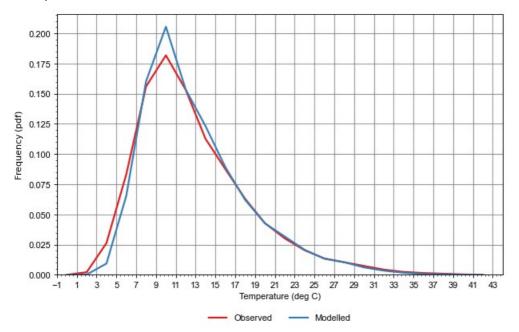


Figure 4-5 Distribution of observed (left) and TAPM predicted (right) winds at the BoM Mt Gellibrand AWS

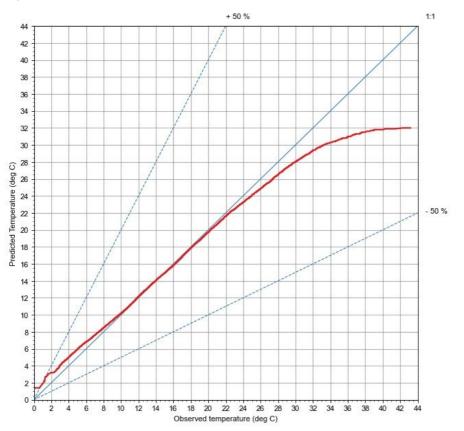


4.4 Air temperature

The PDF and Q-Q plots for air temperature are provided in Figure 4-6 and Figure 4-7 respectively, showing that TAPM predicted a very temperature distribution for the period modelled, slightly overestimating the frequency of temperatures between 8 and 12 °C and underestimating the frequency of temperatures between 8 and 12 °C and underestimating the frequency of temperatures between 8 and 12 °C and underestimating the frequency of temperatures between 8 and 12 °C.





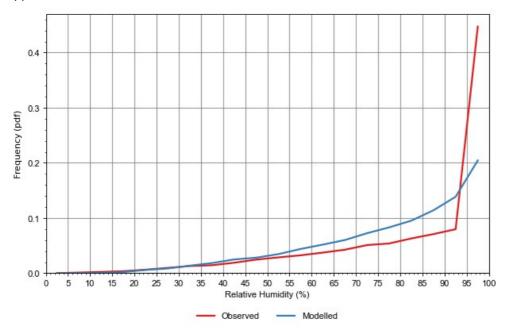






4.5 Relative humidity

The PDF and Q-Q plots for relative humidity are provided in Figure 4-8 and Figure 4-9 respectively, showing that TAPM predicted a similar distribution of relative humidity to the observations for the period modelled with some deviation between the observed and modelled results as the relative humidity approaches 100%.





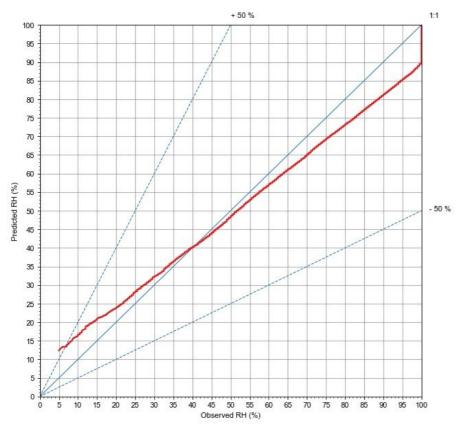


Figure 4-9 Quantile-quantile (Q-Q) plot of relative humidity at the BoM Mt Gellibrand AWS



The closest BoM observation site to Mooleric Broiler farm is located north-northwest of the site at Mt Gellibrand, approximately 4.9 km away. On the TAPM 300 m grid (Grid 5), the closest grid point to this location is approximately 160 m to the north-west of the BoM observation site. TAPM predictions made at the closest Grid 5 grid point to the BoM observation site were compared against observations for the same time period.

Temperature and relative humidity were each well-predicted, meeting all their respective statistical evaluation benchmarks in all cases. However, wind speed and direction were less well-predicted with a number of statistical measures exceeding the benchmark.

The variation between the observed results and modelled results in relation to wind speed and direction is most likely due to the positioning of the AWS and the topography surrounding it. The Mt Gellibrand AWS is positioned on the peak of a hill approximately 150 metres higher than the surrounding terrain and as such, the terrain changes very rapidly with distance from the monitor. Due to this, the nearest TAPM 300m grid cell, despite being only 160 metres from the AWS is still no longer on the top of the mountain but rather on the northern face of it.

The results show that the meteorological dataset generated for the TAPM 300 m grid is imperfect but usable in a CALMET No-Obs dispersion model scenario.

Appendix D CALPUFF Dispersion Model Configuration

CALPUFF Parameters

0132.2306_ProTen_Mooleric

CALPUFF 2017-2018 all sheds average emission rates 100m resolution, 10x10 km

INPUT GROUP: 0 Input and Output File Names		
Parameter	Description	Value
METDAT	CALMET gridded meteorological data file (CALMET.DAT)	CALMET.DAT
PUFLST	CALPUFF output list file (CALPUFF.LST)	CALPUFF.LST
CONDAT	CALPUFF output concentration file (CONC.DAT)	CONC.DAT
DFDAT	CALPUFF output dry deposition flux file (DFLX.DAT)	DFLX.DAT
WFDAT	CALPUFF output wet deposition flux file (WFLX.DAT)	WFLX.DAT
LCFILES	Lower case file names (T = lower case, F = upper case)	F
NMETDOM	Number of CALMET.DAT domains	1
NMETDAT	Number of CALMET.DAT input files	1
NPTDAT	Number of PTEMARB.DAT input files	0
NARDAT	Number of BAEMARB.DAT input files	0
NVOLDAT	Number of VOLEMARB.DAT input files	1
NFLDAT	Number of FLEMARB.DAT input files	0
NRDDAT	Number of RDEMARB.DAT input files	0
NLNDAT	Number of LNEMARB.DAT input files	0
VOLDAT	Volume source varying emissions file (VOLEMARB.DAT)	Mooleric_2_modules _3_min_average_3mi N_Vol.dat

INPUT GROUP: 1 General Run Control Parameters		
Parameter	Description	Value
METRUN	Run all periods in met data file? (0 = no, 1 = yes)	0
IBYR	Starting year	2017
IBMO	Starting month	3
IBDY	Starting day	1
IBHR	Starting hour	0
IBMIN	Starting minute	0
IBSEC	Starting second	0
IEYR	Ending year	2018
IEMO	Ending month	3
IEDY	Ending day	1
IEHR	Ending hour	0
IEMIN	Ending minute	0
IESEC	Ending second	0

INPUT GROUP: 1 General Run Control Parameters		
Parameter	Description	Value
ABTZ	Base time zone	UTC+1000
NSECDT	Length of modeling time-step (seconds)	3600
NSPEC	Number of chemical species modeled	1
NSE	Number of chemical species to be emitted	0
ITEST	Stop run after SETUP phase (1 = stop, 2 = run)	2
MRESTART	Control option to read and/or write model restart data	0
NRESPD	Number of periods in restart output cycle	0
METFM	Meteorological data format (1 = CALMET, 2 = ISC, 3 = AUSPLUME, 4 = CTDM, 5 = AERMET)	1
MPRFFM	Meteorological profile data format (1 = CTDM, 2 = AERMET)	1
AVET	Averaging time (minutes)	60
PGTIME	PG Averaging time (minutes)	60
IOUTU	Output units for binary output files (1 = mass, 2 = odour, 3 = radiation)	1

INPUT GROUP: 2 Technical Options		
Parameter	Description	Value
MGAUSS	Near field vertical distribution (0 = uniform, 1 = Gaussian)	1
MCTADJ	Terrain adjustment method (0 = none, 1 = ISC-type, 2 = CALPUFF-type, 3 = partial plume path)	3
MCTSG	Model subgrid-scale complex terrain? (0 = no, 1 = yes)	0
MSLUG	Near-field puffs modeled as elongated slugs? (0 = no, 1 = yes)	0
MTRANS	Model transitional plume rise? (0 = no, 1 = yes)	1
MTIP	Apply stack tip downwash to point sources? (0 = no, 1 = yes)	1
MRISE	Plume rise module for point sources (1 = Briggs, 2 = numerical)	1
MTIP_FL	Apply stack tip downwash to flare sources? (0 = no, 1 = yes)	0
MRISE_FL	Plume rise module for flare sources (1 = Briggs, 2 = numerical)	2
MBDW	Building downwash method (1 = ISC, 2 = PRIME)	1
MSHEAR	Treat vertical wind shear? (0 = no, 1 = yes)	0
MSPLIT	Puff splitting allowed? (0 = no, 1 = yes)	0
MCHEM	Chemical transformation method (0 = not modeled, 1 = MESOPUFF II, 2 = User-specified, 3 = RIVAD/ARM3, 4 = MESOPUFF II for OH, 5 = half-life, 6 = RIVAD w/ISORROPIA, 7 = RIVAD w/ISORROPIA CalTech SOA)	0
MAQCHEM	Model aqueous phase transformation? (0 = no, 1 = yes)	0
MLWC	Liquid water content flag	1
MWET	Model wet removal? (0 = no, 1 = yes)	0
MDRY	Model dry deposition? (0 = no, 1 = yes)	0
MTILT	Model gravitational settling (plume tilt)? (0 = no, 1 = yes)	0
MDISP	Dispersion coefficient calculation method (1= PROFILE.DAT, 2 = Internally, 3 = PG/MP, 4 = MESOPUFF II, 5 = CTDM)	2
MTURBVW	Turbulence characterization method (only if MDISP = 1 or 5)	3
MDISP2	Missing dispersion coefficients method (only if MDISP = 1 or 5)	3

INPUT GROUP: 2 Technical Options		
Parameter	Description	Value
MTAULY	Sigma-y Lagrangian timescale method	0
MTAUADV	Advective-decay timescale for turbulence (seconds)	0
MCTURB	Turbulence method (1 = CALPUFF, 2 = AERMOD)	1
MROUGH	PG sigma-y and sigma-z surface roughness adjustment? (0 = no, 1 = yes)	0
MPARTL	Model partial plume penetration for point sources? (0 = no, 1 = yes)	1
MPARTLBA	Model partial plume penetration for buoyant area sources? (0 = no, 1 =	0
MTINV	Strength of temperature inversion provided in PROFILE.DAT? (0 = no - compute from default gradients, 1 = yes)	0
MPDF	PDF used for dispersion under convective conditions? (0 = no, 1 = yes)	0
MSGTIBL	Sub-grid TIBL module for shoreline? (0 = no, 1 = yes)	0
MBCON	Boundary conditions modeled? (0 = no, 1 = use BCON.DAT, 2 = use CONC.DAT)	0
MSOURCE	Save individual source contributions? (0 = no, 1 = yes)	0
MFOG	Enable FOG model output? (0 = no, 1 = yes - PLUME mode, 2 = yes - RECEPTOR mode)	0
MREG	Regulatory checks (0 = no checks, 1 = USE PA LRT checks)	0

INPUT GROUP: 3 Species List		
Parameter	Description	Value
CSPEC	Species included in model run	ODOR

INPUT GROUP: 4 Map Projection and Grid Control Parameters		
Parameter	Description	Value
PMAP	Map projection system	UTM
FEAST	False easting at projection origin (km)	0.0
FNORTH	False northing at projection origin (km)	0.0
IUTMZN	UTM zone (1 to 60)	54
UTMHEM	Hemisphere (N = northern, S = southern)	S
RLAT0	Latitude of projection origin (decimal degrees)	0.00N
RLON0	Longitude of projection origin (decimal degrees)	0.00E
XLAT1	1st standard parallel latitude (decimal degrees)	30S
XLAT2	2nd standard parallel latitude (decimal degrees)	60S
DATUM	Datum-region for the coordinates	WGS-84
NX	Meteorological grid - number of X grid cells	100
NY	Meteorological grid - number of Y grid cells	100
NZ	Meteorological grid - number of vertical layers	12
DGRIDKM	Meteorological grid spacing (km)	0.1

INPUT GROUP: 4 Map Projection and Grid Control Parameters		
Parameter	Description	Value
ZFACE	Meteorological grid - vertical cell face heights (m)	0.0, 20.0, 60.0, 100.0, 150.0, 200.0, 250.0, 350.0, 500.0, 800.0, 1600.0, 2600.0, 4600.0
XORIGKM	Meteorological grid - X coordinate for SW corner (km)	742.3930
YORIGKM	Meteorological grid - Y coordinate for SW corner (km)	5755.9190
IBCOMP	Computational grid - X index of lower left corner	1
JBCOMP	Computational grid - Y index of lower left corner	1
IECOMP	Computational grid - X index of upper right corner	100
JECOMP	Computational grid - Y index of upper right corner	100
LSAMP	Use sampling grid (gridded receptors) (T = true, F = false)	Т
IBSAMP	Sampling grid - X index of lower left corner	1
JBSAMP	Sampling grid - Y index of lower left corner	1
IESAMP	Sampling grid - X index of upper right corner	100
JESAMP	Sampling grid - Y index of upper right corner	100
MESHDN	Sampling grid - nesting factor	1

INPUT GROUP: 5 -- Output Options Parameter Value Description **ICON** Output concentrations to CONC.DAT? (0 = no, 1 = yes)1 IDRY Output dry deposition fluxes to DFLX.DAT? $(0 = n_0, 1 = y_{es})$ 0 IWET Output wet deposition fluxes to WFLX.DAT? (0 = no, 1 = yes) 0 IT2D Output 2D temperature data? (0 = no, 1 = yes)0 IRHO Output 2D density data? (0 = no, 1 = yes) 0 IVIS Output relative humidity data? (0 = no, 1 = yes)0 Т LCOMPRS Use data compression in output file (T = true, F = false) IQAPLOT Create QA output files suitable for plotting? $(0 = n_0, 1 = y_{es})$ 1 Output puff tracking data? (0 = no, 1 = yes use timestep, 2 = yes use **IPFTRAK** 0 sampling step) IMFLX 0 Output mass flux across specific boundaries? (0 = no, 1 = yes) 0 IMBAL Output mass balance for each species? $(0 = n_0, 1 = y_{es})$ INRISE 0 Output plume rise data? (0 = no, 1 = yes) **ICPRT** Print concentrations? (0 = no, 1 = yes)0 IDPRT Print dry deposition fluxes? $(0 = n_0, 1 = y_{es})$ 0 IWPRT Print wet deposition fluxes? (0 = no, 1 = yes)0 **ICFRQ** 1 Concentration print interval (timesteps) IDFRQ 1 Dry deposition flux print interval (timesteps) IWFRQ 1 Wet deposition flux print interval (timesteps) IPRTU Units for line printer output (e.g., $3 = ug/m^{**}3 - ug/m^{**}2/s$, 5 = odor units) 5

INPUT GROUP: 5 Output Options		
Parameter	Description	Value
IMESG	Message tracking run progress on screen (0 = no, 1 and 2 = yes)	2
LDEBUG	Enable debug output? (0 = no, 1 = yes)	F
IPFDEB	First puff to track in debug output	1
NPFDEB	Number of puffs to track in debug output	1000
NN1	Starting meteorological period in debug output	1
NN2	Ending meteorological period in debug output	10

INPUT GROUP: 6 Subgrid Scale Complex Terrain Inputs		
Parameter	Description	Value
NHILL	Number of terrain features	0
NCTREC	Number of special complex terrain receptors	0
MHILL	Terrain and CTSG receptor data format (1= CTDM, 2 = OPTHILL)	2
XHILL2M	Horizontal dimension conversion factor to meters	1.0
ZHILL2M	Vertical dimension conversion factor to meters	1.0
XCTDMKM	X origin of CTDM system relative to CALPUFF system (km)	0.0
YCTDMKM	Y origin of CTDM system relative to CALPUFF system (km)	0.0

INPUT GROUP: 9 Miscellaneous Dry Deposition Parameters		
Parameter	Description	Value
RCUTR	Reference cuticle resistance (s/cm)	30
RGR	Reference ground resistance (s/cm)	10
REACTR	Reference pollutant reactivity	8
NINT	Number of particle size intervals for effective particle deposition velocity	9
IVEG	Vegetation state in unirrigated areas (1 = active and unstressed, 2 = active and stressed, 3 = inactive)	1

INPUT GROUP: 11 Chemistry Parameters		
Parameter	Description	Value
MOZ	Ozone background input option (0 = monthly, 1 = hourly from OZONE.DAT)	1
BCKO3	Monthly ozone concentrations (ppb)	80.00, 80.00, 80.00, 80.00, 80.00, 80.00, 80.00, 80.00, 80.00, 80.00, 80.00, 80.00
MNH3	Ammonia background input option (0 = monthly, 1 = from NH3Z.DAT)	0
MAVGNH3	Ammonia vertical averaging option (0 = no average, 1 = average over vertical extent of puff)	1
BCKNH3	Monthly ammonia concentrations (ppb)	10.00, 10.00, 10.00, 10.00, 10.00, 10.00, 10.00, 10.00, 10.00, 10.00, 10.00, 10.00
RNITE1	Nighttime SO2 loss rate (%/hr)	0.2
RNITE2	Nighttime NOx loss rate (%/hr)	2

INPUT GROUP: 11 Chemistry Parameters		
Parameter	Description	Value
RNITE3	Nighttime HNO3 loss rate (%/hr)	2
MH2O2	H2O2 background input option (0 = monthly, 1 = hourly from H2O2.DAT)	1
BCKH2O2	Monthly H2O2 concentrations (ppb)	1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00
RH_ISRP	Minimum relative humidity for ISORROPIA	50.0
SO4_ISRP	Minimum SO4 for ISORROPIA	0.4
BCKPMF	SOA background fine particulate (ug/m**3)	1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00
OFRAC	SOA organic fine particulate fraction	0.15, 0.15, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.15
VCNX	SOA VOC/NOX ratio	50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00
NDECAY	Half-life decay blocks	0

INPUT GROUP: 12 Misc. Dispersion and Computational Parameters		
Parameter	Description	Value
SYTDEP	Horizontal puff size for time-dependent sigma equations (m)	550
MHFTSZ	Use Heffter equation for sigma-z? (0 = no, 1 = yes)	0
JSUP	PG stability class above mixed layer	5
CONK1	Vertical dispersion constant - stable conditions	0.01
CONK2	Vertical dispersion constant - neutral/unstable conditions	0.1
TBD	Downwash scheme transition point option (<0 = Huber-Snyder, 1.5 = Schulman-Scire, 0.5 = ISC)	0.5
IURB1	Beginning land use category for which urban dispersion is assumed	10
IURB2	Ending land use category for which urban dispersion is assumed	19
ILANDUIN	Land use category for modeling domain	20
ZOIN	Roughness length for modeling domain (m)	.25
XLAIIN	Leaf area index for modeling domain	3.0
ELEVIN	Elevation above sea level (m)	.0
XLATIN	Meteorological station latitude (deg)	-999.0
XLONIN	Meteorological station longitude (deg)	-999.0
ANEMHT	Anemometer height (m)	10.0
ISIGMAV	Lateral turbulence format (0 = read sigma-theta, 1 = read sigma-v)	1
IMIXCTDM	Mixing heights read option (0 = predicted, 1 = observed)	0
XMXLEN	Slug length (met grid units)	1
XSAMLEN	Maximum travel distance of a puff/slug (met grid units)	1
MXNEW	Maximum number of slugs/puffs release from one source during one time step	99

INPUT GROUP: 12 Misc. Dispersion and Computational Parameters		
Parameter	Description	Value
MXSAM	Maximum number of sampling steps for one puff/slug during one time step	99
NCOUNT	Number of iterations used when computing the transport wind for a sampling step that includes gradual rise	2
SYMIN	Minimum sigma-y for a new puff/slug (m)	1
SZMIN	Minimum sigma-z for a new puff/slug (m)	1
SZCAP_M	Maximum sigma-z allowed to avoid numerical problem in calculating virtual time or distance (m)	5000000
SVMIN	Minimum turbulence velocities sigma-v (m/s)	0.2, 0.2, 0.2, 0.2, 0.2, 0.2, 0.2, 0.2,
SWMIN	Minimum turbulence velocities sigma-w (m/s)	0.2, 0.12, 0.08, 0.06, 0.03, 0.016, 0.2, 0.12, 0.08, 0.06, 0.03, 0.016
CDIV	Divergence criterion for dw/dz across puff (1/s)	0, 0
NLUTIBL	TIBL module search radius (met grid cells)	4
WSCALM	Minimum wind speed allowed for non-calm conditions (m/s)	0.5
XMAXZI	Maximum mixing height (m)	3000
XMINZI	Minimum mixing height (m)	50
ТКСАТ	Emissions scale-factors temperature categories (K)	265., 270., 275., 280., 285., 290., 295., 300., 305., 310., 315.
PLX0	Wind speed profile exponent for stability classes 1 to 6	0.07, 0.07, 0.1, 0.15, 0.35, 0.55
PTG0	Potential temperature gradient for stable classes E and F (deg K/m)	0.02, 0.035
PPC	Plume path coefficient for stability classes 1 to 6	0.5, 0.5, 0.5, 0.5, 0.35, 0.35
SL2PF	Slug-to-puff transition criterion factor (sigma-y/slug length)	10
FCLIP	Hard-clipping factor for slugs (0.0 = no extrapolation)	0
NSPLIT	Number of puffs created from vertical splitting	3
IRESPLIT	Hour for puff re-split	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
ZISPLIT	Minimum mixing height for splitting (m)	100
ROLDMAX	Mixing height ratio for splitting	0.25
NSPLITH	Number of puffs created from horizontal splitting	5
SYSPLITH	Minimum sigma-y (met grid cells)	1
SHSPLITH	Minimum puff elongation rate (SYSPLITH/hr)	2
CNSPLITH	Minimum concentration (g/m**3)	0
EPSSLUG	Fractional convergence criterion for numerical SLUG sampling integration	0.0001
EPSAREA	Fractional convergence criterion for numerical AREA source integration	1E-006
DSRISE	Trajectory step-length for numerical rise integration (m)	1.0
HTMINBC	Minimum boundary condition puff height (m)	500

INPUT GROUP: 12 Misc. Dispersion and Computational Parameters		
Parameter	Description	Value
RSAMPBC	Receptor search radius for boundary condition puffs (km)	10
MDEPBC	Near-surface depletion adjustment to concentration (0 = no, 1 = yes)	1

INPUT GROUP: 13 Point Source Parameters		
Parameter	Description	Value
NPT1	Number of point sources	0
IPTU	Units used for point source emissions (e.g., $1 = g/s$)	5
NSPT1	Number of source-species combinations with variable emission scaling factors	0
NPT2	Number of point sources in PTEMARB.DAT file(s)	0

INPUT GROUP: 14 Area Source Parameters		
Parameter	Description	Value
NAR1	Number of polygon area sources	0
IARU	Units used for area source emissions (e.g., 1 = g/m**2/s)	1
NSAR1	Number of source-species combinations with variable emission scaling factors	0
NAR2	Number of buoyant polygon area sources in BAEMARB.DAT file(s)	0

INPUT GROUP: 15 Line Source Parameters		
Parameter	Description	Value
NLN2	Number of buoyant line sources in LNEMARB.DAT file	0
NLINES	Number of buoyant line sources	0
ILNU	Units used for line source emissions (e.g., 1 = g/s)	1
NSLN1	Number of source-species combinations with variable emission scaling factors	0
NLRISE	Number of distances at which transitional rise is computed	6

INPUT GROUP: 16 Volume Source Parameters		
Parameter	Description	Value
NVL1	Number of volume sources	0
IVLU	Units used for volume source emissions (e.g., 1 = g/s)	1
NSVL1	Number of source-species combinations with variable emission scaling factors	0
NVL2	Number of volume sources in VOLEMARB.DAT file(s)	24

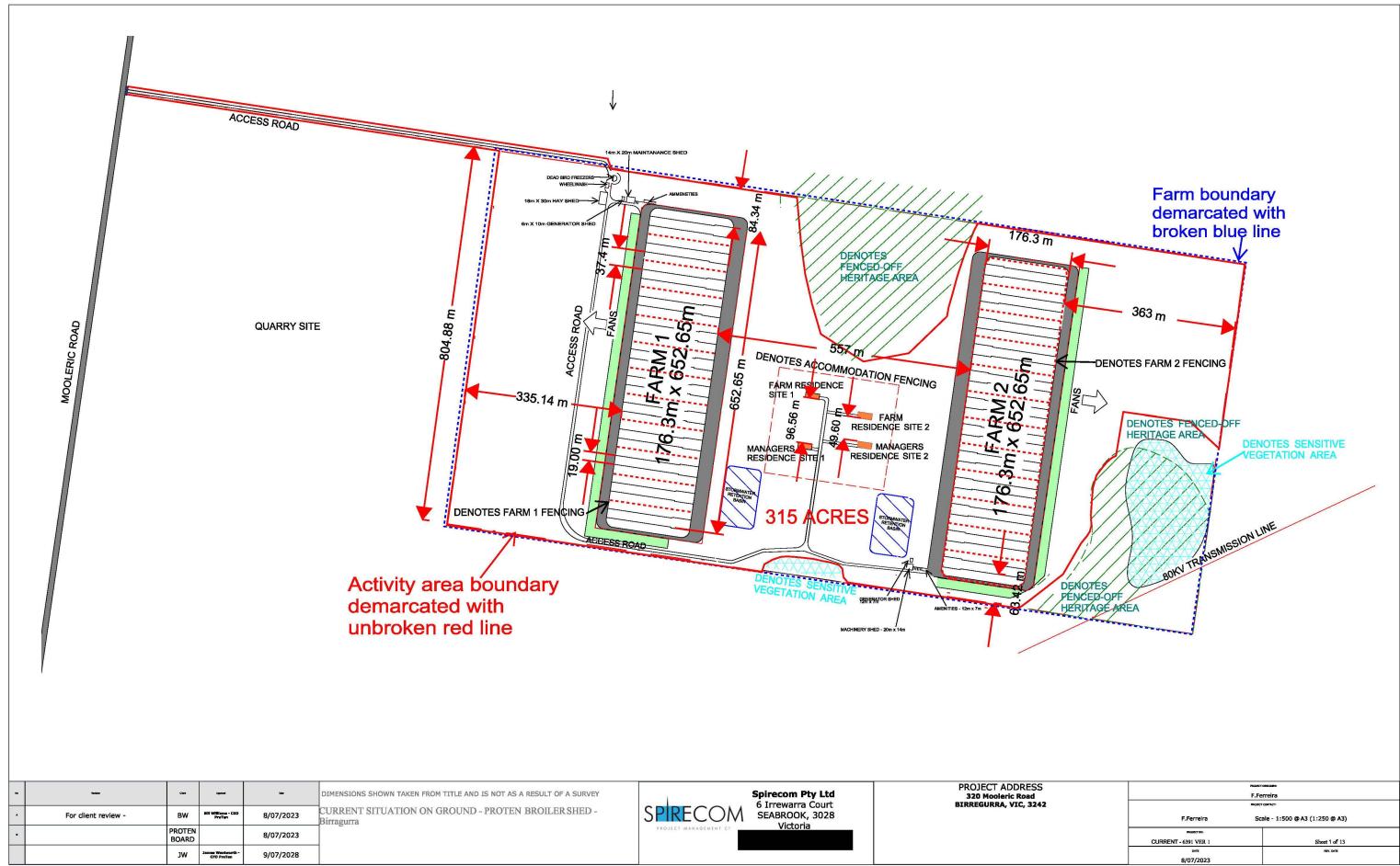
INPUT GROUP: 17 FLARE Source Control Parameters (variable emissions file)		
Parameter	Description	Value
NFL2	Number of flare sources defined in FLEMARB.DAT file(s)	0

Г

INPUT GROUP: 18 Road Emissions Parameters		
Parameter	Description	Value
NRD1	Number of road-links sources	0
NRD2	Number of road-links in RDEMARB.DAT file	0
NSFRDS	Number of road-links and species combinations with variable emission-rate scale-factors	0

INPUT GROUP: 19 Emission Rate Scale-Factor Tables		
Parameter	Description	Value
NSFTAB	Number of emission scale-factor tables	0

INPUT GROUP: 20 Non-gridded (Discrete) Receptor Information		
Parameter	Description	Value
NREC	Number of discrete receptors (non-gridded receptors)	18
NRGRP	Number of receptor group names	0



	PROJECT DESIGNER:					
	F.Ferreira					
PROJECT CONFIACT						
F.Ferreira	Scale - 1:500 @ A3 (1:250 @ A3)					
PROJECT NO.						
CURRENT - 6391 VER 1	Sheet 1 of 13					
DATE	REV. DATE					
8/07/2023						



PROPOSED NEW CONSTRUCTION - Preliminary drawing

Phone:1300 815 888 (+61) 07 3281 3200 Fax: 1300 816 888 (+61) 07 3281 8295 Email: enquiries@santrev.com.au

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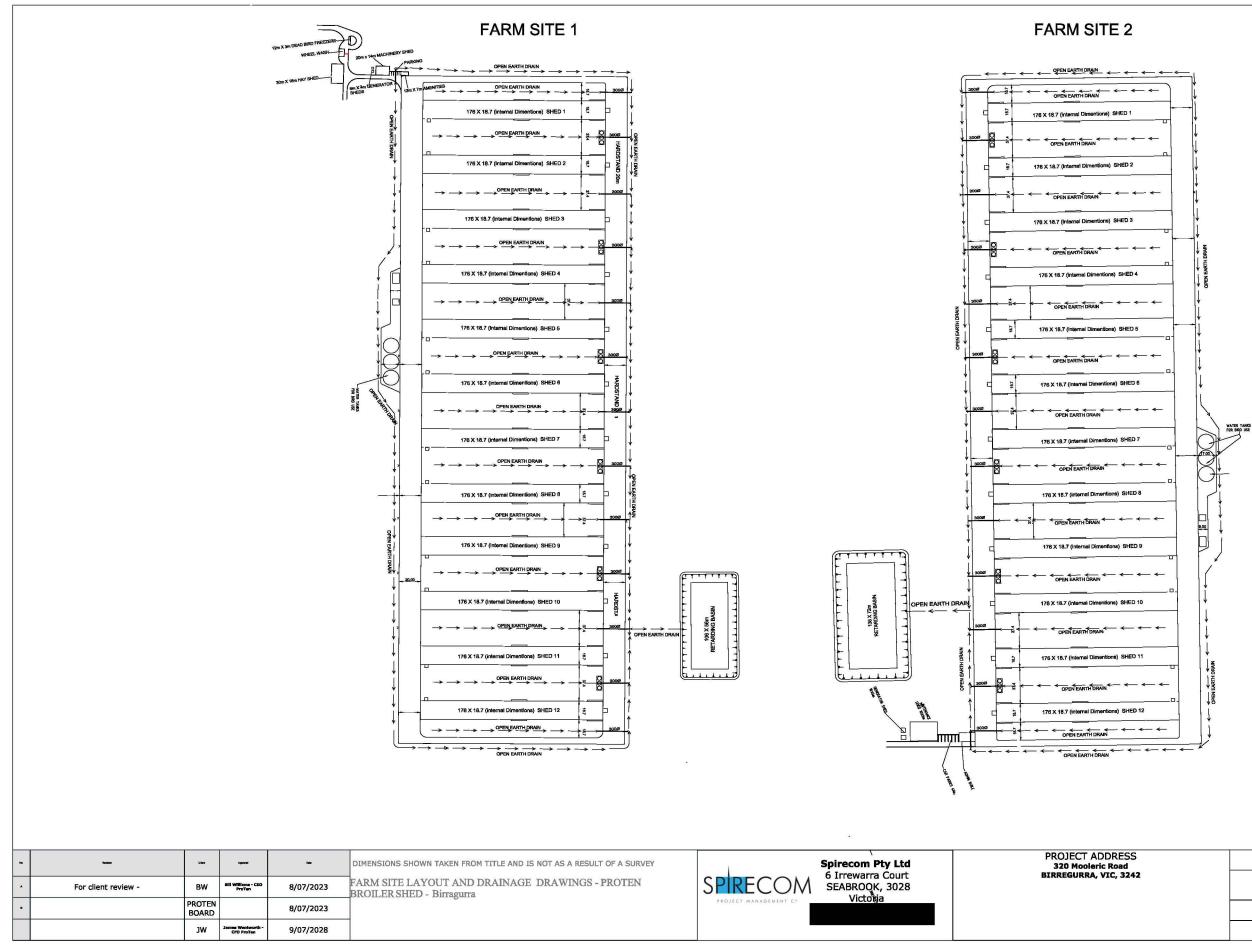
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nary drawings	SITE PLAN - DA 1 : 8400		dwelling	s in wrong place		
	REV	DESCRIPTION	DATE	320 MOOLERIC ROAD	SHEET TITLE:	
NOTE: ALL DIMENSIONS ARE IN mm (millimetres) UNLESS NOTED OTHERWISE				FOR: - PROJECT ADDRESS: 320 MOOLERIC ROAD, OMBERSLEY VIC 3241	JOB No.: MOOL DATE:	LAN - DA DRAWN BY: DRK 5/2023 DRG No: D 02

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	PROJECT DESIGNER:
	F.Ferreira
	PROJECT CONTACT:
F.Ferreira	Scale - NOT TO SCALE
PROJECT NO.	
PLAN - 6391 VER 1	Sheet 8 of 13
DATE	REV. DATE
8/07/2023	

NOTE:

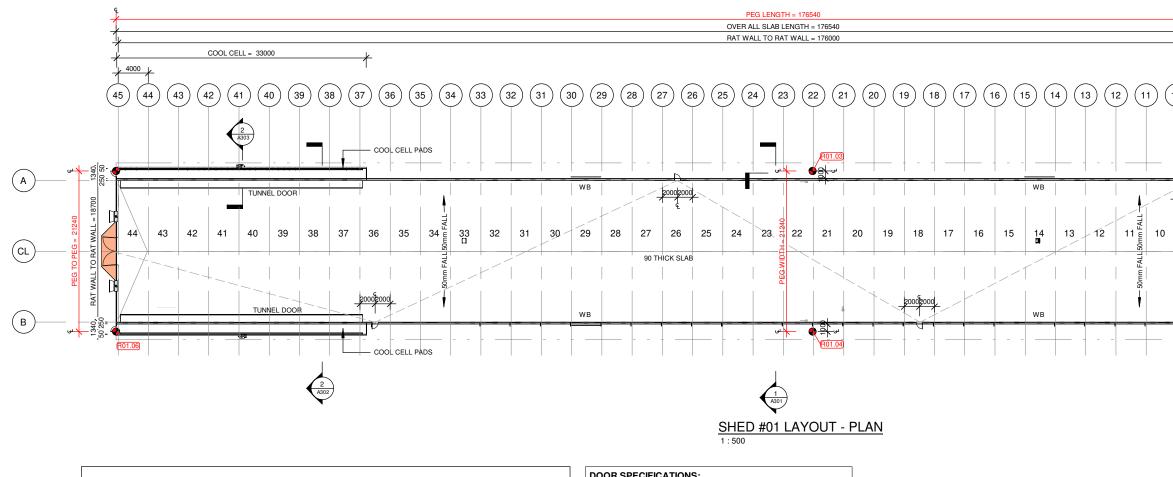
THE FOLLOWING TBC WITH CLIENT PRIOR TO ANY INSTALL

FAN CONFIGURATION

 MINI-VENT CONFIGURATION HEATER POSITIONS MINIMUM VENTILATION FAN CONFIGURATION TO BE CONFIRMED

NOTE:

- WALL BRACING (WB) ON BAYS 14 AND 29. - DRAIN IN SIDE WALLS-BAY #08,12,14,16,21,24,28,32,36,40,42 AND 2 AT EACH END WALL - ALL SIDE PA DOORS TO BE IN CENTER OF BAYS U.N.O.



			DOOR SCHEDULE PER SHED			
Level	DOOR NUMBER	SP #	DESCRIPTION	Head Height	Clear Opening Width	Above FFL (TOS)

DOOR SPECIFICATIONS:

• COLOUR EXTERNAL - WHITE (SURFMIST OR ALIKE). COLOUR INTERNAL – WHITE (SURFMIST OR ALIKE).
 COLOUR FRAME – WHITE (SURFMIST OR ALIKE).
 BOLLARDS PROVIDED TO EXTERNAL OPENING DOORS.

POP-OUT DOOR SCHEDULE PER SHED

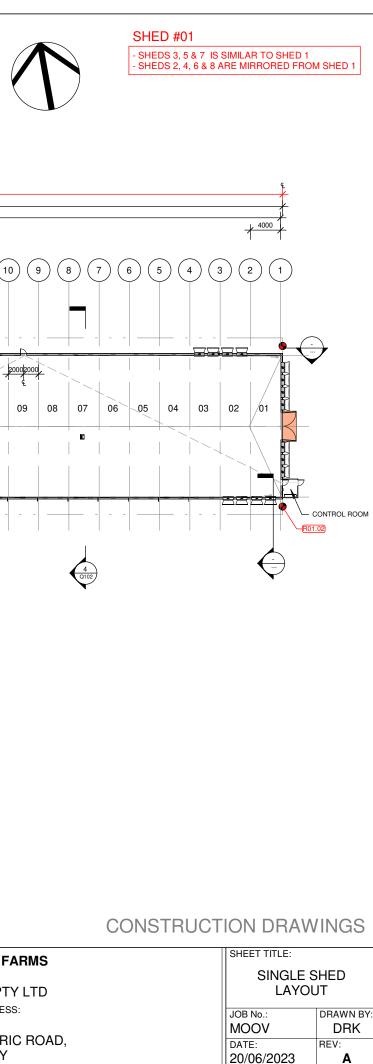
52 x 3.9m LONG x 0.5m HIGH POP OUT OPENING DOORS

WINDOW SCHEDULE PER SHED

	WINDOW					Head	Above
Level	NUMBER	TYPE	DESCRIPTION	Heiaht	Width	Height	FFL (TOS)
	-					- 3 -	x = = /

	Phone:1300 815 888 (+61) 07 3281 3200 Fax: 1300 816 888 (+61) 07 3281 8295		REV	DESCRIPTION	DATE	MOOLERIC F
	Email: enquiries@santrev.com.au		A	PRELIMINARY DRAWINGS	13/07/2023	
	Web: www.santrev.com.au					FOR: SRPP PT
C A RITDEV/	ABN: 43 124 970 878	NOTE: ALL DIMENSIONS				
SANTREV	BSA QLD: 1214566					PROJECT ADDRES
THE POULTRY HOUSE CONSTRUCTION SPECIALISTS	OCBA SA: 277785	ARE IN mm (millimetres)				
	BC VIC: CB-U 44246	UNLESS NOTED				
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Queensland Australia 4305	MAY NOT BE COPIED OR REPRODUCED IN PART OR IN					10 3241
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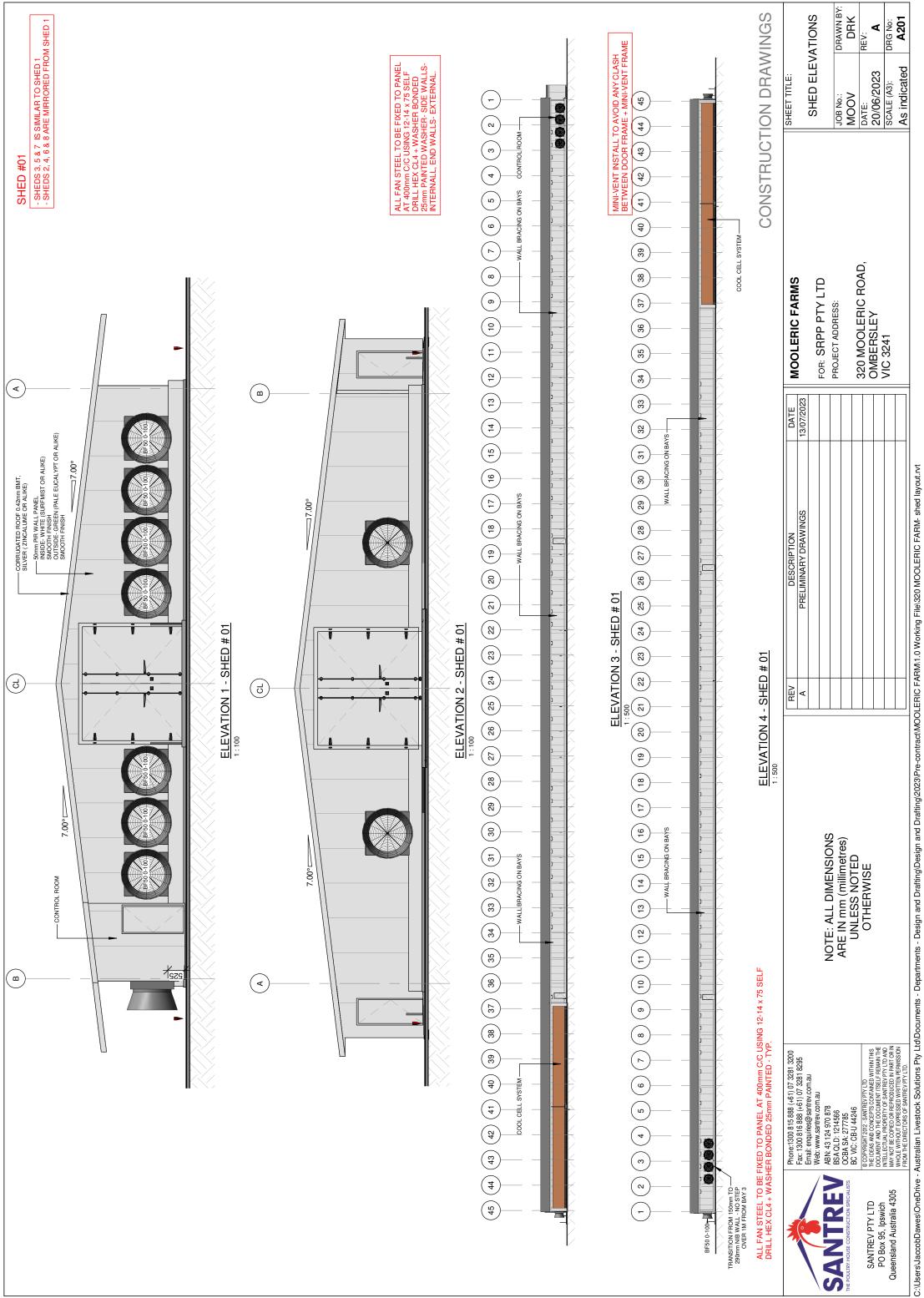
C:\Users\JaccobDawes\OneDrive - Australian Livestock Solutions Pty Ltd\Documents - Departments - Design and Drafting\Design and Drafting\2023\Pre-contract\MOOLERIC FARM\1.0 Working File\320 MOOLERIC FARM- shed layout.rvt

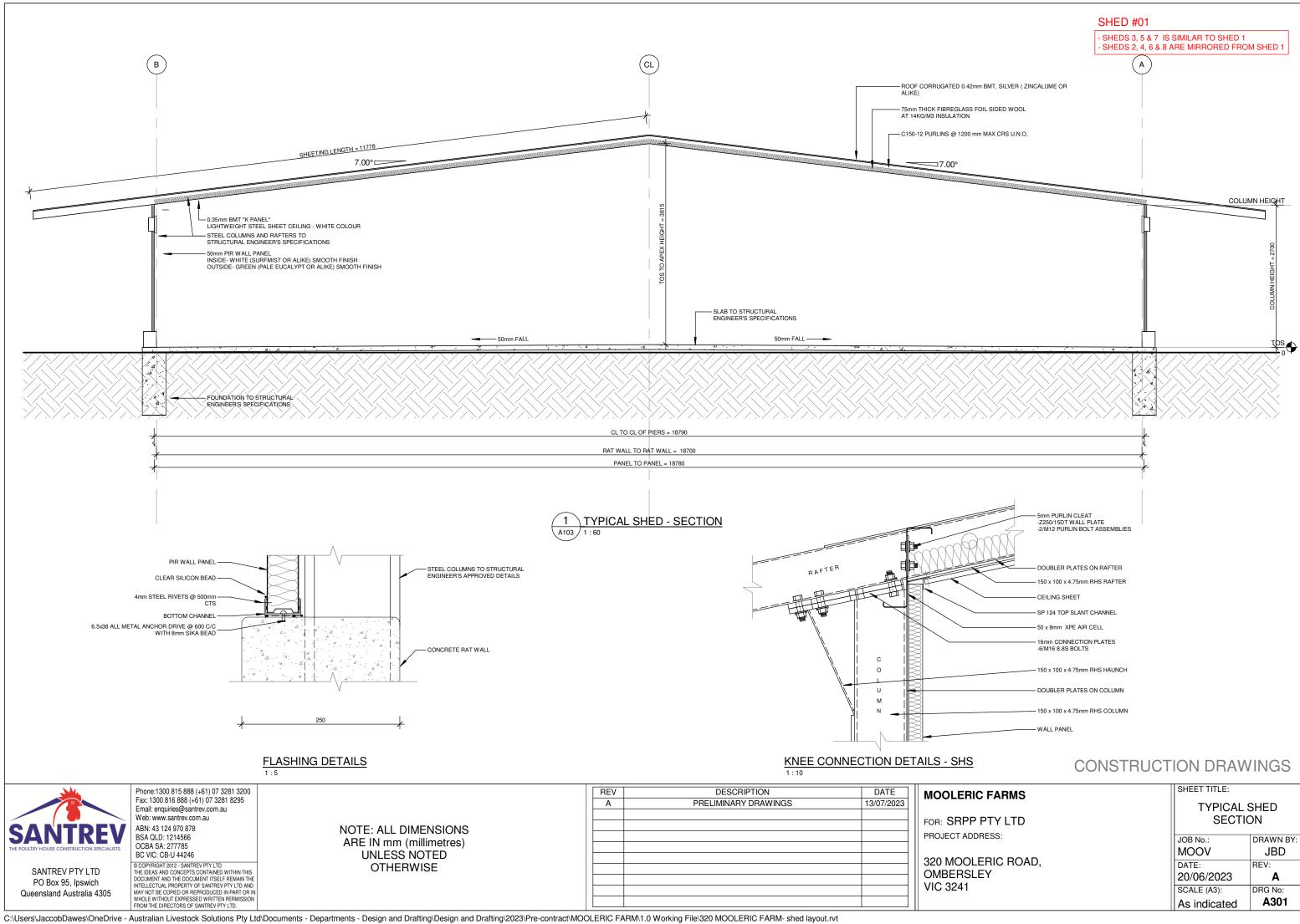


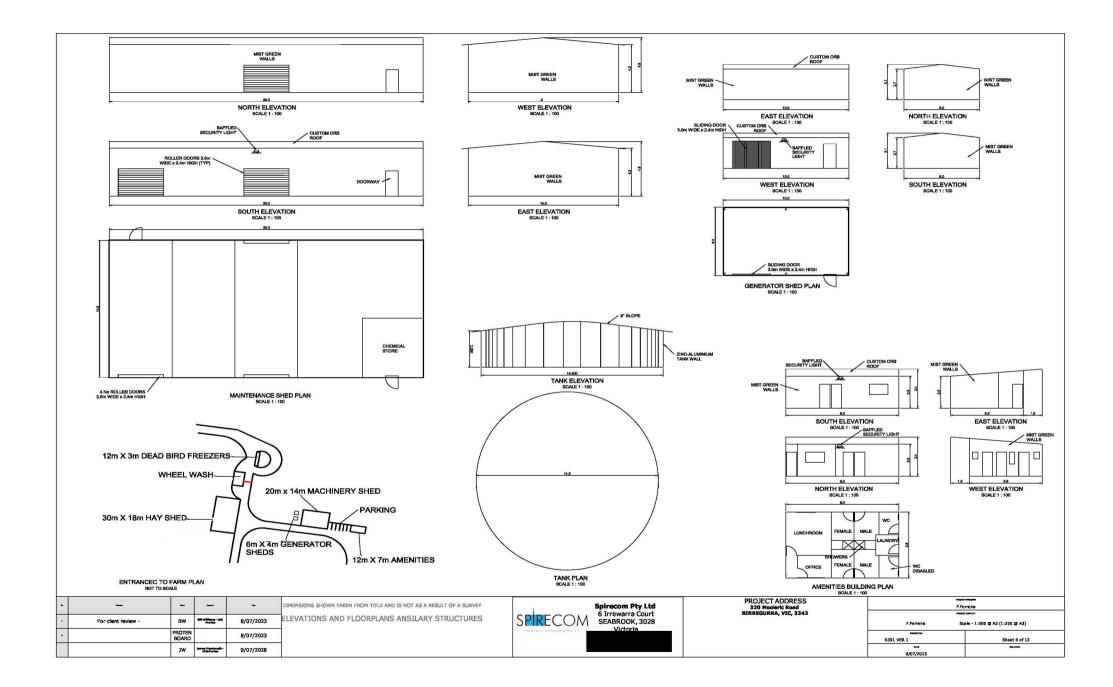
SCALE (A3):

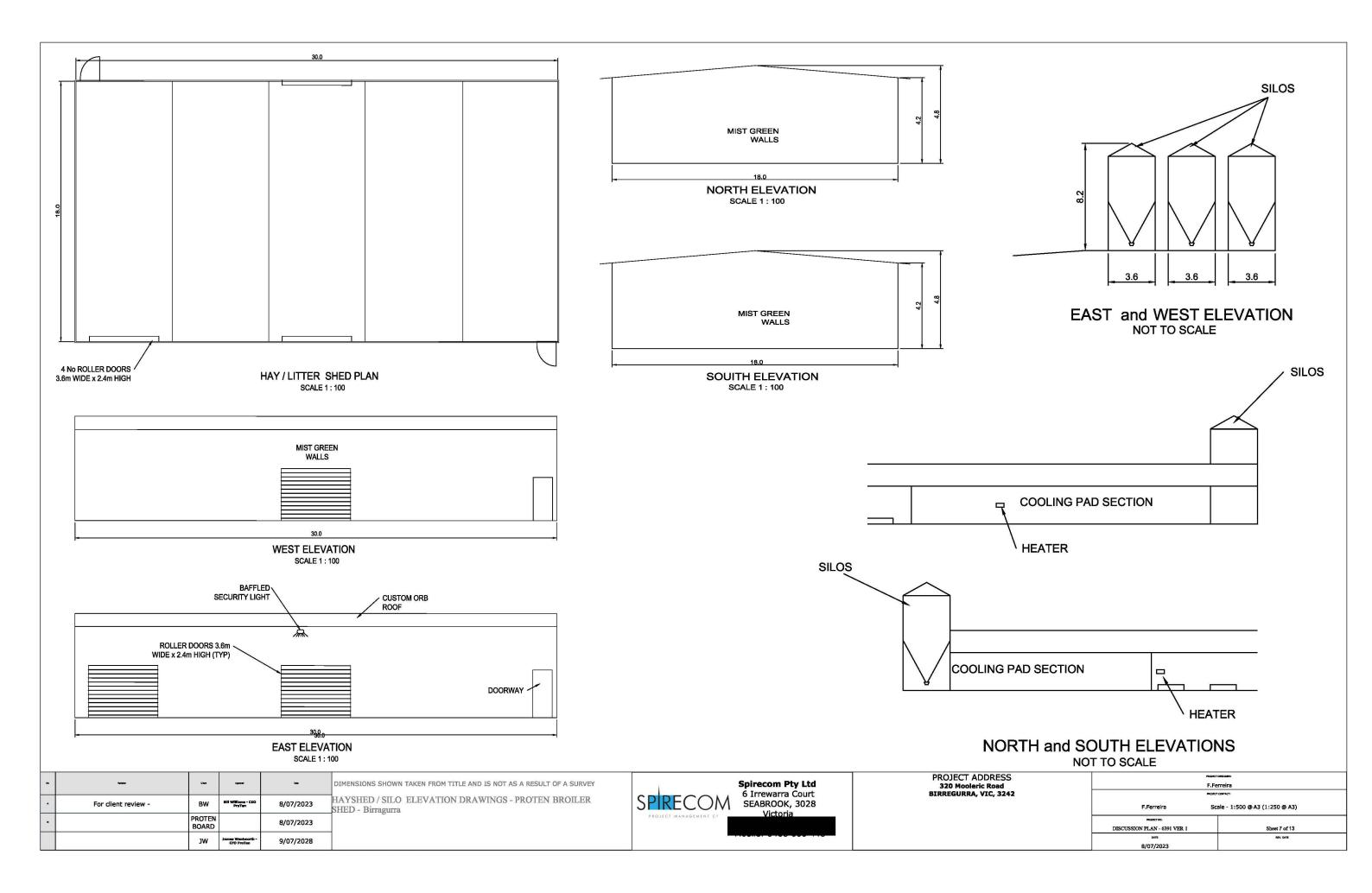
As indicated

DRG No: A103









REFRIGERATED CONTAINER (TEMPERATURE-CONTROLLED CONTAINER)

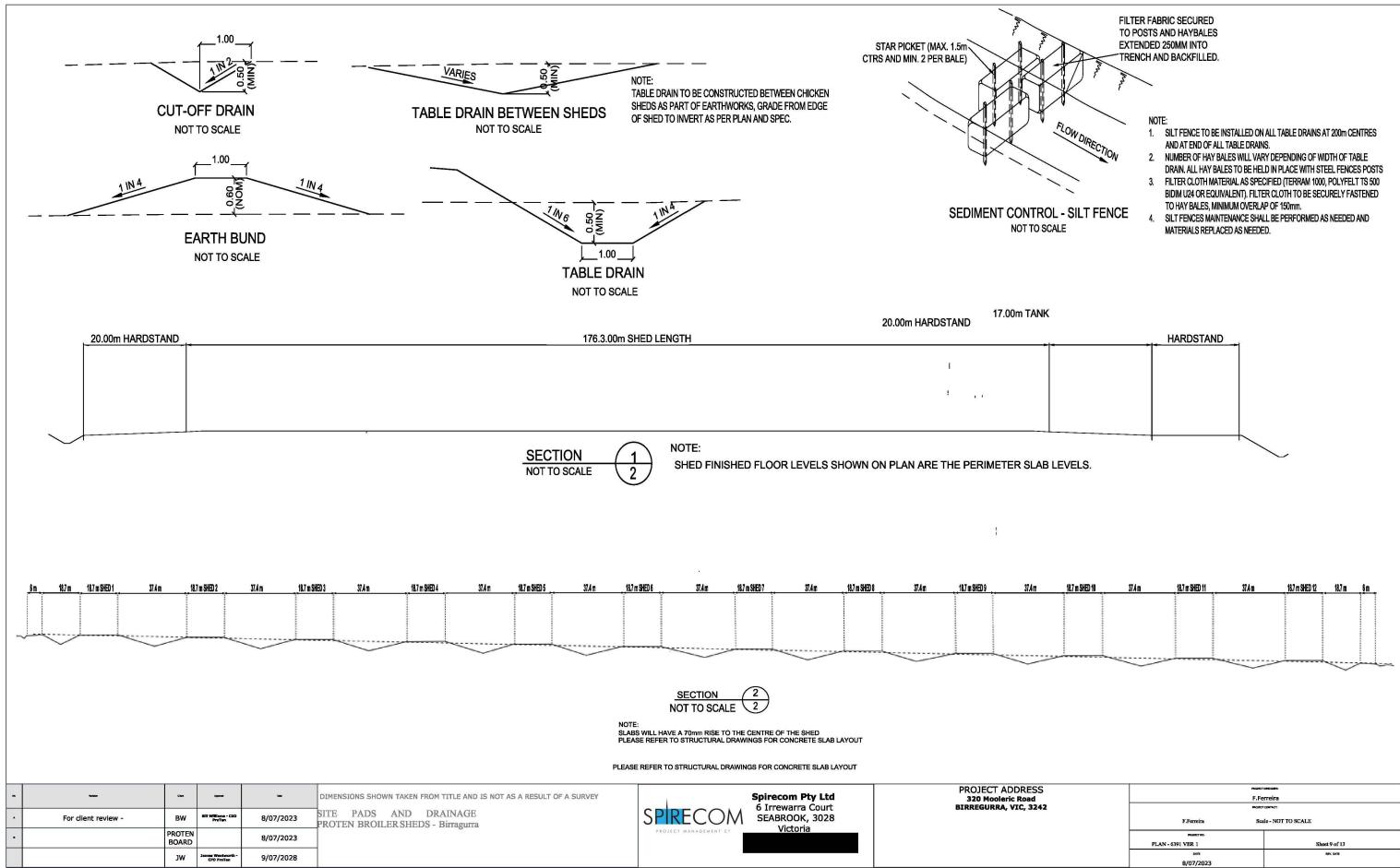
ISO Size Type Code: 45R1 High Cube, 45R9



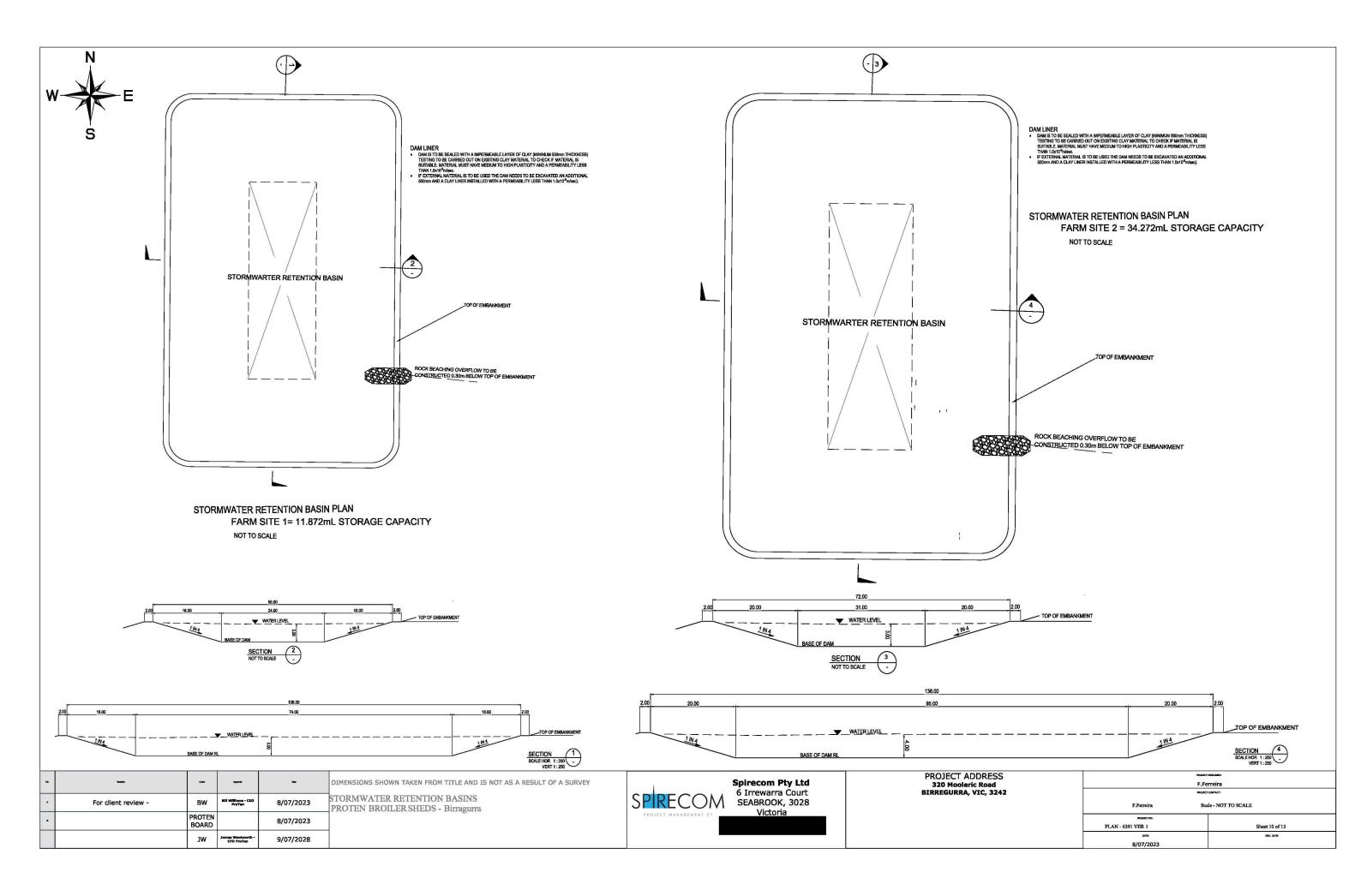
- Low CO₂ footprint due to less power-consuming refrigeration technology
- Pre-Trip Inspection (PTI) and maintenance procedure prior each shipment
- Container built and tested to fulfill or even exceed industrial standards and regulations
- Constant high airflow for perishable products guarantees best temperature maintenance
- Hygienically designed sealing-free container with side lining protecting scuff lining
- Container certified for cold treatment control
 e.g. meeting requirement of the USDA
- Contemporary insulation factors
- Low tare weight offers advantage of high payload designed container
- Dedicated equipment available for non-foodstuff cargoes
- Container available to maintain temperature control range as low as -40°C up to +30°C

- Container built to maintain temperature in ambient environment up to 50°C
- Multi-temperature setting (MTS) option available
- "On demand" defrosting assists to avoid unnecessary heat supply
- Reefer containers equipped with de-humidification option (including sensor)
- Maximum stowage height indicated by red line inside the container in order to ensure proper air circulation

- Tailor-made atmosphere (TMA) via gas injection (controlled atmosphere technology) available
- ATO-DLO certified by Agrotechnological Research Institute e.g. for flower bulb transportation, bulb mode option available
- All containers are suitable for shore power supply, voltages: 380V / 50 Hz to 460V / 60Hz
- For the technical specification and illustration of electric plug, see page 48



F.F	erreira					
PROJECT CONTACT						
F.Ferreira Sc	ale - NOT TO SCALE					
PROJECT NO.						
PLAN - 6391 VER 1	Sheet 9 of 13					
DATE	REV. DATE					
8/07/2023						





ARTISTS IMPRESSION - for illustrative purposes only (Chadwick 310 Classic Facade Shown)

NCC 22	The bathroom and powder room must be construct This includes any circulation space req's, noggings			PLANS ARE SUBJECT TO LOCAL COUN			
		CONCEPT	29/06/2022	FLOOR AREAS	TOTAL 261.3 m ²		ARTIST IMPRE
	HADWICK 260	© Copyright Arcl	himan Pty Ltd	LIVING	193.1 m²	26 m - 28 m	N.T.S.
Classic Streetscape		exclusiv G.J. Gardne	ve to	GARAGE ALFRESCO	37.6 m² 19.3 m²		
	Estate Series				4.3 m ² 7.0 m ²		

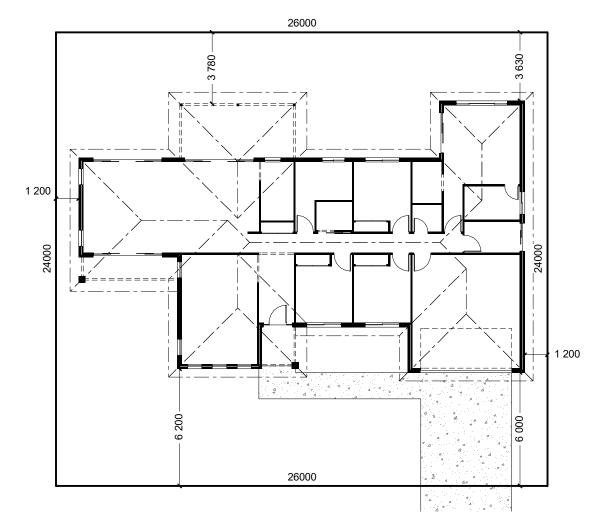






NCC 22	CC 22The bathroom and powder room must be constructed and reinforced in accordance with NCC regulations.This includes any circulation space req's, noggings and sheeting provisions for future grab rails where required.P			PLANS ARE SUBJECT TO LOCAL COUNCIL & DEVELOPERS GUIDELINES (COVENA			
C	HADWICK 260	CONCEPT 29/06/2022 © Copyright Archiman Pty Ltd	FLOOR AREAS	TOTAL 261.3 m² 193.1 m ²	Min. Lot Width 26 m - 28 m	PRESENTATION PLAN Scale 1:100 @A3	G.J. Gardner.
	Classic Streetscape	exclusive to G.J. Gardner Homes	GARAGE ALFRESCO	37.6 m² 19.3 m²			J
	Estate Series	Concept plans only, final working drawings may vary	PORCH VERANDAH	4.3 m ² 7.0 m ²			HOMES



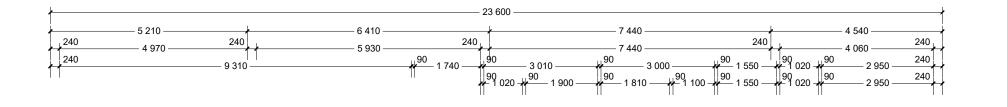


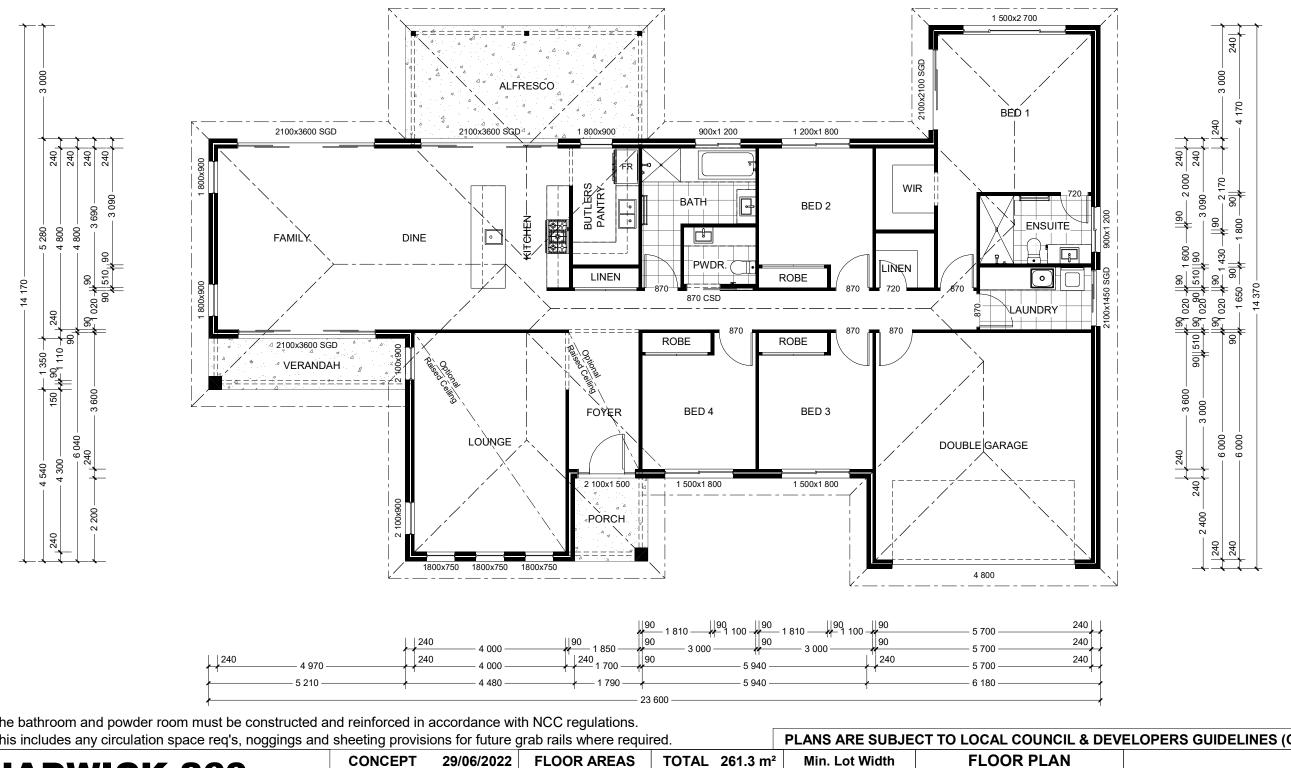
STREET FRONTAGE

INDICATIVE SITE PLAN ONLY. ACTUAL LOT WIDTH, SIZE AND SETBACKS MAY VARY TO SUIT LOCAL REQUIREMENT'S AND MAY REQUIRE A LARGER SITE OR PLAN MODIFICATIONS TO SUIT A PARTICULAR SITE.

NCC 22 The bathroom and powder room must be constructed This includes any circulation space req's, noggings an		5	red.	PLANS ARE SUBJED	T TO LOCAL COUNCIL & D	EVELOPERS GUIDELINES (COVENANTS).
CHADWICK 260	© Copyright Archiman Pty Ltd	•	TOTAL 261.3 m² 193.1 m ²		SITE PLAN Scale 1:200 @A3	
Classic Streetscape	exclusive to G.J. Gardner Homes	GARAGE ALFRESCO	37.6 m² 19.3 m²			G.J. Gardner.
Estate Series	Concept plans only, final working drawings may vary	PORCH VERANDAH	4.3 m ² 7.0 m ²			HOMES

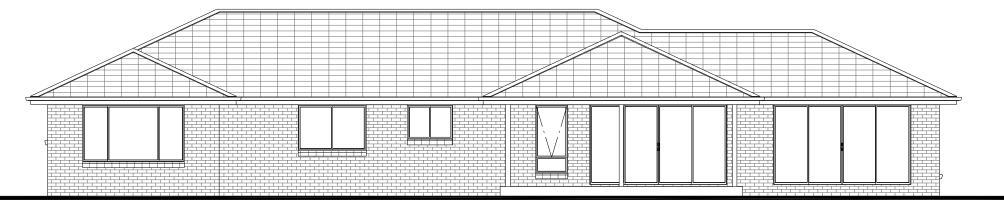


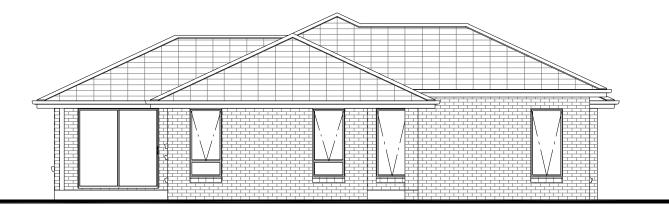




NCC 22 The bathroom and powder room must be constructed a This includes any circulation space req's, noggings and		-	red.	PLANS ARE SUBJEC	T TO LOCAL COUNCIL & DE	VELOPERS GUIDELINES (COVENANTS).
CHADWICK 260	CONCEPT29/06/2022© Copyright Archiman Pty Ltd	FLOOR AREAS	TOTAL 261.3 m² 193.1 m ²	Min. Lot Width 26 m - 28 m	FLOOR PLAN Scale 1:100 @A3	G.I. Gardner.
Classic Streetscape	exclusive to G.J. Gardner Homes	GARAGE ALFRESCO	37.6 m² 19.3 m²			J
Estate Series	Concept plans only, final working drawings may vary	PORCH VERANDAH	4.3 m ² 7.0 m ²			HOMES







NCC 22	The bathroom and powder room must be constructed a This includes any circulation space req's, noggings and		0	ired.	PLANS ARE SUBJEC	CT TO LOCAL COUNCIL & DE	VELOPERS GUIDELINES (COVENANTS).	
C	CHADWICK 260	CONCEPT 29/06/2022 © Copyright Archiman Pty Ltd	FLOOR AREAS	TOTAL 261.3 m² 193.1 m ²	Min. Lot Width 26 m - 28 m	ELEVATIONS Scale 1:100 @A3	CICardenar	
Classic Streetscape		exclusive to G.J. Gardner Homes	GARAGE ALFRESCO	37.6 m² 19.3 m²			G.J. Gardner.	
	Estate Series	Concept plans only, final working drawings may vary	PORCH VERANDAH	4.3 m ² 7.0 m ²			HOMES	

I				

ELECTRICAL LEGEND

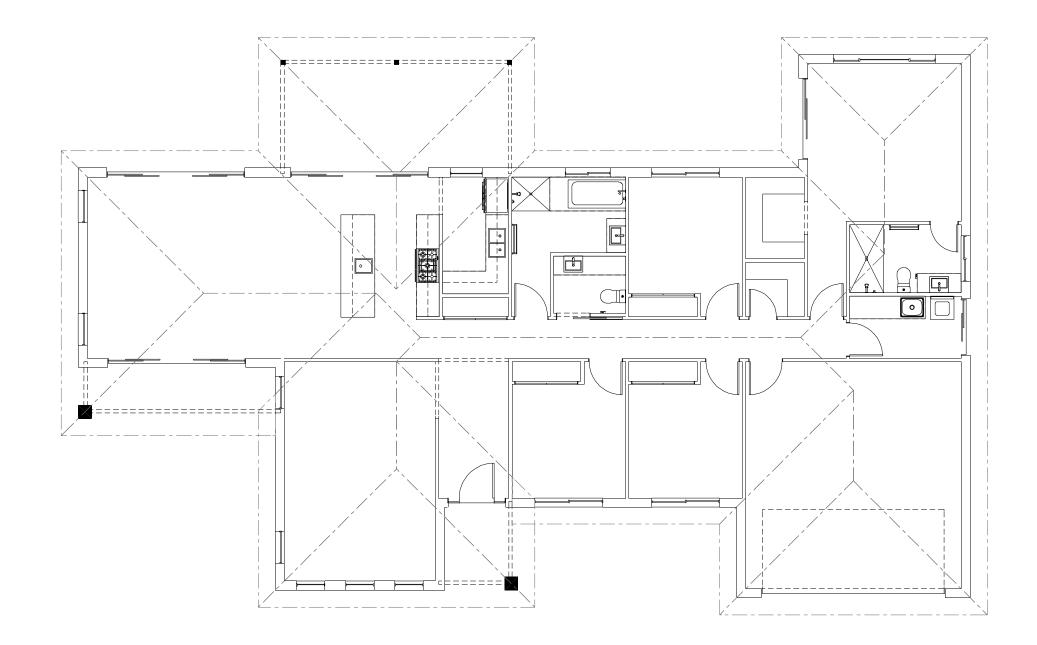
NOTE:

ALL ELECTRICAL WORK MUST BE COMPLETED TO THE RELEVANT AUSTRALIAN STANDARDS AND THE NATIONAL CONSTRUCTION CODE OF AUSTRALIA.

LIGHT	ING *EEF (denotes energy efficie	nt light fit	tings)
Symbol	Description	Spec.	Extra
0	Ceiling Light *EEF	-	-
•	Down Light *EEF	-	-
H <u>1800 H</u>	Wall Light *EEF approx height	-	-
××	Pendant / Track Light *EEF	-	-
000	IXL Tastic (or similar)	-	-
Ē	Batten Fluro Light *EEF	-	-
Ē	Round Fluro Light *EEF	-	-
♠	Flood / Spot Light *EEF	-	-
	TOTAL LIGHT POINTS	-	-

POWER

\mathbf{x}^{4}	Quad Power Point	-	-
1 X	Single Power Point	-	-
× ² ×	Double Power Point	-	-
W/P 2 XX	Double W/Proof Power Point	-	-
W/P 1 X	Single W/Proof Power Point	-	-
T.V	T.V.Point	-	-
ph	Phone Point	-	-
#	T.V Antenna & Booster inc. SGPO	-	-
D.W	Dishwasher Point	-	-
R.H	Rangehood Point	-	-
M.W	Microwave Point	-	-
0.V	Oven Point	-	-
C.T	Cook Top Iso point	-	-
MISCE	LLANEOUS		
E	Exhaust Fan	-	-
X	Ceiling Fan (stainless steel)	-	-
\times	Ceiling Fan & Light (white)	-	-
	Meter Box	-	-
HMS	Hot Water	-	-
	Smoke Detectors	-	-
ds	Dimmer Switch	-	-
2 way	Two Way Switch	-	-
	OWNER		





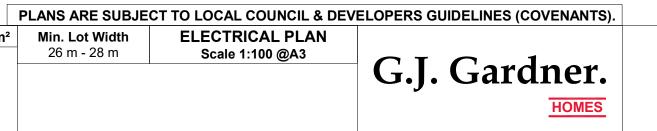
AC A/C Condensor Iso Point

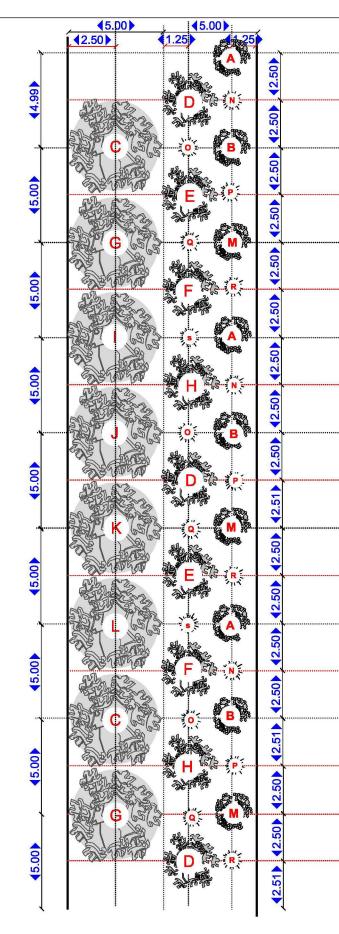
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The bathroom and powder room must be constructed and reinforced in accordance with NCC regulations.

This includes any circulation space red s, noggings and	i sneeling provisions for future g	grad rails where requi	rea.	PLANS ARE SUBJE	CT TO LOCAL COUN
	CONCEPT 29/06/2022	FLOOR AREAS	TOTAL 261.3 m ²		ELECTRICAL
CHADWICK 260	© Copyright Archiman Pty Ltd	LIVING	193.1 m²	26 m - 28 m	Scale 1:100 @
Classia Streateanna	exclusive to	GARAGE	37.6 m²		
Classic Streetscape	G.J. Gardner Homes	ALFRESCO	19.3 m²		
Estata Cariaa	Concept plans only,	PORCH	4.3 m ²		
Estate Series	final working drawings may vary	VERANDAH	7.0 m²		





LANDSCAPE PLANTING LAYOUT **10m WIDE LANDSCAPING** Sites 1 and 2

TREE PLANTING INDIGENOUS SPECIES LIST

Botanical Name	Common name	<u>Height</u>	ID	Total Tr
		Width		Plantin
Acacia Genistificola	Spreading Wattle	1-3x	Α	57
		1-2m		
Acacia Hakeoides	Hakea Wattle	1-3x	В	57
		1-2m		
Acacia melanoxylon	Blackwood	8-20x	C	28
		5-12m		
Acacia pycnantha	Golden wattle	3-8x	D	38
		2-5m		
Acacia verticillata	Prickly Moses	1-5x	E	38
		3-5m		
Allococasuarina Verticillata	Drooping Sheoak	4-10mx	F	38
		5-6m		
Allococasuarina Littoralis	Black Sheoak	8-12x	G	28
		4-7m		
Banksia marginata	Silver Banksia	1-8x	Н	38
		1-5m		
Eucalyptus Camaldulensis	Red Gum	12-45x	I.	28
		15- 30m		
Eucalyptus ovata	Swamp Gum	8-30x	1	28
		5-20m		
Eucalyptus radiata	Narrow-leaf Peppermint	6-20x	K	28
		6-15m		
Eucalyptus viminalis	Manna Gum	10-40x	L	28
		8-15m		
Leptospermum Continentale	Prickly Tea- Tree	1-4x	М	57
		1-2m		
Total	number of trees to be plante	ed		491

Plant Sizes Large Medium Small Grass 0 м D н Q R S

GRAS	SS PLANTIN	G INDIGENOUS SPECIES LIST		
Botanical Name	Common name	<u>Comments</u>	ID	TOTAL PLANTINGS
Austrostipa stipoides	Prickly spear-grass	Forms large clumps up to about 80 cm in height with smooth inrolled leaves 70 cm long and 1 mm wide with sharp tips.	N	57
Poa Labillardieri	Silver Tussock	The tussock. Softens a landscape. Excellent for water filter	0	57
Poa Morrisi	Velvet Tussock	Small blue leaved tussock for dry gardens	P	57
Themeda Triandra	Kangaroo Grass	Tough mat forming native grass, iconic flower heads	Q	57
Carex Appressa	Tall Sedge	Quick growing. exc for grey water filtering / creeks!	R	57
Carex Fascicularis	Tassel Sedge	Quick growing. exc for grey water filtering / creeks!!	S	57
		Total m ² of grases to be planted	[342 r

NOTES

- SATISFACTION OF THE RESPONSIBLE AUTHORITY.
- 2. PLANTINGS SHALL BE CARRIED OUT USING THE APPROVED LANDSCAPE PLAN. PLANTS IN THE PREVIOUS ROWS. A MINIMUM OF 3 ROWS SHALL BE PROVIDED.
- 4. PLANTS TO BE USED SHALL BE AS PER ATTACHED LIST BASED ON INDIGENOUS SPECIES LIST.
- 5. ENSURE A DENSE FOLIAGE IS PROVIDED UPON MATURITY AND TO ENSURE EFFECTIVE SCREENING..
- 6.
- 7. IS NOT EXPECTED.
- 8. CONSERVE WATER AND TO PROTECT AGAINST GRAZING AND RABBITS.

10.00	

м.	Nation .	Ciet	Approval	-	DIMENSIONS SHOWN TAKEN FROM TITLE AND IS NOT AS A RESULT OF A SURVEY	Spirecom Pty Ltd	PROJECT ADDRESS
*	For client review -	James Wentworth	JW	25/09/2023	LANDSCAPING PLAN FARM SITES 1 AND 2	6 Irrewarra Court SEABROOK, 3028 Victoria	PROTEN PTY LTD
							320 Mooleric Road BIRREGURRA, VIC, 3242

1. ALL TREES AND SHRUBS INCLUDED IN THE ENDORSED, LANDSCAPE PLAN MUST BE PLANTED AND MAINTAINED TO THE

3. PLANTINGS TO BE IN ROWS 3m APART WITH SPACING OF PLANTS AT 4m INTERVALS. PLANTS TO BE PLACED IN BETWEEN THE

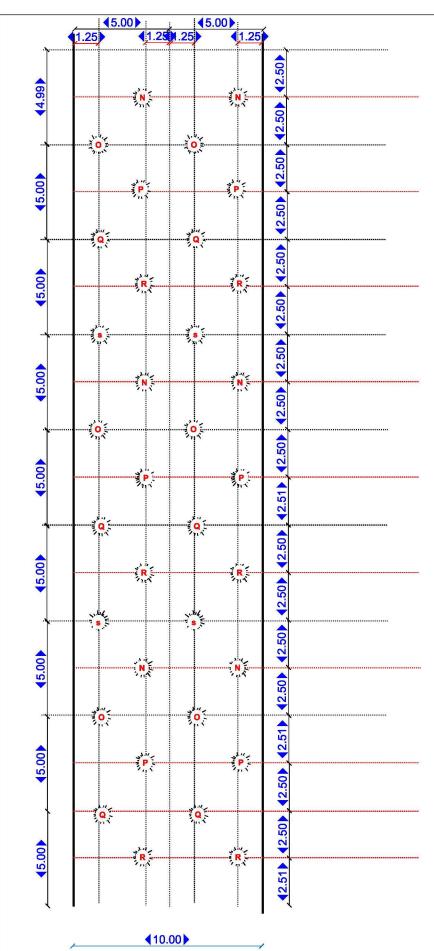
LANDSCAPING PLANTS SHALL BE PLANTED TO ENSURE THE PROPOSED DEVELOPMENT IS SCREENED FROM THE ADJOINING PROPERTIES. THIS WILL REQUIRE THE PLANTING AND GROUPING OF LARGER TREES WITH INFILL OF SMALLER SHRUBS TO

REGULAR WATERING WITH WATER CART AND PUMP AND MAINTENANCE SHALL BE CARRIED OUT FOR THE FIRST 3 YEARS, WITH REPLACEMENT OF DEAD TREES TO BE CARRIED OUT AS REQUIRED. MAINTENANCE SHALL OCCUR EVERY 6 MONTHS.

PLANT INTO MOIST SOIL IF POSSIBLE IN SPRING, AFTER THE RISK OF FROSTS HAS PASSED, WOULD BE THE IDEAL TIME FOR PLANTING. WATERING AT THE TIME OF PLANTING IS ADVANTAGEOUS AS LONG AS THE SOIL IS NOT WATER-LOGGED AND IF RAIN

MULCH CAN BE EVENLY SPREAD OVER THE AREA PRIOR TO THE COMMENCEMENT OF PLANTING. TREE GUARDS HELP

PROJECT	DESIGNER:	
F.F	erreira	
PROJEC	F CONTACT:	
F.Ferreira	Scale - @ A1	
PROJECT NO.		
PLAN 6391.1 Ver 2	Sheet 1	
DATE	REV. DATE	
08/07/2023	25/09/2023	
	F.F PROJEC F.Ferreira PROJECT NO. PLAN 6391.1 Ver 2 DATE	PROJECT NO. PLAN 6391.1 Ver 2 Sheet 1 DATE REV. DATE



LANDSCAPE PLANTING LAYOUT **10m WIDE LANDSCAPING** Around the perimeter fence of the 4 residences

<u>Botanical Name</u>	<u>Common name</u>	<u>Comments</u>	<u>ID</u>	TOTAL PLANTINGS
Austrostipa stipoides	Prickly spear-grass	Forms large clumps up to about 80 cm in height with smooth inrolled leaves 70 cm long and 1 mm wide with sharp tips.	Ν	96
Poa Labillardieri	Silver Tussock	The tussock. Softens a landscape. Excellent for water filter	0	96
Poa Morrisi	Velvet Tussock	Small blue leaved tussock for dry gardens	Ρ	96
Themeda Triandra	Kangaroo Grass	Tough mat forming native grass, iconic flower heads	Q	96
Carex Appressa	Tall Sedge	Quick growing. exc for grey water filtering / creeks!	R	96
Carex Fascicularis	Tassel Sedge	Quick growing. exc for grey water filtering / creeks!!	S	96
	·	Total m ² of grases to be planted	1	576

NOTES

- ALL GRASSES INCLUDED IN THE ENDORSED, LANDSCAPE PLAN MUST BE PLANTED AND MAINTAINED TO THE 1. SATISFACTION OF THE RESPONSIBLE AUTHORITY.
- 2. PLANTINGS SHALL BE CARRIED OUT USING THE APPROVED LANDSCAPE PLAN.
- 3. PLANTINGS TO BE IN ROWS 2.5m APART WITH SPACING OF PLANTS AT 2.5m INTERVALS. PLANTS TO BE PLACED IN BETWEEN THE PLANTS IN THE PREVIOUS ROWS. A MINIMUM OF 4 ROWS SHALL BE PROVIDED.
- PLANTS TO BE USED SHALL BE AS PER ATTACHED LIST BASED ON INDIGENOUS SPECIES LIST. 4.
- 5. LANDSCAPING PLANTS SHALL BE PLANTED TO ENSURE THE PROPOSED PLANTING IS PROTECTED FROM GRAZERS.
- 6. REGULAR WATERING BY THE WASTEWATER IRIGATION SYSTEM WHEN NEEDED BY WATER CART AND MAINTENANCE SHALL BE CARRIED OUT FOR THE FIRST 3 YEARS, WITH REPLACEMENT OF DEAD PLANTS TO BE CARRIED OUT AS REQUIRED. MAINTENANCE SHALL OCCUR EVERY 6 MONTHS.
- 7. PLANT INTO MOIST SOIL IF POSSIBLE IN SPRING, AFTER THE RISK OF FROSTS HAS PASSED, WOULD BE THE IDEAL TIME FOR PLANTING. WATERING AT THE TIME OF PLANTING IS ADVANTAGEOUS AS LONG AS THE SOIL IS NOT WATER-LOGGED AND IF RAIN IS NOT EXPECTED.

Testilan	Clast	Approval	-	DIMENSIONS SHOWN TAKEN FROM TITLE AND IS NOT AS A RESULT OF A SURVEY	Spirecom Pty Ltd	PROJECT ADDRESS	TANKA DEC VERY	Γ DESIGNER: Ferreira
For client review -	James Wentworth	JW	25/09/2023	LANDSCAPING PLAN AROUND PERIMETER	SPIRECOM ⁶ Irrewarra Court SEABROOK, 3028	PROTEN PTY LTD	PROJECT F.Ferreira	T CONTACT: Scale - @ A1
				FENCE OF 4 RESIDENCES	PROJECT MANAGEMENT CT Victoria	320 Mooleric Road BIRREGURRA, VIC, 3242	PROJECT NO. PLAN 6391.1 Ver 2	Sheet 1
							DATE 08/07/2023	REV. DATE 25/09/2023

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Mooleric Road Birregurra

Flora and fauna assessment

FINAL REPORT Prepared for Spirecom Pty Ltd 26 February 2024



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- Victorian Government Department of Environment, Energy and Climate Action for access to the Victorian Biodiversity Atlas, NatureKit and EnSym/Native Vegetation Information Management tool
- Australian Government Department of Climate Change Energy the Environment and Water for access to the Protected Matters Search Tool

Biosis staff involved in this project were:

- Ian Smales (field assistance).
- Sam Panter (mapping).
- Clare McCutcheon, Katrina Sofo, and Ian Smales (quality assurance).

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SUMMARY

Biosis Pty Ltd (Biosis) was commissioned by Spirecom Pty Ltd (Spirecom) to undertake a flora and fauna assessment of a proposed water pipeline footprint and a proposed all-weather road. The pipeline will link a proposed poultry development at 320 Mooleric Road with the Birregurra township. The all-weather road will be constructed in an un-named road reserve to the north of the proposed poultry farm. The study area is located in private property and along public roadsides approximately 20 kilometres northeast of Colac, Victoria.

Biosis undertook a flora and fauna assessment of the proposed poultry development (320 Mooleric Road) for Spirecom in June 2023 (Biosis 2023).

Ecological values

Key ecological values identified within the study area are as follows:

- 0.08 hectares of Plains Grassy Woodland Ecological Vegetation Class (EVC) 55. This EVC has a Bioregional Conservation Status (BCS) of Endangered within the Victorian Volcanic Plain Bioregion.
- 0.04 hectares of Grassy Woodland (EVC 175). This EVC has a BCS of Endangered within the Otway Plain Bioregion.
- 0.55 hectares of Plains Grassy Wetland EVC 125. This EVC has a BCS of Endangered within the Victorian Volcanic Plain Bioregion.
- 0.09 hectares of Plains Sedgy Wetland (EVC 647). This EVC has a BCS of Endangered within the Otway Plain Bioregion.
- Habitat for one flora species and eight fauna species listed as threatened under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act):
 - Potential habitat for River Swamp Wallaby-grass Amphibromus fluitans.
 - Gang-gang Cockatoo Callocephalon fimbriatum. Two individuals were recorded using the eucalypts *Eucalyptus* sp. planted along the boundary of a neighbouring property and the study area.
 - Striped Legless Lizard *Delma impar*. Two (potentially three) individuals were recorded on site during targeted reptile surveys in the unnamed road reserve that connects Mooleric Road to the poultry farm site.
 - Potential habitat for Blue-winged Parrot *Neophema chrysostoma*, Growling Grass Frog *Litoria raniformis*, and Yarra Pygmy Perch *Nannoperca obscura*.
 - Potential habitat for wide-ranging species including Grey-headed Flying-fox *Pteropus* poliocephalus, Southern Bent-wing Bat *Miniopterus orianae bassanii*, and White-throated Needletail *Hirundapus caudacutus*.
- Habitat for two threatened flora species and eight additional threatened fauna species listed under the *Flora and Fauna Guarantee Act 1988* (FFG Act):



- Two variants of Purple Blown-grass; *Lachnagrostis semibarbata* var. *filifolia* and *Lachnagrostis semibarbata* var. *semibarbata*.
- Black Falcon *Falco subniger*, Brolga *Grus rubicunda*, Hardhead *Aythya australis*, Little Egret *Egretta garzetta*, Blue-billed Duck *Oxyura australis*, and Platypus *Ornithorhynchus anatinus*.
- The Tussock Skink *Pseudemoia pagenstecheri* (Volcanic Plains form) was recorded during targeted reptile surveys in the unnamed road reserve that connects Mooleric Road to the poultry farm site.
- Burrowing crayfish burrows were recorded on site, which could belong to Hairy Burrowing Crayfish *Engaeus sericatus*.
- The Birregurra Creek flows beneath Birregurra Road where it crosses the study area.

Government legislation and policy

An assessment of the project in relation to key biodiversity legislation and policy is provided and summarised below.

Legislation / policy	Relevant ecological feature on site	Permit / approval required
EPBC Act	 Eight EPBC Act listed fauna species were either recorded, or assessed as having a medium or higher likelihood of occurring within the study area: Gang-gang Cockatoo (recorded) Blue-winged Parrot Grey-headed Flying-fox Growling Grass Frog Southern Bent-wing Bat Striped Legless Lizard White-throated Needletail Yarra Pygmy Perch. One EPBC Act listed flora species is assessed as having a medium or higher likelihood of occurrence within the study area: River Swamp Wallaby-grass. 	If direct impacts to the Birregurra Creek remain avoided (avoidance proposed in designs received on 14 December 2023) River Swamp Wallaby-grass and Yarra Pigmy Perch will not be impacted and further surveys will not be required. Habitat for Gang-gang Cockatoo is limited to the roadside eucalypts lining Mooleric Road and Birregurra Road. The pipeline is no longer proposed to impact Mooleric Road, as a result this habitat will not be impacted. Blue-winged Parrot may occur in the broader area on occasion, during which time the study area and adjacent grassy areas may be utilised for foraging. The study area contains habitat that meets the broad definition of 'habitat critical to the survival of the species' (DCCEEW 2023), however, the proposed works are considered unlikely to result in a significant impact on a population of this species based on the scale and nature of impacts.

320 Mooleric Road Birregurra | Fauna and flora assessment report | 26 FEBRUARY 2024



Legislation / policy	Relevant ecological feature on site	Permit / approval required
		wing Bat and White-throated Needletail have the potential to fly and forage throughout the general area but are unlikely to be impacted by the proposed development, as the study area does not support areas of important habitat for these species.
		The current design will avoid all impacts to potential Growling Grass Frog habitat by directional drilling the pipeline below potential habitat. If this design is altered and impacts to Growling Grass frog habitat are proposed, a referral may be required.
		 Habitat for Striped Legless Lizard is limited to the unnamed road reserve that connects Mooleric Road to the poultry farm site. Targeted surveys for threatened reptiles were undertaken in this section of the study area during October – December 2023, and Striped Legless Lizard were recorded in this area. An EPBC referral is required for the works involved in upgrading the road reserve to an all- weather road. Biosis understands that Spirecom is currently undertaking an EPBC Act referral for the construction of the road.
FFG Act	 Two FFG Act listed threatened flora are assessed as having a medium or higher likelihood of occurrence: Purple Blown-grass (variants <i>filifolia</i> and <i>semibarbata</i>). Fifteen FFG Act listed threatened fauna species are assessed as having a medium or higher likelihood of occurrence within the study area: Gang-gang Cockatoo (recorded) Black Falcon Blue-billed Duck Brolga 	 Where the installation of the pipeline is proposed on public roadsides a FFG Act Protected Flora permit will be required for any impacts to the protected or listed flora species. Only two of these species are likely to be impacted by the proposed pipeline and road construction (the remaining two species are the Purple Blown-grass variants, which are unlikely to be impacted by construction): Up to 20 individuals each of Lemon Beauty-heads and Jersey Cud-weed will
	 Brolga Grey-headed Flying-fox Growling Grass Frog Hairy Burrowing Crayfish 	be impacted by the proposed construction in the unnamed road reserve and Darcy's Lane. These impacts are likely to occur even if directional drilling avoids impacts to

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Legislation / policy	Relevant ecological feature on site	Permit / approval required
	 Hardhead Little Egret Platypus Southern Bent-wing Bat Striped Legless Lizard Tussock Skink White-throated Needletail Yarra Pigmy Perch. Two protected flora species were recorded on public land during the site assessment: Lemon Beauty-heads <i>Calocephalus citreus</i> Jersey Cudweed <i>Laphangium luteoalbum</i>. 	patches of native vegetation. As a result, a FFG Act protected flora permit will still be required. Impacts to Hairy Burrowing Crayfish will be minimised using directional drilling in the paddocks where crayfish burrows were observed. Hairy Burrowing Crayfish mounds were only observed on private property. Habitat for Tussock Skink is limited to the unnamed road reserve that connects Mooleric Road to the poultry farm site. Targeted surveys for threatened reptiles were undertaken in this section of the study area during October – December 2023, and Tussock Skinks were recorded there.
Planning & Environment Act	Study area contains patches of Plains Grassy Woodland EVC 55, Grassy Woodland EVC 175, Grassy Wetland EVC 125 and Plains Sedgy Wetland (EVC 647). Scattered native vegetation also occurs outside the patches of native vegetation.	A planning permit will be required to remove scattered native vegetation that occurs within the study area. Scattered native vegetation occurs outside patches of mapped native vegetation and will likely be impacted in areas where a trench is used to install the pipeline and within the proposed footprint of the all-weather road.
CaLP Act	 Five Regionally Controlled (RC) noxious weeds occur within the study area: Artichoke Thistle <i>Cynara cardunculus subsp. flavescens</i> African Box-thorn <i>Lycium ferocissimum</i> Sweet Briar <i>Rosa rubiginosa</i> Common Blackberry <i>Rubus anglocandicans</i> Gorse <i>Ulex europaeus.</i> Three Restricted (R) noxious weeds occur within the study area: Chilean Needle-grass <i>Nassella neesiana</i> Soursob <i>Oxalis pes-caprae</i> Great Mullein <i>Verbascum thapsus subsp. thapsus.</i> 	Comply with requirements to control the spread of these species during construction.
Water Act	Birregurra Creek	Birregurra Creek will not be directly impacted by the installation of the pipeline, which is currently proposed to impact adjacent to the road surface of Birregurra

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Legislation / policy	Relevant ecological feature on site	Permit / approval required
		Road. This will avoid significant impacts to the creek and the associated native vegetation and fauna habitat. Referral to Corangamite Catchment Management Authority (CMA) will be required if the works plan is altered and the creek will be impacted by the proposed installation of the pipeline.



Guidelines for the removal, destruction or lopping of native vegetation (the Guidelines)

Based on the current design (provided by Spirecom on 14 December 2023), the proposed construction of the pipeline and the all-weather road will not require the removal of any native patch vegetation. Directional drilling will be used beneath all patches of native vegetation (including a 2m buffer between the start of boring and the patch of vegetation) to ensure impacts are avoided.

Trenching will be used to install the pipeline in areas where native vegetation patches or important fauna habitat have not been mapped. As a result, impacts to scattered native vegetation are still likely to occur. Impacts to scattered native vegetation require a planning permit, but are not assessed under the *Guidelines for the removal, destruction and lopping of native vegetation*.

The six-metre-wide all-weather road has been positioned to avoid impacts to all native vegetation within the unnamed road reserve. Temporary construction fencing has been erected in the unnamed road reserve to ensure impacts to all patches of native vegetation are avoided during construction. It is important to note that construction of the road will still result in impacts to some scattered native vegetation and Striped Legless Lizard habitat.

The following actions have been taken to avoid and/or minimise the impacts of the proposed pipeline development on the landscape:

- Directional drilling will be implemented in areas where the pipeline intersects patches of native vegetation. This will avoid all impacts to patches of native vegetation. Directional drilling will also be used in areas identified as potential habitat for Growling Grass Frog and Hairy Burrowing Crayfish to avoid impacting these threatened fauna species.
- Additionally, directional drilling will be used to install the pipeline above the concrete structure of Birregurra Road, below the road surface crossing the Birregurra Creek. This will avoid impacts to the creek and the associated habitat and vegetation.
- Impacts to high quality vegetation are limited. Much of the vegetation proposed to be impacted by the installation of the pipeline is degraded and no longer supports a diverse mix of native species.
- The placement of the road and implementation of a temporary construction fence will ensure impacts to native vegetation patches are avoided during construction of the six metre-wide all weather road.

A Planning permit will be required for the impacts to scattered native vegetation that are proposed by the construction of the all-weather road and the pipeline.

Recommendations

Specific detail relating to preventing impacts to retained native vegetation and aquatic and terrestrial habitat should be addressed in a site-specific Construction Environmental Management Plan. This will include requirements for environmental inductions, installation of temporary fencing/signage, drainage and sediment control.

Striped Legless Lizard targeted surveys were undertaken in suitable habitat within the northern, unnamed road reserve (east of Mooleric Road) during October – December 2023 (Biosis 2024). Striped Legless Lizards and Tussock Skink were recorded during these surveys. Due to the nature of planned



works for an all-weather road within the road reserve, a significant impact on Striped Legless Lizard is likely, therefore an EPBC Act referral will be required.

Additional targeted surveys for threatened flora and fauna will not be required based on the most recent construction design (14 December 2023). Direct impacts to habitat for threatened flora and fauna will be avoided by installing the pipeline using directional drilling in the following areas:

- Beneath all patches of native vegetation that intersect the pipeline. Directional drilling will be used to install he pipeline below ground, avoiding impacts to native vegetation. A buffer of 2 metres between the start of boring and the patch of vegetation will be used to avoid indirect impacts on vegetation from machinery.
- Above the concrete structure of Birregurra Road and below the road surface crossing the Birregurra Creek, avoiding all direct impacts to the creek.
- Beneath the area that is considered a potential Growling Grass Frog movement corridor between the M1 and Birregurra Creek (see figure 2).
- Beneath the areas that support potential Hairy Burrowing Crayfish mounds (see Figure 2).

Targeted surveys for threatened flora and fauna are recommended if the construction design / process is changed and direct impacts to Birregurra Creek are proposed. Targeted surveys are also recommended if changes to the construction design / method result in impacts to the potential Growling Grass Frog habitat between the M1 and Birregurra Creek

If impacts to Growling Grass Frog habitat can no longer be avoided using directional drilling, this may also trigger an EPBC Act referral (subject to the results of targeted surveys).

No-go fencing will need to be installed around native vegetation that occurs within the vicinity of trenches and bore points for the installation of the pipeline. This will avoid unintentional impacts to the vegetation from machinery, trampling etc. during construction. Long-term protection of vegetation adjacent the all-weather road should also be considered to ensure vegetation is protected during ongoing use. No-go fencing has already been placed in the unnamed road reserve.



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1. Introduction

1.1. Project background

Biosis Pty Ltd (Biosis) was commissioned by Spirecom Pty Ltd (Spirecom) to undertake a flora and fauna assessment of a proposed water pipeline footprint. The pipeline will link a proposed poultry development at 320 Mooleric Road with the Birregurra township. The footprint occurs within public road reserves along Moorelic Road, Darcy's Lane and Birregurra Road (the study area). The study area encompasses the entire road reserve and does not include any private property adjacent to the road reserve.

Biosis undertook a flora and fauna assessment of the proposed poultry farm development (320 Mooleric Road) for Spirecom in June 2023 (Biosis 2023).

1.2. Scope of assessment

The objectives of this investigation are to:

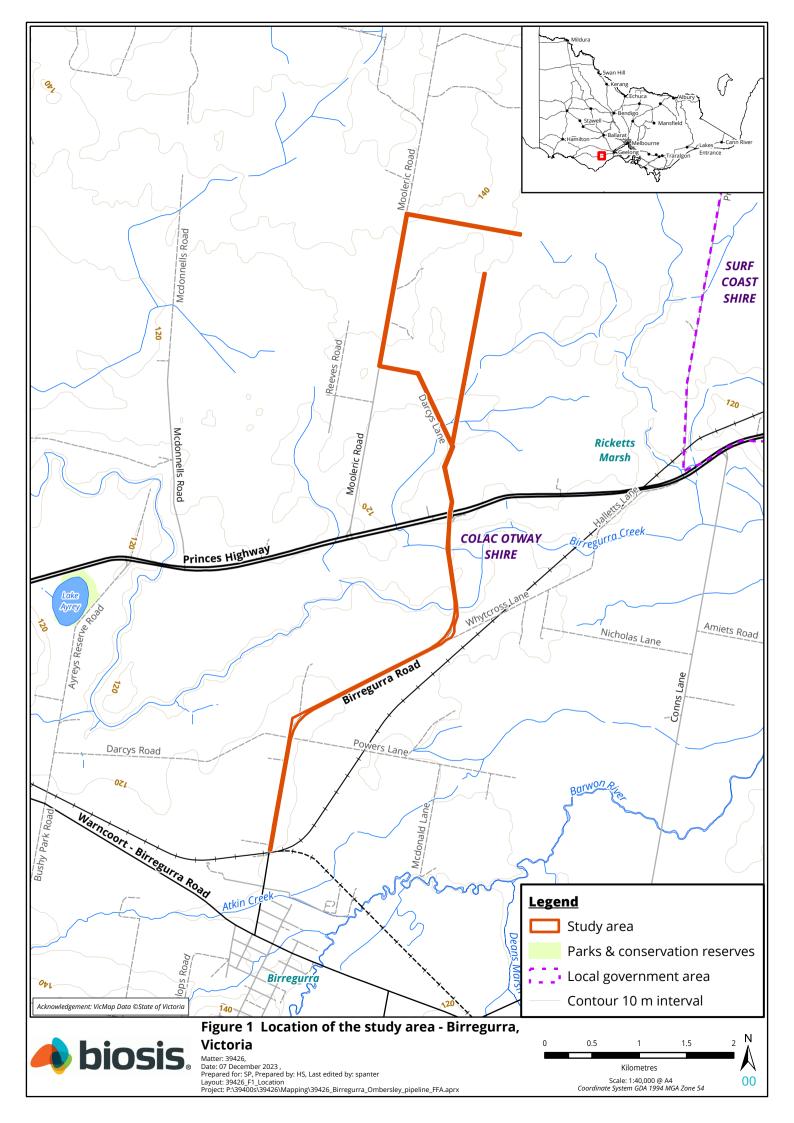
- Describe the vascular flora (ferns, conifers, flowering plants), vertebrate fauna (mammals, birds, reptiles, frogs, fishes) and decapod crustacea (e.g. crayfish).
- Map native vegetation and other habitat features.
- Review the implications of relevant biodiversity legislation and policy, including Victoria's Guidelines for the removal, destruction or lopping of native vegetation ('the Guidelines').
- Identify potential implications of the proposed development and provide recommendations to assist with development design.
- Recommend any further assessments of the site that may be required (e.g. a vegetation impact assessment or targeted searches for threatened species).

1.3. Location of the study area

The study area is located along public road reserves between Ombersley and Birregurra, 20 kilometres north-east of Colac, Victoria (Figure 1). It encompasses approximately 21hectares of public land currently zoned in the Colac Otway Planning Scheme as Transport zone 2 (TRZ2) south of Princes Highway and Farming Zone (FZ) north of the Princes Highway. It occurs within a predominantly agricultural landscape with the surrounding properties cleared for grazing and cropping.

The study area is within the:

- Victorian Volcanic Plain and the Otway Plain Bioregion.
- Barwon River Basin.
- Management area of the Corangamite Catchment Management Authority (CMA).
- Colac Otway Shire local government area.
- Traditional lands of the Eastern Maar.





2. Methods

2.1. Database review

In order to provide a context for the study area, information about flora and fauna from within 5 kilometres of the study area (the 'local area') was obtained from relevant biodiversity databases, many of which are maintained by the Victorian Government Department of Energy, Environment and Climate Action (DEECA) or the Australian Government Department of Climate Change, Energy, Environment and Water (DCCEEW). Records from the following databases were collated and reviewed:

- DEECA's Victorian Biodiversity Atlas (VBA), including the 'VBA_FLORA25, FLORA100 & FLORA Restricted' and 'VBA_FAUNA25, FAUNA100 & FAUNA Restricted' datasets.
- DCCEEW's Protected Matters Search Tool for matters protected by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Other sources of biodiversity information were examined including:

- DEECA's NatureKit mapping tool.
- DEECA's Habitat Importance maps.
- DEECA's Native Vegetation Information Management (NVIM) system.
- Planning Scheme overlays relevant to biodiversity based on <u>http://planningschemes.dpcd.vic.gov.au</u>.

Previous biodiversity assessments relevant to the study area were also reviewed, including:

- Biosis (2014). Report prepared for MCG Quarries Pty Ltd. Biosis Project #17781.
- Biosis (2023). 320 Mooleric Road, Birregurra. Flora and Fauna Assessment. Report prepared for Spirecom Pty Ltd. Biosis Project no. 38562. (Biosis 2023).

2.2. Definitions of threatened species or communities

Threatened species or communities include those species or communities that are listed under the EPBC Act and/or *Flora and Fauna Guarantee Act* (1988) (FFG Act). The conservation status of a species or ecological community is determined by its listing status under Commonwealth or State legislation / policy (Table 1).

Government level	Conservation status
National	Listed as nationally critically endangered, endangered or vulnerable under the EPBC Act
State	Listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable or conservation dependent in Victoria under the FFG Act

Table 1 Conservation status of threatened species and ecological communities

Lists of threatened species generated from the databases are provided in Appendix A (flora) and Appendix B (fauna) and the species have been assessed to determine their likelihood of occurrence based on the process outlined below.



2.3. Determining likelihood of occurrence of threatened species

Likelihood of occurrence indicates the potential for a species or ecological community to occur regularly within the study area. It is based on expert opinion, information in relevant biodiversity databases and reports, and an assessment of the habitats on site. Likelihood of occurrence is ranked as negligible, low, medium, high or recorded. The rationale for the rank assigned is provided for each species in Appendix A (flora) and Appendix B (fauna). Those species for which there is little or no suitable habitat within the study area are assigned a likelihood of low or negligible and are not considered further.

Only those species listed under the EPBC Act or the FFG Act (hereafter referred to as ' threatened species') are assessed to determine their likelihood of occurrence. The habitat value for threatened species is calculated by the Habitat Importance Modelling produced by DEECA (DELWP 2017a). Where threatened species are recorded in the study area this is noted in Appendix A (flora) and Appendix B (fauna).

Threatened species which have at least medium likelihood of occurrence are given further consideration in this report. The need for targeted surveys for these species is also considered.

2.4. Site investigation

2.4.1. Flora assessment

The flora assessment was undertaken on 5 July 2023 by Hayley Sime (Botanist). A list of species was collected and will be submitted to DEECA for incorporation into the Victorian Biodiversity Atlas (VBA). Planted vegetation will not be included in the VBA submission unless it has naturalised.

Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs, and grasses' (Clause 73.01).

The Guidelines classify native vegetation into two categories (DELWP 2017a):

- A **scattered tree** is defined as a native canopy tree that does not form part of a patch of native vegetation.
- A patch of native vegetation (measured in hectares) is either:
 - An area of native vegetation, with or without trees, where at least 25% of the total perennial understorey cover is native plants.
 - An area with three or more native canopy trees where the drip line (i.e. the outermost boundary
 of a tree canopy) of each tree touches the drip line of at least one other tree, forming a
 continuous canopy.
 - Any mapped wetland included in the Current wetlands map, available in DEECA systems and tools.

Patch vegetation is classified into ecological vegetation classes (EVCs). An EVC contains one or more floristic (plant) communities, and represents a grouping of broadly similar environments. Definitions of EVCs and benchmarks (condition against which vegetation quality at the site can be compared) are determined by DEECA.

A canopy tree is a mature tree that is greater than three metres in height and is normally found in the upper layer of a vegetation type. EVC descriptions provide a list of the typical canopy species. A scattered tree is defined as either small or large, and is determined using the large tree benchmark for the relevant EVC. The extent of a small, scattered tree is the area of a circle with a 10 metre radius (i.e. 0.031



hectares), while the extent of a large scattered tree is a circle with a 15 metre radius (i.e. 0.070 hectares). A condition score is applied to each scattered tree based on information provided by DEECA's NVIM.

A Vegetation Quality Assessment (VQA) was undertaken for all patches of native vegetation identified in the study area. This assessment is consistent with DEECA's habitat hectare method (DSE 2004) and the Guidelines (DELWP 2017a). For the purposes of this assessment the limit of the resolution for identification of a patch of native vegetation was taken to be 0.001 habitat hectares (Hha). That is, if a discrete patch of native vegetation was present with sufficient cover but its condition and extent would not have resulted in the identification of at least 0.001 habitat hectares, the vegetation patch of vegetation was not mapped or included in the assessment.

Species nomenclature for flora follows the Victorian Biodiversity Atlas (VBA).

2.4.2. Fauna assessment

The study area was investigated on 5 July and 25 September 2023 by Ian Smales (Principal Zoologist) and Danielle Eastick (Zoologist) to determine its values for fauna. These were determined based on the types and qualities of habitat(s) present. All species of fauna observed during the assessment were noted and active searching for fauna was undertaken. This included direct observation, searching under rocks and logs, examination of tracks and scats and identifying calls. Particular attention was given to searching for significant species and their habitats. Fauna species were recorded with a view to characterising the values of the site and the investigation was not intended to provide a comprehensive survey of all fauna that has potential to utilise the site over time.

2.4.3. Permits

Biosis undertakes flora and fauna assessments under the following permits and approvals:

- Wildlife Authorisation issued by DEECA under the *Victorian Wildlife Act 1975* (Permit Number 10010193).
- Permit to Take/Keep Protected Flora issued by DEECA under the *Flora and Fauna Guarantee Act 1988* (FFG Act) (Permit Number 10010194).
- Permit to Take Protected Fish issued by DEECA under the *Flora and Fauna Guarantee Act 1988* (FFG Act) (Permit Number 10010195).
- Permit to Conduct Research in areas managed by the Parks Victoria issued by DEECA under the *National Parks Act 1975, Crown Land (Reserves) Act 1978* and *Parks Victoria Act 2018* (Permit Number 10010071).
- Permit to catch and release fish issued by the Victorian Fisheries Authority under the *Victorian Fisheries Act 1995* (Permit Number RP 1220, Personal File Number 13041).
- Approvals 18.21 and 20.21 issued by the Wildlife and Small Institutions Animal Ethics Committee of the Victorian Government Department of Economic Development, Jobs, Transport and Resources (DEDJTR).
- Scientific Procedures Fieldwork Licence issued by the Department of Economic Development, Jobs, transport and Resources (DEDJTR's) Wildlife and Small Institutions Animal Ethics Committee (Licence Number 20020).



2.5. Threatened reptile targeted surveys

Targeted surveys were undertaken for Striped Legless Lizards and Tussock Skink. The primary method used to survey for reptiles within the study area was the placement of artificial shelter (terracotta roof tile) transects, in accordance with the Survey guidelines for Australia's threatened reptiles (DEWHA 2011). Each tile transect consisted of 25 terracotta roof tiles spaced approximately 5 metres apart. Three tile transects were placed in suitable habitat along the northern side of the road reserve (grids 1, 3, 5), and three transects on the south side (grids 2, 4, 6), such that a total of 150 tiles were surveyed.

Tile transects were established within the study area on 22 September 2023, three weeks prior to the initial survey. Tile checks were conducted in the species active period, with a total of ten tile checks completed from 17 October to 22 December 2023 at approximately weekly intervals. Survey grids were decommissioned on 22 December 2023. Transects were sampled across a variety of weather conditions, on days when ambient temperatures did not exceed 28 °C (except for survey 9, which was undertaken at 30°C).

In addition to tile transects, active searching was also undertaken opportunistically throughout the study area while completing tile transect checks. This included lifting rocks and other debris to locate reptiles sheltering beneath. Animals were only briefly handled to obtain a photograph for the purpose of data collection and identification, and were released immediately afterwards at the point of capture. All reptile species encountered within the study area were noted and species records will be submitted to the Department of Energy, Environment and Climate Action (DEECA) for inclusion in the Victorian Biodiversity Atlas (VBA).

2.6. Qualifications

Ecological surveys provide a sampling of flora and fauna at a given time and season. There are a number of reasons why not all species will be detected at a site during survey, such as low abundance, patchy distribution, species dormancy, seasonal conditions, and migration and breeding behaviours. In many cases these factors do not present a significant limitation to assessing the overall biodiversity values of a site.

The current flora and fauna assessment was conducted in July (winter) which is not an optimal time for survey. However, the conditions were appropriate for assessing the extent of native vegetation and habitats present within the site due to the high weed cover and historical modification of the study area.

As a result, the survey was considered sufficient to assess the general values of the study area.

2.7. Legislation and policy

The implications for the project were assessed in relation to key biodiversity legislation and policy including:

- Matters listed under the EPBC Act, associated policy statements, significant impacts guidelines, listing advice and key threatening processes.
- Threatened taxa, communities and threatening processes listed under Section 10 of the FFG Act and associated action statements and listing advice.
- Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017a).
- *Planning and Environment Act 1987* specifically Clauses 12.01-2, 52.17 and 66.02 and Overlays in the Planning Scheme.



- Fisheries Act 1995.
- Noxious weeds and pest animals listed under the Catchment and Land Protection Act 1994 (CaLP Act).

2.8. Mapping

Mapping was conducted using hand-held GPS-enabled tablets and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the tablets (generally \pm 7 metres) and dependent on the limitations of aerial photo rectification and registration.

Mapping has been produced using a Geographic Information System (GIS). Electronic GIS files which contain our flora and fauna spatial data are available to incorporate into design concept plans, however, this mapping may not be sufficiently precise for detailed design purposes.



3. Results

The ecological features of the study area are described below and mapped in Figure 2.

Species recorded during the flora and fauna assessment are listed in Appendix A (flora) and Appendix B (fauna). Unless of note, these species are not discussed further.

Threatened species recorded or predicted to occur in the local area are also provided in those appendices, along with an assessment of the likelihood of the species occurring within the study area.

3.1. Vegetation and fauna habitat

Remnant roadside vegetation is often locally and regionally significant, providing habitat for threatened flora and fauna and connectivity in landscapes that have been heavily modified, cleared and degraded (Victorian Landcare 2020). This is especially true where roadsides have been excluded from livestock grazing and, as a result, support higher native biodiversity and structural diversity in the understorey.

The roadsides surveyed within the study area do not support the high native species diversity that is typically expected in roadside reserves. Birregurra's high average annual rainfall (668 millimetres) has resulted in a dominance of weeds such as Toowoomba Canary-grass *Phalaris aquatica* following modification for grazing and agriculture.

The paddocks to the south of the proposed poultry farm support a predominantly introduced suite of vegetation. Pasture species and common weeds such as Toowoomba Canary Grass dominate the cover. A large patch of Grassy Wetland occurs in the south-west corner of the middle paddock (see Figure 2), this patch is relatively low quality due to the sparse cover of rushes *Juncus spp.* and dominance of introduced weeds. Some higher quality patches of Grassy Wetland vegetation occur within the paddock along drainage lines. Areas within the drainage lines that have not been heavily degraded by cattle support some native herb species. These patches support the key diagnostic characters to be considered Seasonal Herbaceous Wetland of the Temperate Lowland Plains, however the patches are too small to qualify as the Threatened Ecological Community.

Darcy's Lane supports four small patches of native vegetation where Common Tussock Grass *Poa labillardierei* and Kangaroo Grass *Themeda triandra* occur at greater than 25% (perennial) cover. The remainder of the reserve is dominated by Toowoomba Canary-grass and Brown-top Bent *Agrostis capillaris*. Native vegetation outside the patches is limited to scattered native rushes (Toad Rush *Juncus bufonius*) native herbs (Lemon Beauty-heads *Calocephalus citreus*) and native grasses (Kangaroo Grass, spear grasses *Austrostipa* spp. and wallaby grasses *Rytidosperma* spp.).

The unnamed government road to the north of the proposed poultry farm supports several small patches of Plains Grassy Wetland EVC 125. Beyond the mapped patches of Plains Grassy Wetland EVC 125, native vegetation is scattered throughout a largely disturbed area that supports predominantly introduced vegetation such as Toowoomba Canary-grass. The soils are black, cracking clays with some surface and embedded rocks.

Tussock grasses (such as Common Tussock-grass) are sparse and appear to have been heavily grazed throughout the road reserve. Despite the relatively low cover of tussock grasses, the site is considered potentially suitable habitat for Striped Legless Lizard *Delma impar* because the property to the north supports moderate quality habitat with large tussock grasses, surface rocks and inter-tussock spaces.

The surface rocks within the road reserve may be utilised by Striped Legless Lizards that could move in from the more suitable habitat to the north. Additionally, Striped Legless Lizards have been recorded in roadsides dominated by Toowoomba Canary-grass in western Victoria. Habitat of this type is known to also support additional small vertebrates including threatened reptiles like the Tussock Skink. Striped Legless Lizard and Tussock Skink were recorded in the road reserve during targeted reptile surveys.

No threatened flora were recorded within the study area during the assessment, and the high level of disturbance (evident through cattle pugging and grazing) means it is unlikely that any threatened flora species persist within the patches of wetland vegetation.

The habitat zones within the unnamed road reserve were assessed for the presence of Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (Seasonal Herbaceous Wetlands; threatened ecological community listed under the EPBC Act). Several key species of this threatened community such as Common Spike-sedge *Eleocharis acuta,* Prickfoot *Eryngium vesiculosum* and Small Loosestrife *Lythrum hyssopifolia* were recorded within habitat zone 22 (Figure 1, Appendix A) at a high enough cover to qualify as Seasonal Herbaceous Wetlands. While habitat zone 22 meets the condition thresholds for Seasonal Herbaceous Wetlands, the size threshold is not met (both individually and collectively). Habitat zones 23 and 24 do not support any native forb species and therefore do not meet the size or condition thresholds to be considered Seasonal Herbaceous Wetlands.

The roadsides along Birregurra Road support several patches of Plains Sedgy Wetland (EVC 647) where shallow depressions hold water. These vegetation patches are relatively low quality and are all dominated by a single native sedge, Common Spike-sedge *Eleocharis acuta*. Limited patches of Grassy Woodland (EVC 175) occur along Birregurra Road where Blackwood *Acacia melanoxylon* has recruited.

Birregurra Creek crosses underneath Birregurra Road south of the Princes Highway. While the vegetation near the creek is largely dominated by weeds, a native Swamp Wallaby-grass *Amphibromus* sp. was identified along the margin of the creek, within the study area. There is a medium likelihood that the Swamp Wallaby-grass recorded onsite is the EPBC Act listed River Swamp Wallaby-grass *Amphibromus fluitans*. As a result, additional targeted surveys will be required if impacts to the Birregurra Creek are proposed. The creek also provides habitat for water birds, frogs and fish.

Photos are provided in Appendix C.



Table 2 Summary of vegetation and habitat types within the study area

Vegetation or habitat type	Description	Location	Significant values
Plains Grassy Woodland (EVC 55).	Small patches of Plains Grassy Woodland (EVC 55) occur along Mooleric Road and within Darcy's Lane. These patches support a small native species diversity including wallaby grasses <i>Rytidosperma</i> spp., Hedge Wattle <i>Acacia paradoxa</i> and Black Wattle <i>Acacia melanoxylon</i> . While the Hedge Wattle and Blackwood may have initially been planted along the roadside, it is now recruiting naturally and therefore considered a native vegetation patch.	Small patches along Mooleric Road and Darcy's Lane.	Acacias provide habitat for many common bird species, and grassy understory supports many common reptile species. Blue-winged Parrot may forage in this habitat.
Grassy Woodland (EVC 175).	These patches occur south of the Princes Highway (within the Otway Plain Bioregion). They are similar to the Plains Grassy Woodland patches found to the north of the Princes Highway. They support recruiting Blackwood individuals and a high cover of understorey weeds.	Small patches along Birregurra Road.	Grassy woodland provides similar fauna habitat values to Plains Grassy Woodland.
Plains sedgy Wetland (EVC 647).	Shallow drainage lines along Birregurra Road support Plains Sedgy Wetland (EVC 64)7. These patches are not diverse and most only support Common Spike-sedge <i>Eleocharis acuta</i> .	In shallow drainage lines along Birregurra Road.	Drainage lines provide habitat and connectivity for wetland fauna including frogs. Growling Grass Frog may use these drainage lines as corridors between permanent water bodies, such as dams on the adjacent properties.
Plains Grassy Wetland (EVC 125).	Occurs as isolated patches within the paddocks that have been degraded by cattle grazing. The patches are dominated by native grasses such as Tussock Grass. The higher quality examples of this community support native herbs such as Small Loosestrife and Prickfoot. The low-quality examples of this community lack native herb diversity.	South of the proposed poultry farm and in the unnamed road reserve. Occurs in shallow drainage lines and	Drainage lines provide habitat and connectivity for wetland fauna including frogs. Growling Grass Frog may use these drainage lines as corridors between permanent water bodies, such as dams on the adjacent properties. This habitat may support Striped Legless Lizard where it occurs in adjacent higher

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Vegetation or habitat type	Description	Location	Significant values
		depressions caused by cattle movement.	quality (and more suitable) habitat.
Predominantly introduced vegetation.	Most of the study area supports modified vegetation dominated by Toowoomba Canary-grass <i>Phalaris aquatica</i> . Native vegetation within these areas is limited to some scattered grasses and herbs, however they do not reach a percentage cover high enough to be considered a patch. These areas may have been grazed in the past and have been degraded by vehicle access in some areas.	Majority of the study area.	Predominantly introduced vegetation has limited value to fauna, however highly mobile and wide-ranging species such as White- throated Needletail, Southern Bent-winged Bat, and Black Falcon may forage overhead on occasion. The road easement north of the quarry contains a mix of native and introduced vegetation that support Striped Legless Lizard and Tussock Skink. These two species were recorded during targeted reptile surveys within the road easement.
Planted vegetation.	Several properties adjacent to the study area have linear 'shelterbelt' plantings along the fence line. These plantings predominantly consist of Australian natives (non- indigenous species). However, Radiata Pine <i>Pinus radiata</i> have been used in some areas as well.	Adjacent the study area in neighbouring properties.	Planted eucalypts may be occasionally visited, when in flower, by foraging Grey-headed Flying-foxes from the colony at the Colac Botanic Gardens. Gang-gang Cockatoos were recorded utilising these roadside eucalypts.
Birregurra Creek.	A wide, ephemeral waterway (>4 m wide) containing submergent and emergent vegetation, and vegetated banks.	Crosses underneath Birregurra Road south of the Princes Highway.	Potential habitat for threatened fauna species, including Brolga, Blue-billed Duck, Hardhead and Little Egret. Potential occurrence of River Swamp-wallaby Grass. Growling Grass Frog and Platypus may use Birregurra Creek as a corridor to permanent water bodies.



3.2. Landscape context

The study area is in a rural farming area and most of the surrounding landscape has been cleared for either grazing or cropping. It is approximately 20 kilometres from Lake Colac and Lake Murdeduke, and a similar distance to the north of the forested area of the Otway Ranges.

The Birregurra Creek passes through the study area (beneath Birregurra Road) providing connectivity between the study area and the Barwon River.

3.3. Threatened species and ecological communities

Threatened species recorded or predicted to occur within 5 kilometres of the study area or from the relevant catchment (aquatic species) are listed in Appendix A (flora) and Appendix B (fauna). An assessment of the likelihood of these species occurring in the study area and an indication of where within the site (i.e. which habitats or features of relevance to the species) is included. A summary of those species recorded or with a medium or higher likelihood of occurring in the study area is provided in Table 3.

Species name	Listing status	Area of value within the study area
River Swamp Wallaby-grass Amphibromus fluitans	Vulnerable under the EPBC Act.	Margins of the Birregurra Creek
Yarra Pigmy Perch <i>Nannoperca</i> obscura	Vulnerable under the EPBC Act and FFG Act.	Birregurra Creek.
Grey-headed Flying-fox Pteropus poliocephalus	Vulnerable under the EPBC Act and FFG Act.	May occasionally forage in flowering eucalypts on roadsides.
Gang-gang Cockatoo Callocephalon fimbriatum	Endangered under the EPBC Act and FFG Act.	Observed using the roadside eucalypts on Mooleric Road and Birregurra Road.
Blue-winged Parrot Neophema chrysostoma	Vulnerable under the EPBC Act.	May forage around roadside overstory and understory vegetation.
White-throated Needletail Hirundapus caudacutus	Vulnerable under the EPBC Act and the FFG Act.	Wide-ranging aerial species that may pass through and/or forage over the study area on occasion.
Southern Bent-winged Bat Miniopterus orianae bassanii	Critically Endangered under the EPBC Act and FFG Act.	May forage throughout the general area and use Birregurra Creek as water source.
Striped Legless Lizard Delma	Vulnerable under the EPBC Act.	Recorded in grassy vegetation in road

Table 3	Summary of EPBC Act and FFG Act listed species most likely to occur in the study area
100100	



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Species name	Listing status	Area of value within the study area
impar	Endangered under the FFG Act.	easement north of the quarry.
Tussock Skink <i>Pseudemoia pagenstecheri</i> (Volcanic Plains form)	Endangered under the FFG Act.	Recorded in grassy vegetation in road easement north of the quarry.
Growling Grass Frog Litoria raniformis	Vulnerable under the EPBC Act and FFG Act.	Birregurra Creek, and drainage lines north of the creek to the dam adjacent to M1 and Birregurra Road intersection.
Brolga Antigone rubicunda	Endangered under the FFG Act.	Floodplains off Birregurra Creek and between Mooleric Road and Darcy's Lane.
Little Egret <i>Egretta garzetta</i>	Endangered under the FFG Act.	Floodplains off Birregurra Creek and between Mooleric Road and Darcy's Lane.
Hairy Burrowing Crayfish Engaeus sericatus	Vulnerable under the FFG Act.	Paddock drainage lines.
Hardhead Aythya australis	Vulnerable under the FFG Act.	Birregurra Creek when full.
Blue-billed Duck Oxyura australis	Vulnerable under the FFG Act.	Birregurra Creek when full.
Black Falcon Falco subniger	Critically Endangered under the FFG Act.	May forage throughout the general area.
Platypus Ornithorhynchus anatinus	Vulnerable under the FFG Act.	May use Birregurra Creek as a movement corridor.

3.3.1. Threatened reptiles targeted surveys

Tile surveys for threatened reptiles were undertaken between 17 October and 22 December 2023. Three reptile and two amphibian species were recorded within the study area during the targeted surveys - Striped Legless Lizard, Eastern Three-lined Skink *Acritoscincus duperreyi*, Tussock Skink *Pseudemoia pagenstecheri*, Southern Brown Tree Frog *Litoria ewingii* and Spotted Marsh Frog *Limnodynastes tasmaniensis*. Additionally, one skink *Scincidae* spp. was observed but unable to be identified to the species level during the targeted surveys, as they evaded capture and/or moved too quickly to obtain visual identification. This typically occurred on warmer or more sunny days when individuals were more active.



Four Striped Legless Lizards were recorded during the surveys; one under a tile in Transect 2 (southern boundary of road reserve) and three under tiles within Transect 3 (northern boundary of road reserve; **Error! Reference source not found.**). Head scales were photographed for two of the Striped Legless Lizards captured on Transect 3, and it was determined they were the same individual captured on two separate days. The Striped Legless Lizards observed on Transect 2 and one of the individuals observed on Transect 3 evaded capture and were not able to be photographed. Hence, it is unknown whether the same individual was recorded all four times. However, it is likely that at least two different individuals were recorded as sightings as the capture points on Transect 2 and Transect 3 are located approximately 150 metres apart.

Tussock Skink were recorded on one occasion during the surveys in Transect 5. The unidentified skink that was observed, but not captured, on Transect 1 was also potentially a Tussock Skink due to its colour and size. Tussock Skink are listed as vulnerable under the FFG Act. Based on the results from the current survey, it is reasonable to assume that Tussock Skink are present in moderate abundance throughout the study area.

More information on these surveys can be found in the Striped Legless Lizard report (Biosis 2024).

3.3.2. Threatened ecological communities.

Four EPBC Act listed Threatened Ecological Communities (TECs) are modelled to occur within 5 kilometres of the study area:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.
- Natural Temperate Grassland of the Victorian Volcanic Plain.
- Grassy Eucalypt Woodland of the Victorian Volcanic Plain.
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains.

Two FFG Act listed communities are modelled to occur within 5 kilometres of the study area:

- Coastal Moonah (*Melaleuca lanceolata* subsp.*lanceolata*) Woodland Community.
- Western Basalt Plains (River Red Gum) Grassy Woodland Floristic Community 55-04.

In most cases the patches of native vegetation within the study area do not support the key diagnostic species of these communities and, as a result, the communities are not considered present. Where key diagnostic species are present within the patches (such as Kangaroo Grass and Common Tussock-grass) the patches are too small to be considered Natural Temperate Grassland of the Victorian Volcanic Plain or Seasonal Herbaceous Wetlands of the Temperate Lowland Plains (SHWTLP). Figure 2 shows the location of patches of native vegetation that support the key diagnostic species for SHWTLP but are too small to gualify as the community (both individually and collectively).

As a result, none of the modelled communities are present within the study area. See Appendix A.3 for further justification.



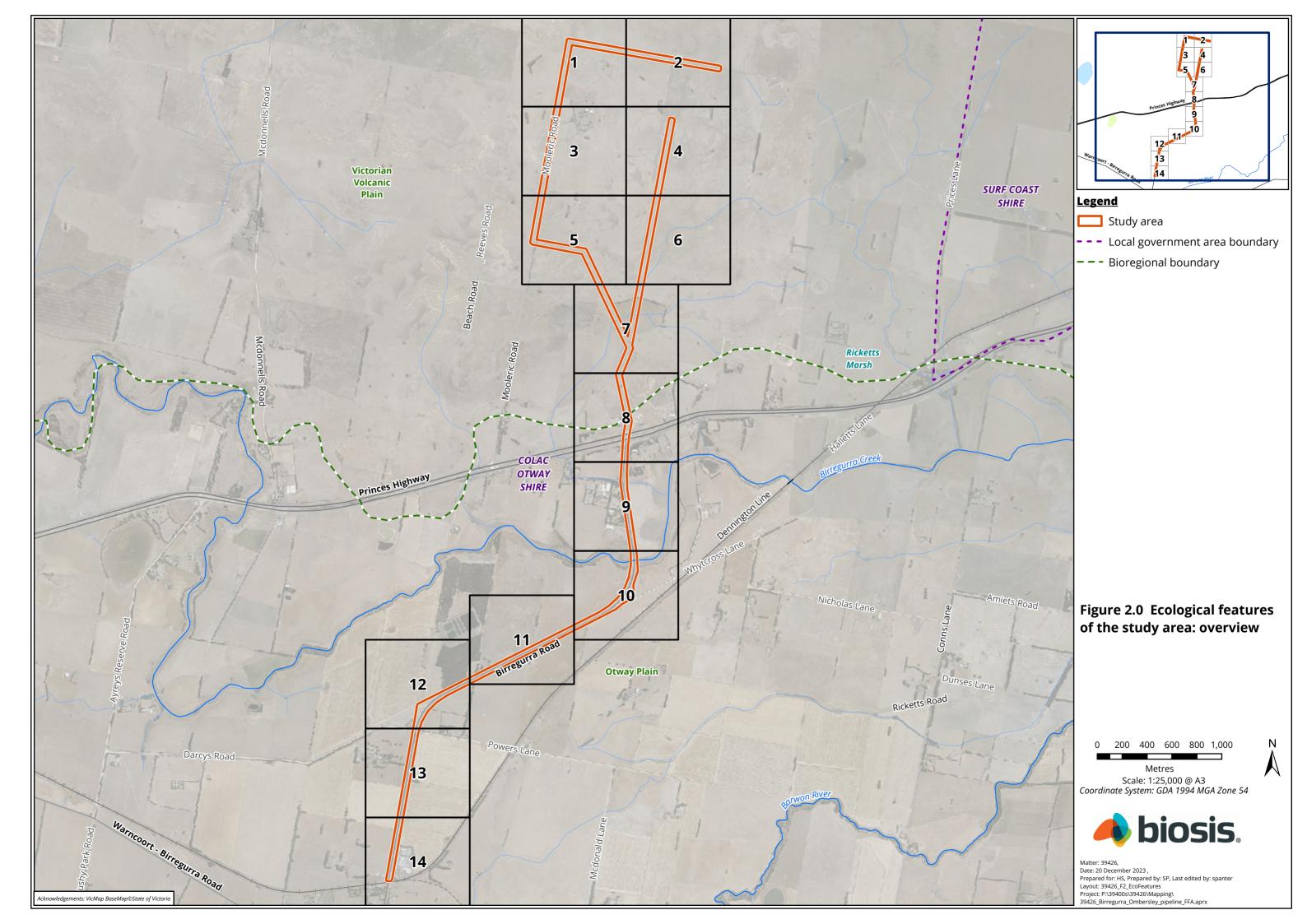
3.4. Further survey recommendations

Additional targeted surveys for threatened flora and fauna will not be required based on the most recent construction design (14 December 2023). Direct impacts on habitat for threatened flora and fauna will be avoided by installing the pipeline using directional drilling in the following areas:

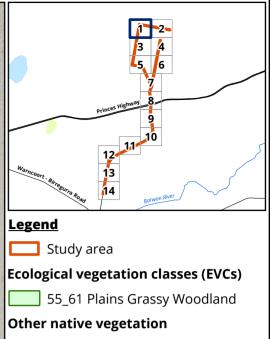
- Beneath all patches of native vegetation that intersect the pipeline. Directional drilling will be used to install he pipeline below ground, avoiding impacts to native vegetation. A buffer of 2 metres between the start of boring and the patch of vegetation will be used to avoid indirect impacts on vegetation from machinery.
- Above the concrete structure of Birregurra Road and below the road surface crossing the Birregurra Creek, avoiding all direct impacts to the creek.
- Beneath the area that is considered a potential Growling Grass Frog movement corridor between the M1 and Birregurra Creek (see figure 2).
- Beneath the areas that support potential Hairy Burrowing Crayfish mounds (see Figure 2).

Targeted surveys for threatened flora and fauna are recommended if the construction design / process is changed and direct impacts to Birregurra Creek are no longer avoided. Targeted surveys are also recommended if changes to the construction design / method result in impacts to the potential Growling Grass Frog habitat between the M1 and Birregurra Creek

An EPBC Act referral will be required for impacts on Striped Legless Lizard (proposed by the all-weather road). If impacts to Growling Grass Frog habitat can no longer be avoided using directional drilling, this may also trigger an EPBC Act referral (subject to the results of targeted surveys). Biosis understands that Spirecom are currently undertaking a referral for the impacts to Striped Legless Lizard proposed by the six-metre wide road construction.





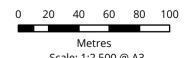


Scattered native vegetation including Basalt Poa. However, not considered native vegetation in the Guidelines.

Threatened fauna habitat

Striped Legless Lizard habitat

Figure 2.1 Ecological features of the study area: detail

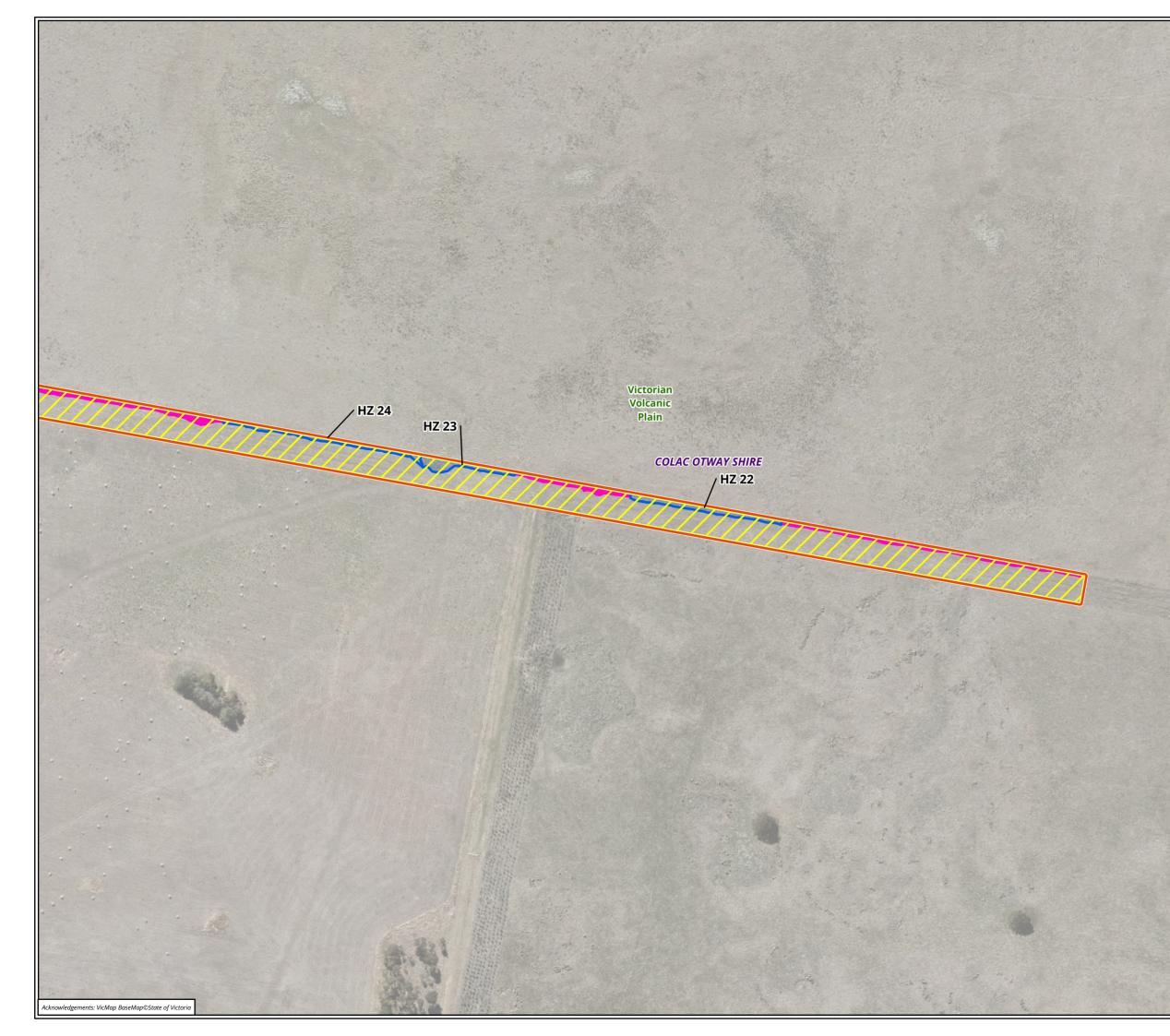




Scale: 1:2,500 @ A3 Coordinate System: GDA 1994 MGA Zone 54



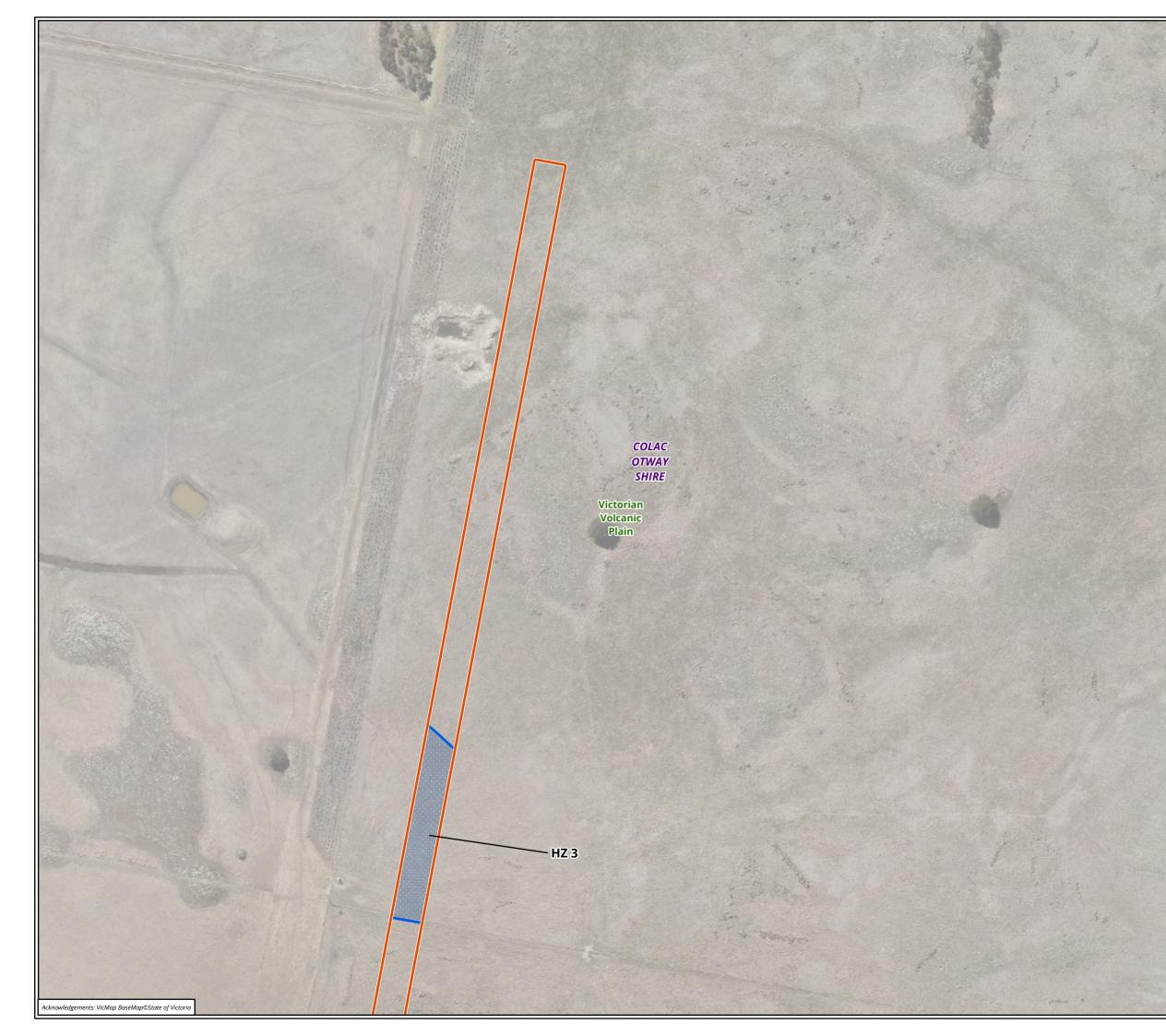
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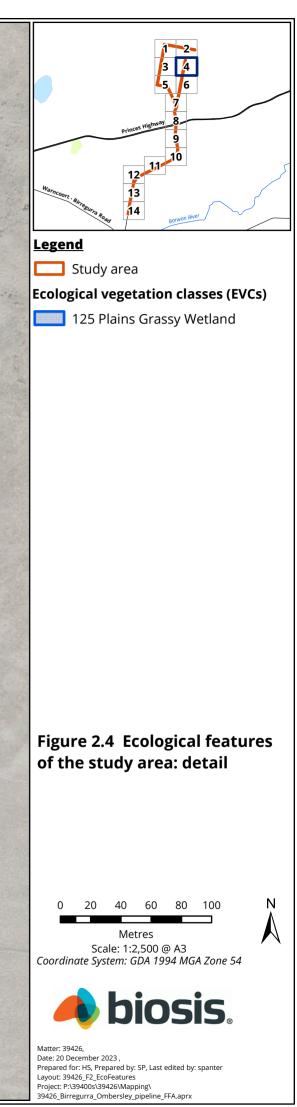


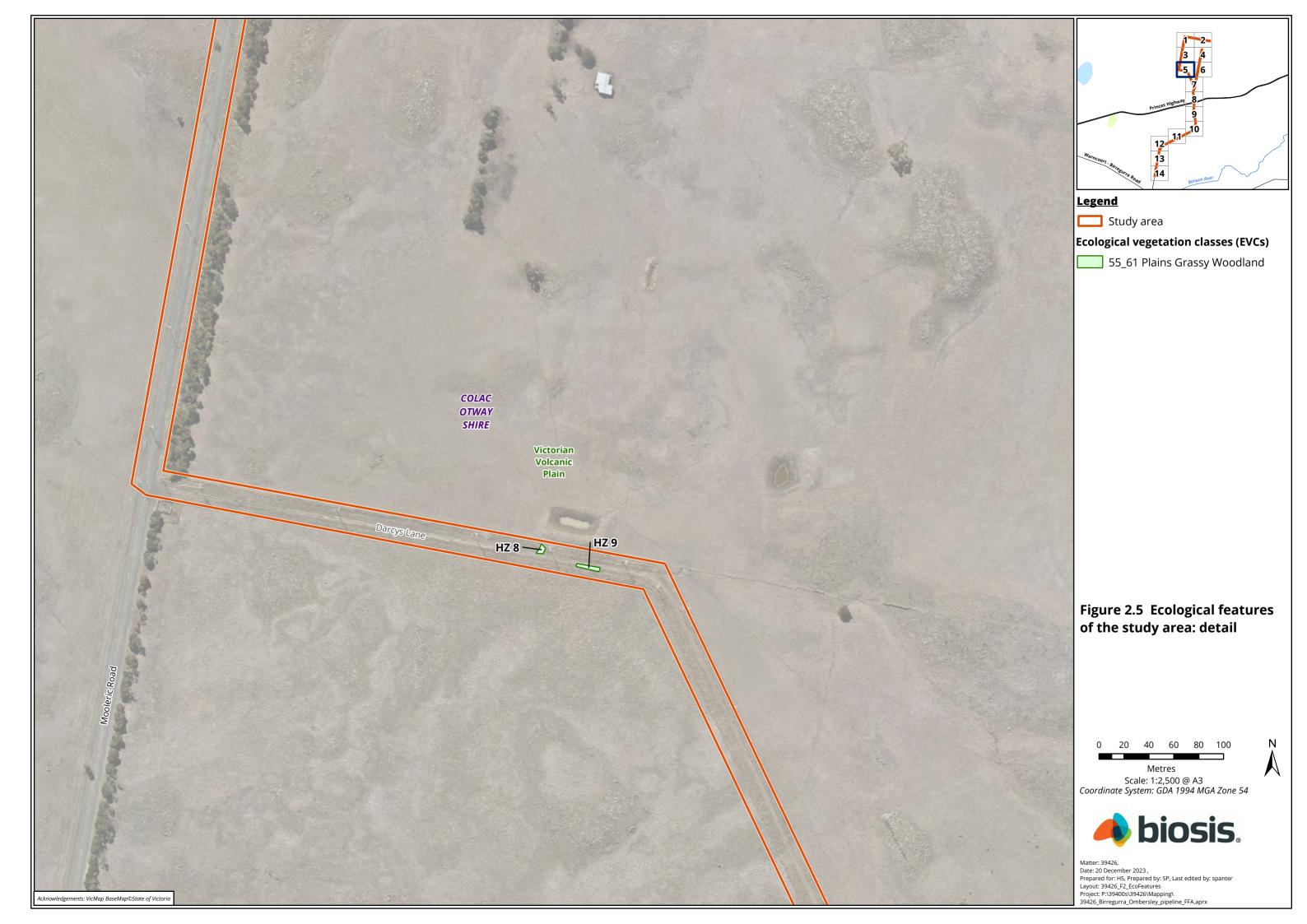


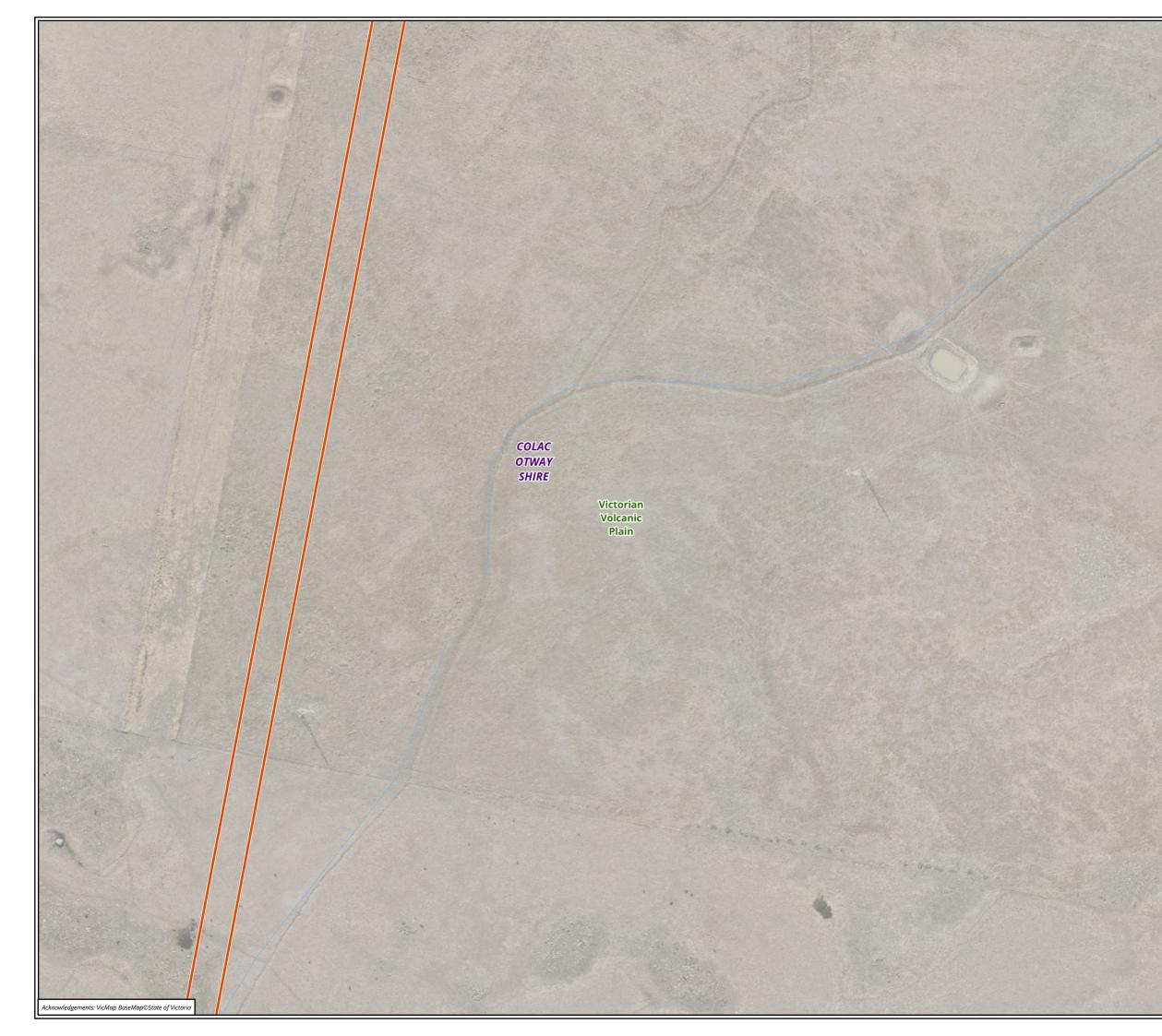






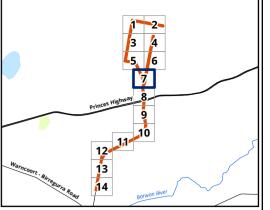












<u>Legend</u>

Study area

Ecological vegetation classes (EVCs)

55_61 Plains Grassy Woodland

125 Plains Grassy Wetland

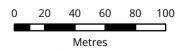
EPBC listed threatened ecological communities

Potential Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (key diagnostic species present, but wetland too small to qualify as community)

Threatened fauna habitat

Burrowing Crayfish burrows

Figure 2.7 Ecological features of the study area: detail

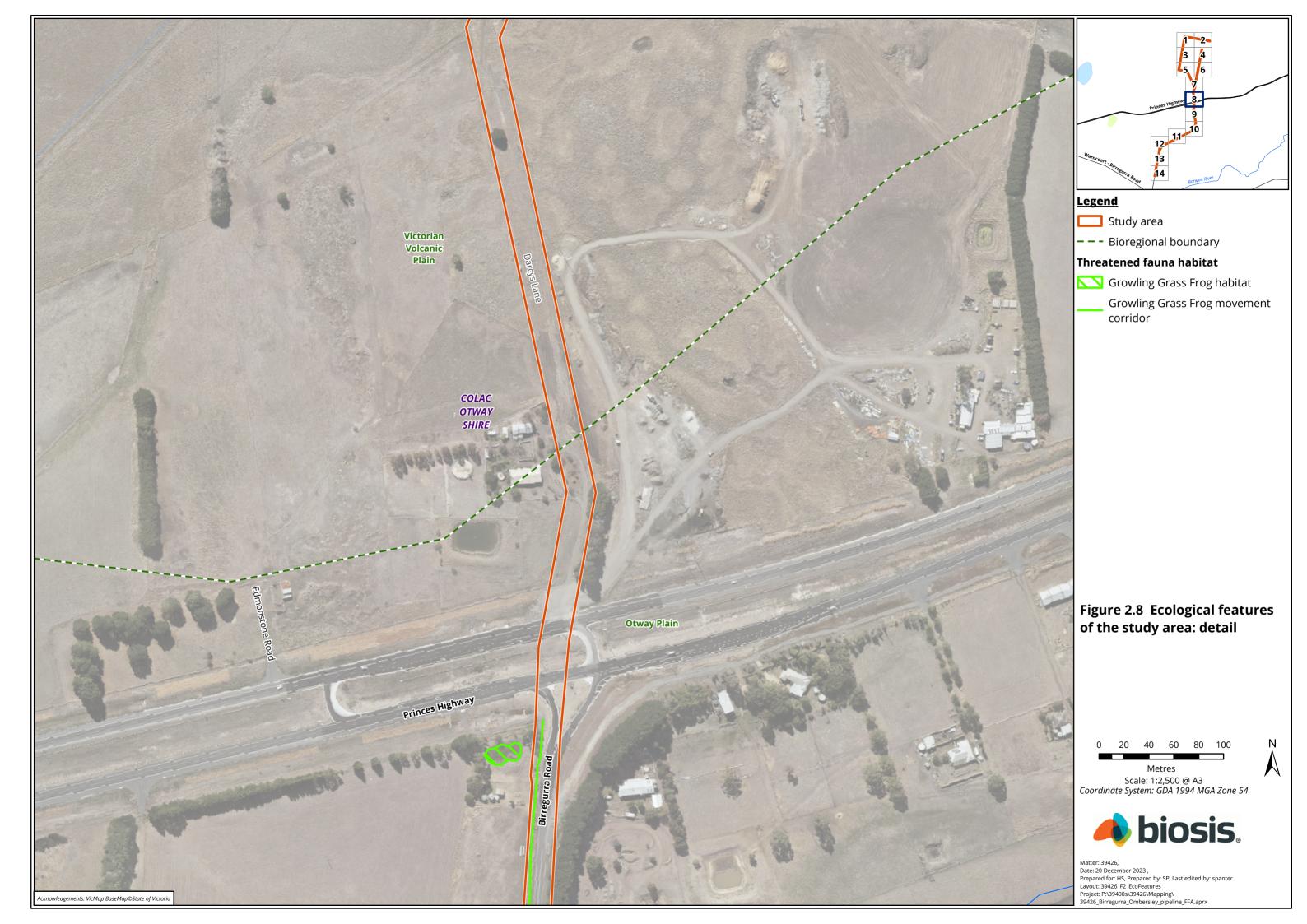




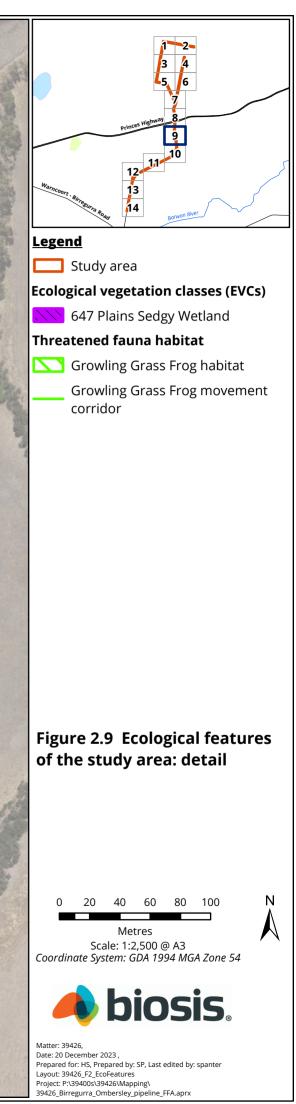
Scale: 1:2,500 @ A3 Coordinate System: GDA 1994 MGA Zone 54



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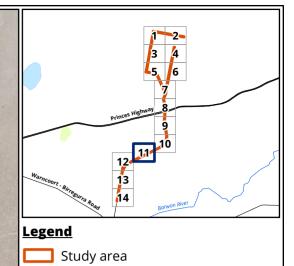
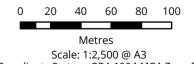


Figure 2.11 Ecological features of the study area: detail





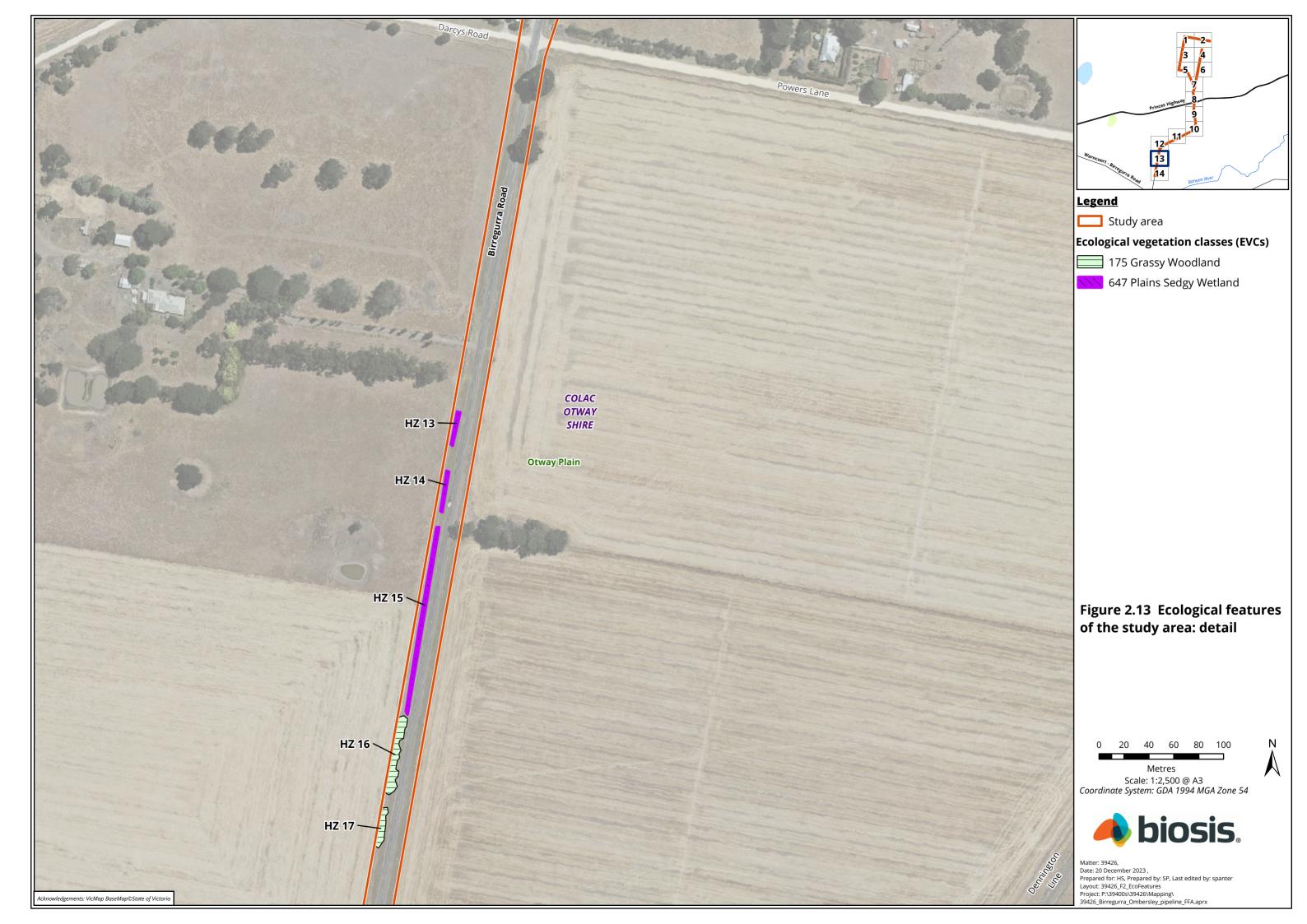
Metres Scale: 1:2,500 @ A3 Coordinate System: GDA 1994 MGA Zone 54



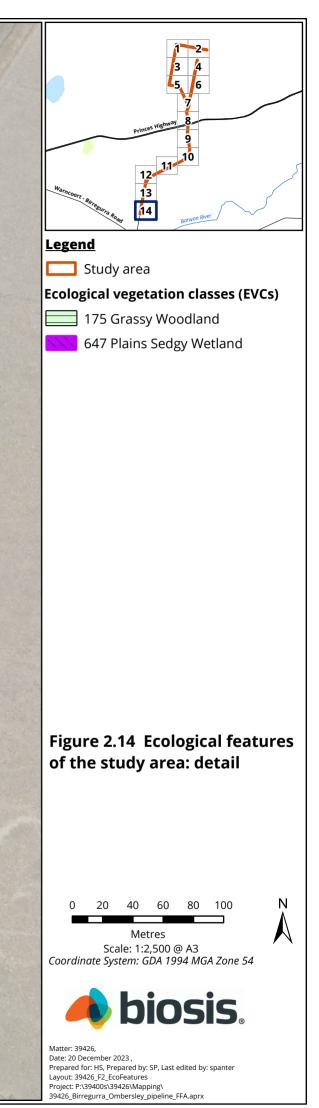
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4. Biodiversity legislation and government policy

This section provides an assessment of the project in relation to key biodiversity legislation and government policy. This section does not describe the legislation and policy in detail. Where available, links to further information are provided.

4.1. Commonwealth

4.1.1. Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act applies to developments and associated activities that have the potential to result in a significant impact on a Matter of National Environmental Significance (MNES) protected under the Act.

Further information including a guide to the referral process is available at <u>http://www.environment.gov.au/epbc/index.html</u>

The MNES relevant to the project are summarised in Table 4. It includes an assessment against the EPBC Act policy statements published by the Australian Government which provide guidance on the practical application of EPBC Act.

MNES	Project specifics	Assessment against significant impact guidelines
EPBC Act listed species	 The likelihood of threatened flora and fauna species occurring in the study area is assessed in Appendix A (flora) and Appendix B (fauna). One EPBC Act listed flora species may occur within the study area: River Swamp Wallaby-grass 	If direct impacts to the Birregurra Creek can continue to be avoided (as proposed on 14 December 2023) River Swamp Wallaby-grass and Yarra Pigmy Perch would not be significantly impacted and further surveys will not be required. Habitat for Gang-gang Cockatoo is limited to
	One EPBC Act listed fauna species was recorded in the study area: • Gang-gang Cockatoo	the roadside eucalypts lining Mooleric Road and Birregurra Road. The pipeline is no longer proposed to impact Mooleric Road, as a result this habitat will not be impacted.
	 Seven EPBC Act listed fauna species may occur within the study area: Yarra Pigmy Perch Blue-winged Parrot Grey-headed Flying-fox Southern Bent-winged Bat White-throated Needletail Growling Grass Frog Striped Legless Lizard 	this habitat will not be impacted. Blue-winged Parrot may occur in the broader area on occasion, during which time the study area and adjacent grassy areas may be utilised for foraging. The study area contains habitat that meets the broad definition of 'habitat critical to the survival of the species' (DCCEEW 2023), however, the proposed works are considered unlikely to result in a significant impact on a population of this species based on the scale and nature of impacts.

Table 4Assessment of project in relation to the EPBC Act

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MNES	Project specifics	Assessment against significant impact
		guidelines
		Grey-headed Flying-fox, Southern Bent-wing Bat and White-throated Needletail have the potential to fly and forage throughout the general area but are unlikely to be impacted by the proposed development, as the study area does not support areas of important habitat for these species.
		The current design (proposed by Spirecom on 14 December 2023) will avoid all impacts to potential Growling Grass Frog habitat by directional drilling the pipeline 6m below ground. If this design is altered and impacts to Growling Grass frog habitat are proposed, a referral may be required.
		Habitat for Striped Legless Lizard is limited to the unnamed road reserve that connects Mooleric Road to the poultry farm site. Targeted surveys for threatened reptiles were undertaken in this section of the study area during October – December 2023, and Striped Legless Lizard were recorded in this area. An EPBC referral is required for the works involved in upgrading the road reserve to an all-weather road.
		Biosis understands that Spirecom is currently undertaking an EPBC Act referral for the construction of the all-weather road.
EPBC Act listed ecological communities	Of the four Threatened Ecological Communities (TECs) modelled to occur within 5 km of the study area, none are considered present.	No impacts to TECs are likely because the patches that potentially qualify as Seasonal Herbaceous Wetland of the Lowland plains are too small to qualify as the Threatened Ecological Community.
Migratory species	Seventeen migratory species have been recorded or predicted to occur in the project search area (Appendix B.3).	While some of these species would be expected to use the study area on occasions, and some of them may do so regularly or may be resident, it does not provide important habitat for an ecologically significant proportion of any of these species.
Wetlands of international importance (Ramsar sites).	The study area is identified as being within the catchment of two Ramsar sites: Western District Lakes and Port Phillip Bay (western shoreline) and Bellarine Peninsula.	The study area does not drain directly into either Ramsar site and the development is not likely to result in a significant impact if Birregurra Creek impacts can be avoided.



On the basis of criteria outlined in the relevant Significant Impact Guidelines, it is currently uncertain whether the proposed works will result in a significant impact on a Matter of National Environmental Significance. If targeted surveys determine presence of Striped Legless Lizard, then referral of the proposed action to the Australian Government Minister for the Environment may be required. This will be resolved following completion of targeted surveys (refer to Section 3.4). If the design method or footprint is altered and impacts to Growling Grass Frog habitat can no longer be avoided, a referral may also be required for these impacts.

4.2. State

4.2.1. Flora and Fauna Guarantee Act 1988 (FFG Act)

The FFG Act is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes. Under the FFG Act a permit is required from DEECA to 'take' protected flora species. Permit exemptions under the FFG Act generally apply to the non-commercial removal of protected flora from private land, unless there is 'critical habitat' that has been declared on the land. Authorisation under the FFG Act is required to collect, kill, injure or disturb listed fish on private or public land.

Link for further information: <u>https://www.environment.vic.gov.au/conserving-threatened-species/victorias-framework-for-conserving-threatened-species</u>

The FFG Act defines public land as Crown land or land owned by, or vested in, a public authority, while private land is defined as any land other than public land. A public authority is defined in the FFG Act as a body established for a public purpose by or under any Act and includes:

- an Administrative Office
- a Government Department
- a municipal council
- a public entity
- a State-owned enterprise.

The study area is on public land, therefore a protected flora permit will be required to take the two protected flora species recorded within the study area:

- Lemon Beauty-heads *Calocephalus citreus*
- Jersey Cudweed Laphangium luteoalbum

Seventeen FFG Act listed fauna species are assessed as having a medium or higher likelihood of occurrence within the study area (Appendix B). Eight of these are also listed as threatened under provisions of the EPBC Act (see above). The proponent is not considered to meet the definition of a public authority, and there is no declared critical habitat within the study area. It is recommended that DEECA should be consulted to determine whether any specific requirements are applicable in this instance. Crayfish mounds that may belong to a FFG Act listed species; Hairy Burrowing Crayfish *Engaeus sericatus* were recorded on private property within the study area. Directional drilling is currently proposed (as of 14 December 2023) beneath the mapped locations of burrows to a depth of 6m to avoid potential impacts to this species.



4.2.2. Catchment and Land Protection Act 1994 (CaLP Act)

The CaLP Act identifies and classifies certain species as noxious weeds or pest animals, and provides a system of controls on noxious species.

Five Regionally Controlled noxious weeds were recorded within the study area:

- Artichoke Thistle Cynara cardunculus subsp. flavescens
- African Box-thorn Lycium ferocissimum
- Sweet Briar Rosa rubiginosa
- Common Blackberry *Rubus anglocandicans*
- Gorse *Ulex europaeus*

Three Restricted (R) noxious weeds occur within the study area:

- Chilean Needle-grass Nassella neesiana
- Soursob Oxalis pes-caprae
- Great Mullein Verbascum thapsus subsp. thapsus

The proponent must take all reasonable steps to eradicate regionally prohibited weeds, prevent the growth and spread of regionally controlled weeds, and prevent the spread of and as far as possible eradicate established pest animals. The State is responsible for eradicating State prohibited weeds from all land in Victoria.

Further information is at http://agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds

4.2.3. Planning and Environment Act 1987 (incl. Planning Schemes)

The *Planning and Environment Act 1987* controls the planning and development of land in Victoria, and provides for the development of planning schemes for all municipalities.

Of particular relevance to the development proposal are controls relating to the removal, destruction or lopping of native vegetation contained within the Colac Otway Planning Scheme (the Scheme), including permit requirements. The Scheme (Clause 73.01) defines 'native vegetation' as 'plants that are indigenous to Victoria, including trees, shrubs, herbs, and grasses'. It is an objective of Clause 12.01-2 of the State Planning Policy Framework (Native Vegetation Management) that removal of native vegetation results in no net loss in the contribution made by native vegetation to Victoria's biodiversity.

Clause 52.17 (Native Vegetation) requires a planning permit to remove, destroy or lop native vegetation including some dead native vegetation. Decision guidelines that must be considered by the referral or responsible authority are contained in Section 7 of the Guidelines, and referred to in Clause 52.17-4. Clause 52.17 does not apply if a Native Vegetation Precinct Plan corresponding to the land is incorporated in the Scheme. It should be noted that where native vegetation does not meet the definition of a patch or scattered tree, as described in Section 3.1, the Guidelines do not apply. However, a permit may still be required to remove, destroy or lop native vegetation under the provisions of the Scheme.



Under Clause 66.02 a permit application to remove, destroy or lop native vegetation is required to be referred to DEECA as a recommending referral authority if any of the following apply:

- the class of application is on the detailed assessment pathway
- a property vegetation precinct plan applies to the site or
- the native vegetation is on Crown land occupied or managed by the Responsible Authority.

The study area is not covered by any overlays relevant to biodiversity under the Scheme.

Victoria's Guidelines for the removal, destruction or lopping of native vegetation.

The Guidelines are incorporated into the Victoria Planning Provisions and all planning schemes in Victoria (DELWP 2017a). The Guidelines replaced the previous incorporated document titled Permitted clearing of native vegetation – Biodiversity assessment guidelines (DEPI 2013) on 12 December 2017.

The purpose of the Guidelines is to guide how impacts to biodiversity should be considered when assessing a permit application to remove, destroy or lop native vegetation. The objective for the guidelines in Victoria is 'No net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation'.

A detailed assessment of the implications for the project under the Guidelines is provided in Section 5 of this report. Under the Guidelines, there are three assessment pathways for assessing an application for a permit to remove native vegetation: basic, intermediate and detailed.

4.2.4. Environment Effects Act 1978

The *Environment Effects Act 1978* establishes a process to assess the environmental impacts of a project. If applicable, the Act requires that an Environment Effects Statement (EES) be prepared by the proponent. The EES is submitted to the Minister for Planning and enables them to assess the potential environmental effects of the proposed development.

The general objective of the assessment process is to provide for the transparent, integrated and timely assessment of the environmental effects of projects capable of having a significant effect on the environment (DSE 2005b).

The *Ministerial Guidelines for Assessment of Environmental Effects under the Environment Effects Act 1978* (DSE 2005b) provide a range of criteria that can be used to determine whether an EES may be required for a project. These criteria relate to individual potential environmental effects and a combination of (two or more) potential environmental effects.

However, the guidelines are not binding, and the decision as to whether an EES is required is ultimately at the discretion of the Minister for Planning.

Given the most recent proposed design avoids all impacts to native vegetation and threatened fauna habitat, an EES is unlikely to be triggered by Ecological impacts. Spirecom should still determine whether an EES is triggered by additional, non-ecological, factors.



4.2.5. Water Act 1989

The primary purpose of the *Water Act 1989* is to provide a framework for the allocation and management of surface water and groundwater throughout Victoria. It provides a principal mechanism for maintenance of ecosystem functions including those of aquatic ecosystems. Under By-Laws created by the relevant Authority under the Act, the authorities regulate the works within and in the vicinity of waterways.

4.2.6. Environment Protection Act 2017: Environmental Reference Standards

The *Environment Protection Act 2017* (EP Act) provides a legal framework for the systematic and strategic management of potential and realised environmental impacts. The *Environment Protection Act 2017*, the Environment Protection Regulations 2021 and Environment Reference Standards (ERS) introduced from 1 July 2021 provide a regulatory framework designed to prevent harm by eliminating or minimising risks of harm to human health and the environment.

Under the regulatory changes, SEPP (Waters) will not continue as a subordinate instrument under the EP Act, and its formal statutory role ended on 1 July 2021. Much of the content of SEPP (Waters) has been saved under the Environment Protection Transitional Regulations 2021 for a period of 2 years after the commencement of the Environment Protection Regulations 2021. As SEPP (Waters) contributes to the state of knowledge and provides guidance on compliance with the General Environmental Duty (GED), the policy remains relevant to the protection and management of Victoria's water environments, including surface waters, estuarine and marine waters and groundwaters.

While not being saved under the Environment Protection Transitional Regulations 2021, the following clauses of SEPP (Waters) applicable to the project remain relevant as they provide guidance for compliance with the GED under the *Environment Protection Act 2017*:

Clause 42 – Construction activities:

- Minimise soil erosion, land disturbance and discharge of sediment and other pollutants to surface waters.
- Where construction activities impinge on surface waters, construction managers need to monitor affected surface waters to assess whether beneficial uses are being protected.

Clause 45 – Native vegetation protection and rehabilitation:

• Minimise the removal of and rehabilitate native vegetation within or adjacent to surface waters.

The ERS requires that aquatic ecosystem values be protected. Environmental quality objectives and indicators are defined to protect beneficial uses (i.e. the uses and values of the water environment) and an attainment program provides guidance on protection of the beneficial uses. Impacts to surface water quality as a result of the project must not result in changes that exceed background levels and/or the water quality objectives specified for the Birregurra Creek to protect surface water uses and values.

To ensure that direct and indirect (e.g. runoff) impacts to surface water quality do not exceed the background levels and/or water quality objectives, it is recommended that Spirecom prepare and implement a site-specific Constructional Environmental Management Plan, which includes all EPA approved erosion control measures. These temporary control measures should be inspected during rainfall events to ensure controls are able to prevent/minimize offsite discharges and longer-term impacts. Sediment control measures selected should also reflect the level of protection required to protect the ecological values within Birregurra Creek, downstream of the project area.



Link to further information: http://www.gazette.vic.gov.au/gazette/Gazettes2021/GG2021S245.pdf

4.2.7. Regional Catchment Strategy and River Health Strategy

State Planning Policy Framework Clause 14.02-1 (Catchment planning and management) states that planning must consider as relevant, Regional Catchment Strategies (RCS) and any associated implementation plan or strategy including any regional river health and wetland strategies.

Strategies of relevance to the study area are the:

Corangamite CMA Regional Catchment Strategy <u>https://corangamite.rcs.vic.gov.au/</u>

These documents provide recommendations on the protection of existing high-value rivers and creeks that are in good condition and strategic improvement of other rivers and creeks.



5. Victoria's Guidelines for the removal, destruction or lopping of native vegetation

The Guidelines were introduced in December 2017 (DELWP 2017). They set out and describe the application of Victoria's statewide policy in relation to assessing and compensating for the removal of native vegetation to achieve the objective of 'no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation'.

This objective is to be achieved through Victoria's planning system using an assessment approach that relies on strategic planning and the permit and offset system. The key policy for achieving no net loss to biodiversity is the three-step approach of avoid, minimise and offset:

- **Avoid** the removal, destruction or lopping of native vegetation to ensure that the important biodiversity values of native vegetation continue to be delivered into the future.
- **Minimise** impacts resulting from the removal of native vegetation that cannot be avoided.
- Provide an **offset** to compensate for the biodiversity impact resulting from the removal of native vegetation.

DEECA has provided biodiversity information tools to assist with determining the assessment pathway associated with the removal of native vegetation and the contribution that native vegetation within the study area makes to Victoria's biodiversity.

It is not possible to determine the extent of vegetation loss without a finalised design or construction footprint. Once impacts are known, the extent of native vegetation loss and subsequent offset requirements can be determined.

5.1. Vegetation quality assessment

The extent of native vegetation patches were mapped within the study area (Figure 2) and the condition was assessed in relation to standard methods provided by DSE (Department of Sustainability and Environment Biodiversity and Natural Resources Division 2004) and pre-determined EVC benchmarks: https://www.environment.vic.gov.au/biodiversity/bioregions-and-evc-benchmarks. DEECA's Native Vegetation Information Management system was also used to determine vegetation extent and condition.

A continuous area of the same EVC is termed a 'habitat zone'. Different habitat zones exists where there are different EVCs present and/or discrete (non-continuous) patches of the same EVC. A separate vegetation quality assessment was conducted for each habitat zone. The vegetation quality assessment score was multiplied by the extent of the habitat zone to give a value in habitat hectares.

The results of the vegetation quality assessments are provided in Appendix D.



Table 5 Vegetation Quality Assessment results - Treed Ecological Vegetation Classes

Site ID			39426 - Pipeline assessment															
Habita	Habitat Zone ID			2	3	4	5	6	7	8	9	10	11	16	17	18	19	20
EVC #:	Name					F	Plains Gra	assy Wood	land EVC	55					Grassy \	Woodland	EVC 175	
		Max Score								So	ore							
	Large Trees	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tree Canopy Cover	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
_	Lack of Weeds	15	2	2	2	7	7	2	2	2	2	2	2	6	6	6	6	0
Site Condition	Understorey	25	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Conc	Recruitment	10	10	0	0	10	10	10	10	0	0	0	0	10	10	10	10	10
	Organic Matter	5	5	5	5	3	3	5	5	5	5	5	5	4	4	4	4	4
	Logs	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total Site Score		22	12	12	25	25	22	22	12	12	12	12	25	25	25	25	19
e	Patch Size	10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Val	Neighbourhood	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landscape Value	Distance to Core Area	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Га	Total Landscape	Score	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Habita	it points = #/100	100	24	14	14	27	27	24	24	14	14	14	14	27	27	27	27	21
CONDI	ITION SCORE	1	0.24	0.14	0.14	0.27	0.27	0.24	0.24	0.14	0.14	0.14	0.14	0.27	0.27	0.27	0.27	0.21
Habita	it Zone area (ha)		0.019	0.007	0.006	0.026	0.001	0.003	0.008	0.002	0.004	0.002	0.010	0.046	0.018	0.011	0.006	0.012
Habita	t Hectares (Hha)		0.005	0.001	0.001	0.007	0.000	0.0007	0.0019	0.0003	0.0006	0.0003	0.0014	0.0124	0.0047	0.0028	0.0016	0.0025

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Site ID			39426 - Pipeline assessment											
Habitat Zone ID			12	13	14	15	21	22	23	24	25	26	27	3
EVC #: Name			I		Plains Grassy Wetland									
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
	Large Trees	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Tree Canopy Cover	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Lack of Weeds	15	2	6	6	6	6	9	9	9	13	13	13	13
Ę	Understorey	25	5	5	5	5	5	10	5	5	10	10	10	10
Site nditio	Recruitment	10	3	3	3	3	3	3	3	3	3	3	3	3
Site Condition	Organic Matter	5	3	3	3	3	3	3	3	3	3	3	3	3
U	Logs	5	0	0	0	0	0	0	0	0	0	0	0	0
	Total Site Score		13	17	17	17	17	25	20	20	29	29	29	29
	EVC standardiser		1.25	1.25	1.25	1.25	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36
	Adjusted Site Score		16.25	21.25	21.25	21.25	23.12	34	27.2	27.2	39.44	39.44	39.44	39.44
e	Patch Size	10	1	1	1	1	1	1	1	1	1	1	1	1
ndsca Value	Neighbourhood	10	0	0	0	0	0	0	0	0	0	0	0	0
Landscape Value	Distance to Core Area	5	1	1	1	1	1	1	1	1	1	1	1	1
La	Total Landscape Score		2	2	2	2	2	2	2	2	2	2	2	2
Habita	t points = #/100	100	18.25	23.25	23.25	23.25	25.12	36	29.2	29.2	41.44	41.44	41.44	41.44
COND	TION SCORE	1	0.18	0.23	0.23	0.23	0.25	0.36	0.29	0.29	0.41	0.41	0.41	0.41
Habita	it Zone area (ha)		0.00342	0.0047	0.0052	0.0269	0.004	0.063	0.09	0.05	0.02	0.02	0.012	1.70
Habita	t Hectares (Hha)		0.0006	0.0011	0.0012	0.0063	0.0010	0.0227	0.0263	0.0146	0.0083	0.01	0.00	0.70



5.2. Offset requirements

The Guidelines set out and describe the application of Victoria's statewide policy in relation to assessing and compensating for the removal of native vegetation in order to achieve the objective of 'no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation' (DELWP 2017).

This objective is to be achieved through Victoria's planning system using an assessment approach that relies on strategic planning and the permit and offset system. The key policy for achieving no net loss to biodiversity is the three-step approach of avoid, minimise and offset:

- **Avoid** the removal, destruction or lopping of native vegetation.
- **Minimise** impacts resulting from the removal, destruction or lopping of native vegetation that cannot be avoided.
- Provide an **offset** to compensate for the biodiversity impact from the removal, destruction or lopping of native vegetation.

The following actions have been taken to avoid and/or minimise the impacts of the proposed pipeline development on the landscape:

- Directional drilling will be implemented in areas where the pipeline intersects patches of native vegetation. This will avoid all impacts to patches of native vegetation. Directional drilling will also be used in areas identified as potential habitat for Growling Grass Frog and Hairy Burrowing Crayfish to avoid impacting these threatened fauna species.
- Additionally, directional drilling will be used to install the pipeline above the concrete structure of Birregurra Road, below the road surface crossing the Birregurra Creek. This will avoid impacts to the creek and the associated habitat and vegetation.
- Impacts to high quality vegetation are limited. Much of the vegetation proposed to be impacted by the installation of the pipeline is degraded and no longer supports a diverse mix of native species.
- The six-metre wide all-weather road proposed within the unnamed road reserve has been positioned to avoid all impacts to native vegetation patches. Additionally, temporary construction fencing has been erected around the patches of native vegetation. It is important to note that the construction of the road will still impact scattered native vegetation patches and Striped Legless Lizard habitat.

The Department of Energy, Environment and Climate Action provides biodiversity information tools to assist with determining the assessment pathway associated with the removal of native vegetation and the contribution that native vegetation within the study area makes to Victoria's biodiversity.

All planning permit applications to remove native vegetation are assigned to an assessment pathway determined by the extent and location of proposed native vegetation removal. The assessment pathway determines the information to be provided in a planning permit application and the decision guidelines the responsible authority (e.g. Council) and/or DEECA as a referral authority will use to assess the permit application.

The biodiversity information tools have two components:



Site-based information

The site-based information is observable at a particular site. Biosis has collected the requisite site-based information for the assessment against the Guidelines.

Landscape scale information

Landscape scale information requires consideration of information beyond the site. This information is managed by DEECA and can be accessed via the NVR Map.

The following section summarises the results of the site-based assessment and the outputs generated by the Native Vegetation Removal Report, which identifies the assessment pathway on which the planning application will be assessed. The full Native Vegetation Removal Report can be viewed in Appendix D.

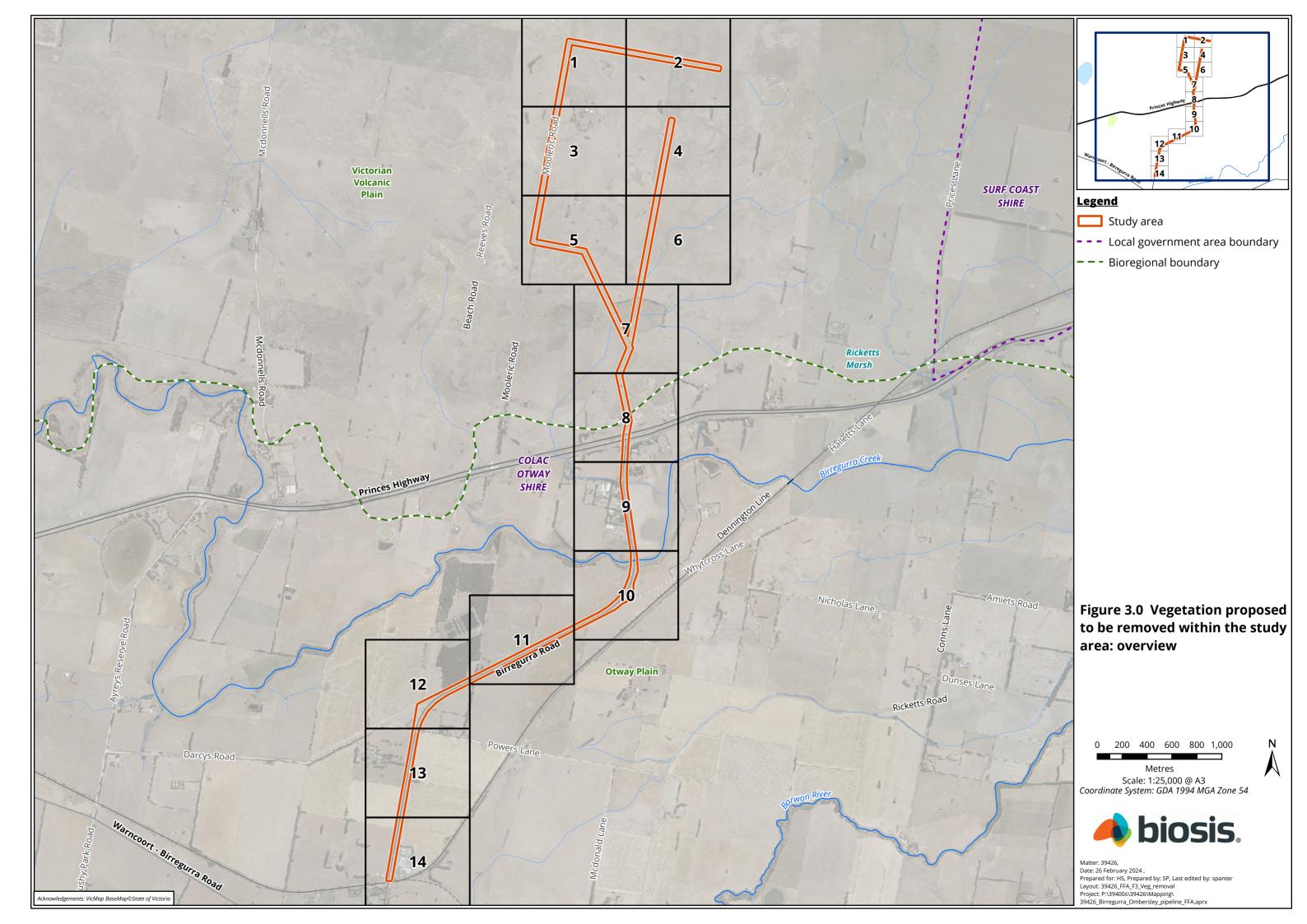
5.3. Proposed removal of native vegetation

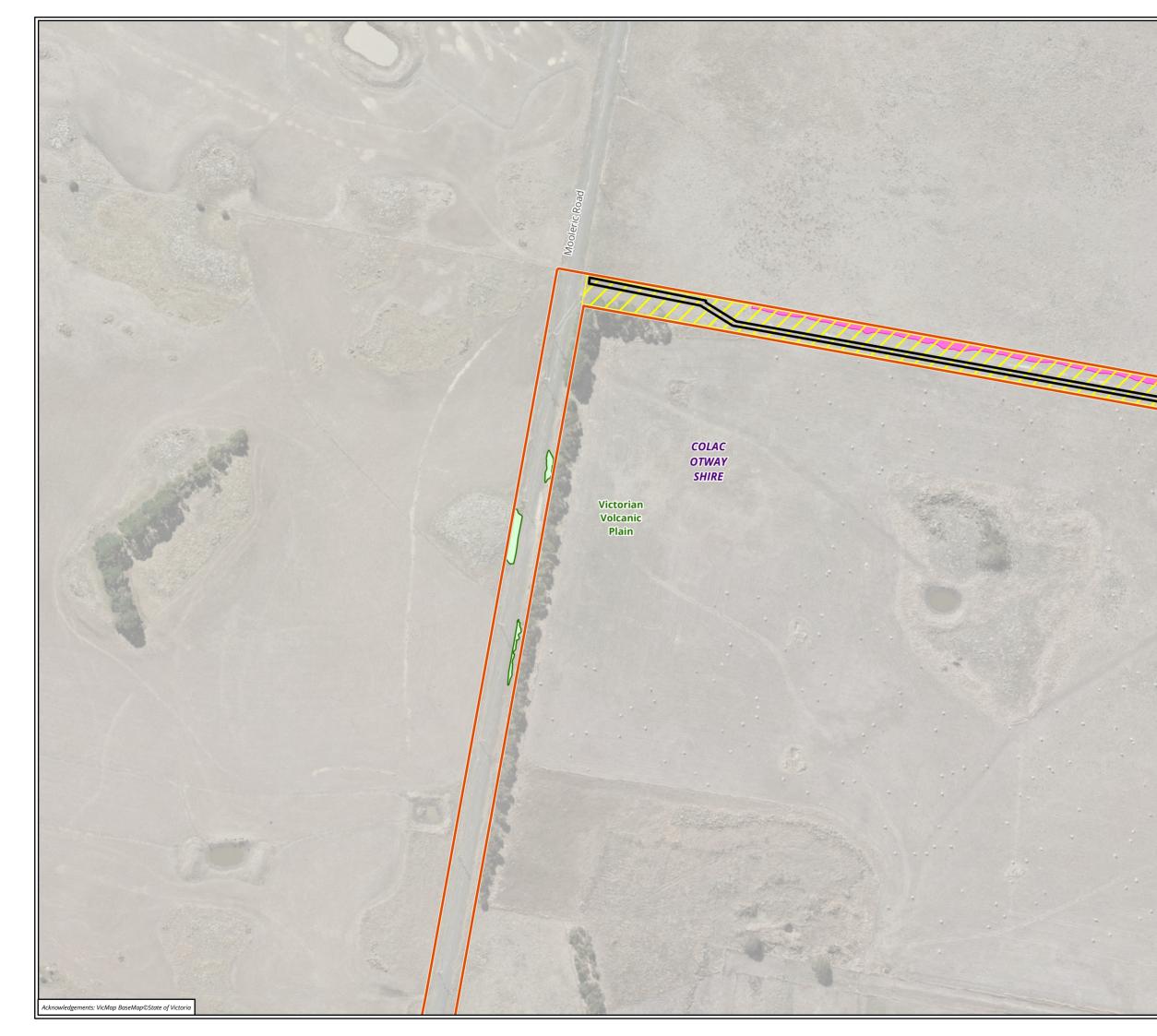
The extent of native vegetation patches and the location of large trees within patches and any scattered trees within the study area were mapped (Figure 2), and the vegetation condition was assessed in relation to standard methods (DSE 2004) and pre-determined EVC benchmarks: https://www.environment.vic.gov.au/biodiversity/bioregions-and-evc-benchmarks.

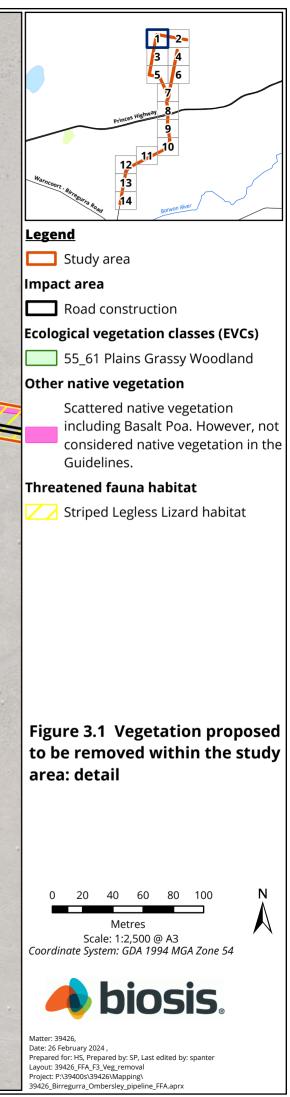
Based on the current design (provided by Spirecom on 14 December 2023), the proposed development of the pipeline and the all-weather road will not require the removal of any native patch vegetation.

Directional drilling will be used beneath all patches of native vegetation (including a 2m buffer between the start of boring and the patch of vegetation) to ensure impacts are avoided. Trenching will be used to install the pipeline in areas where native vegetation patches or important fauna habitat have not been mapped. As a result, impacts to scattered native vegetation are still likely to occur. Impacts to scattered native vegetation require a planning permit, but are not assessed under the *Guidelines for the removal, destruction and lopping of native vegetation* and native vegetation offsets do not need to be secured.

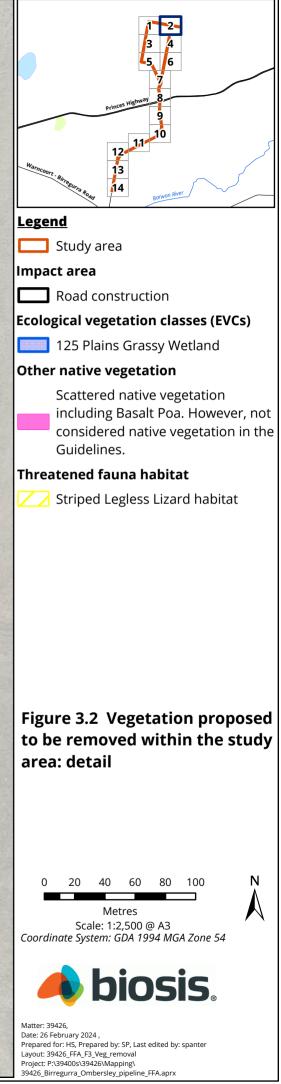
The all-weather road footprint has been placed to avoid impacts to patches of native vegetation. Construction fencing has been erected to stop impacts from machinery to native vegetation during construction. The construction of the road will still impacts scattered native vegetation and Striped Legless Lizard habitat.



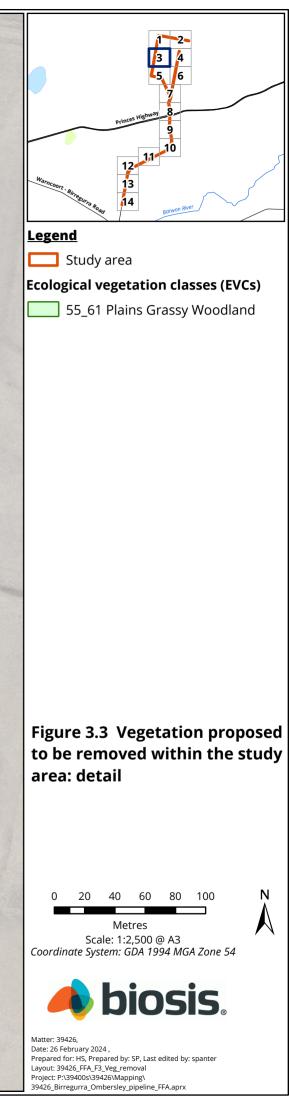




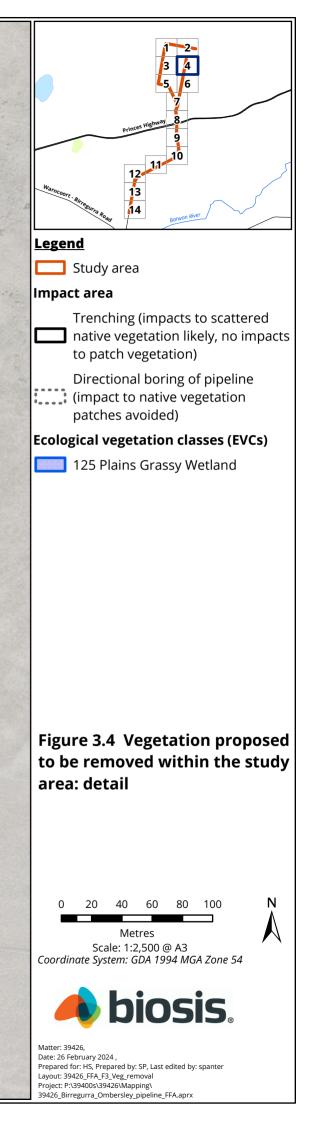




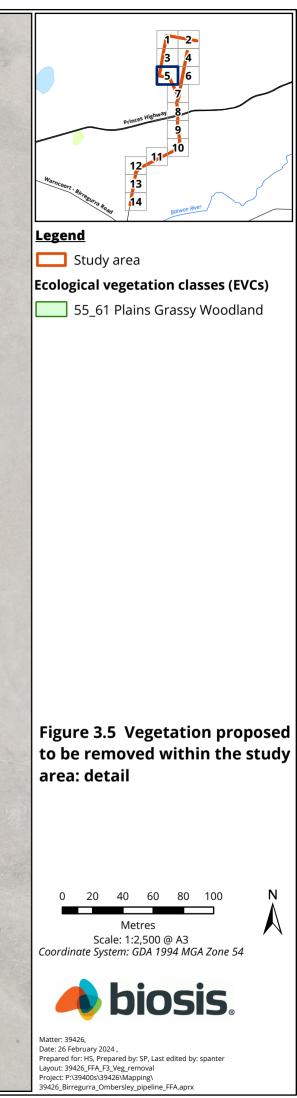


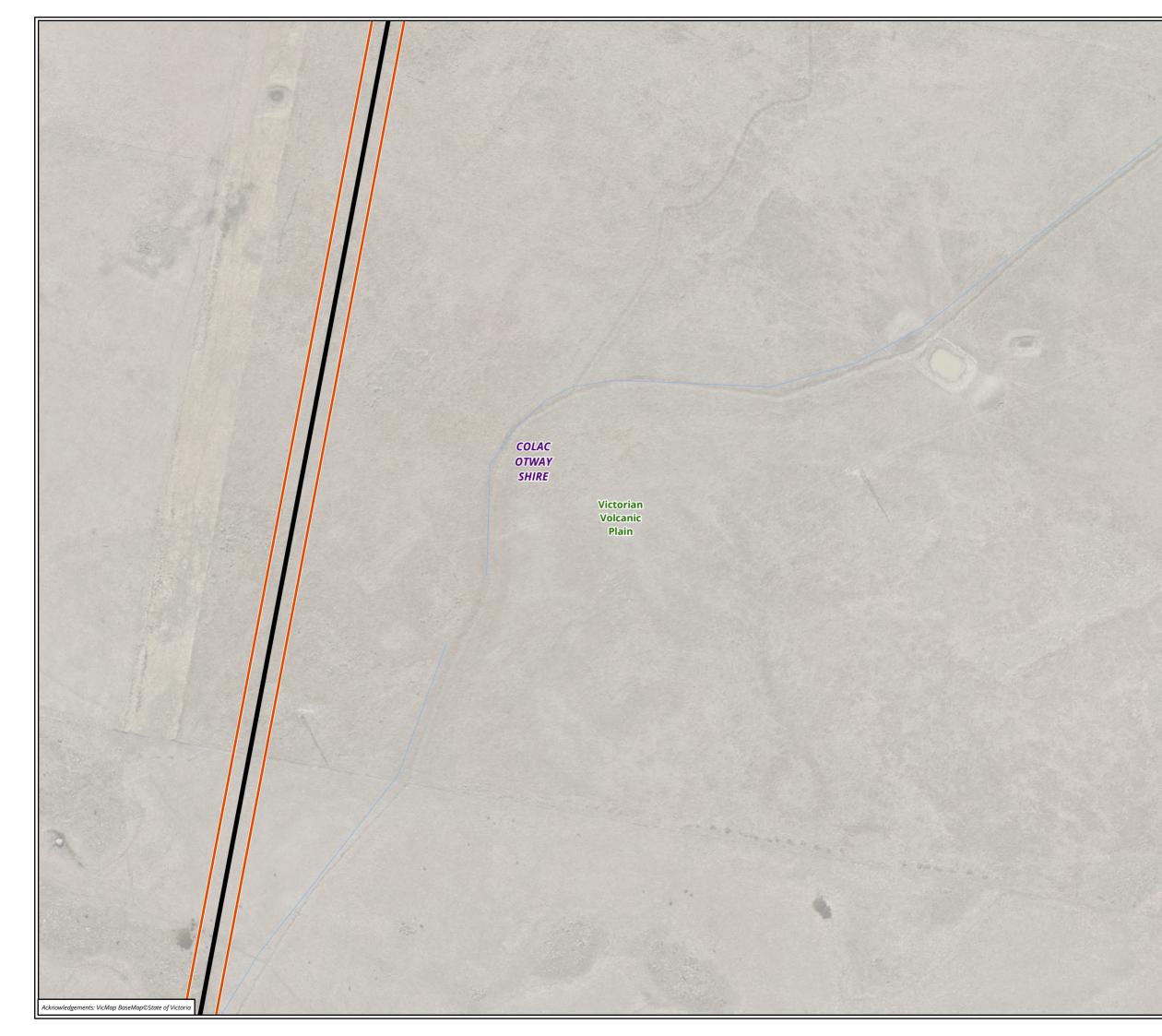






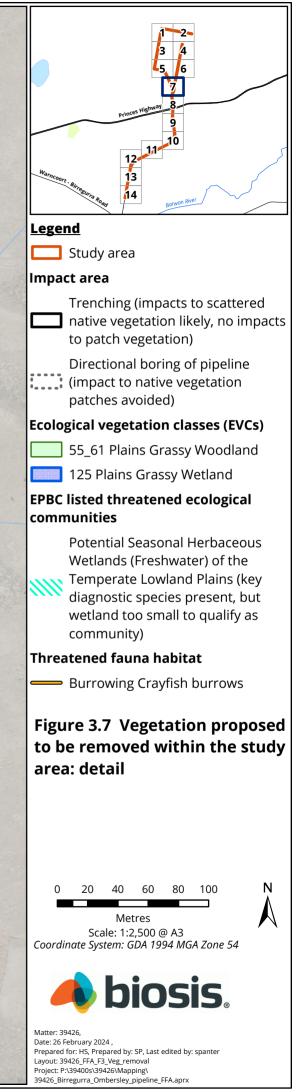


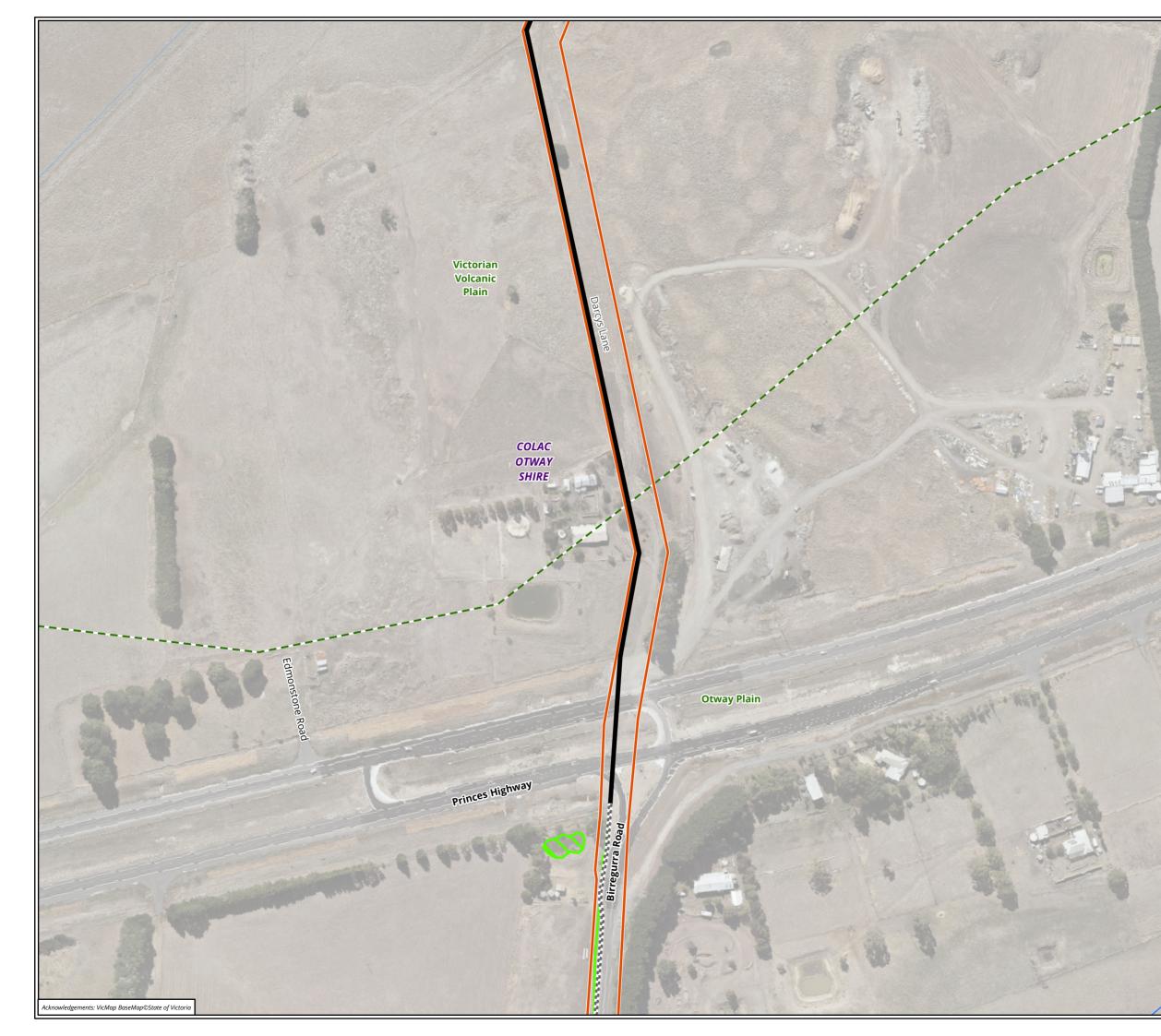


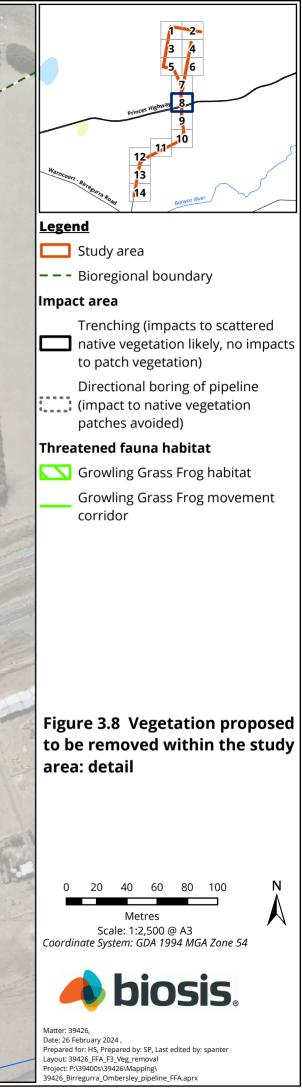




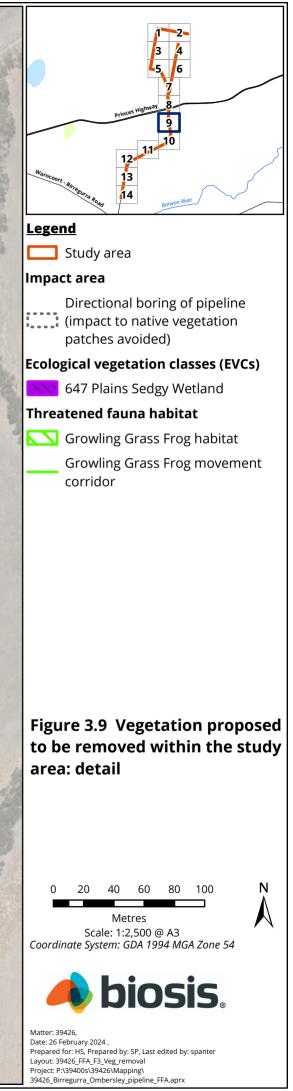




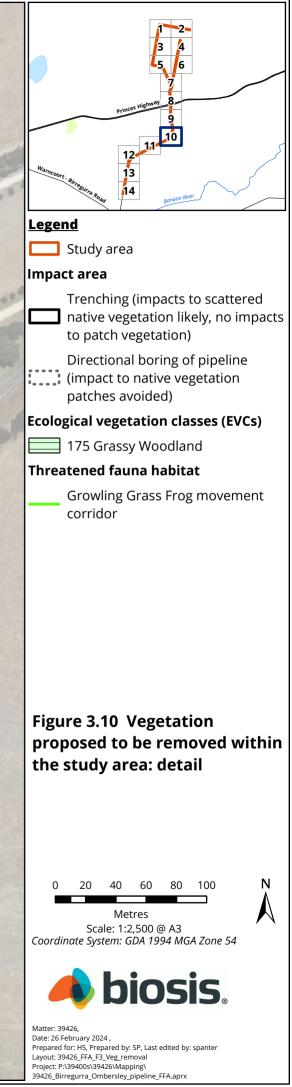




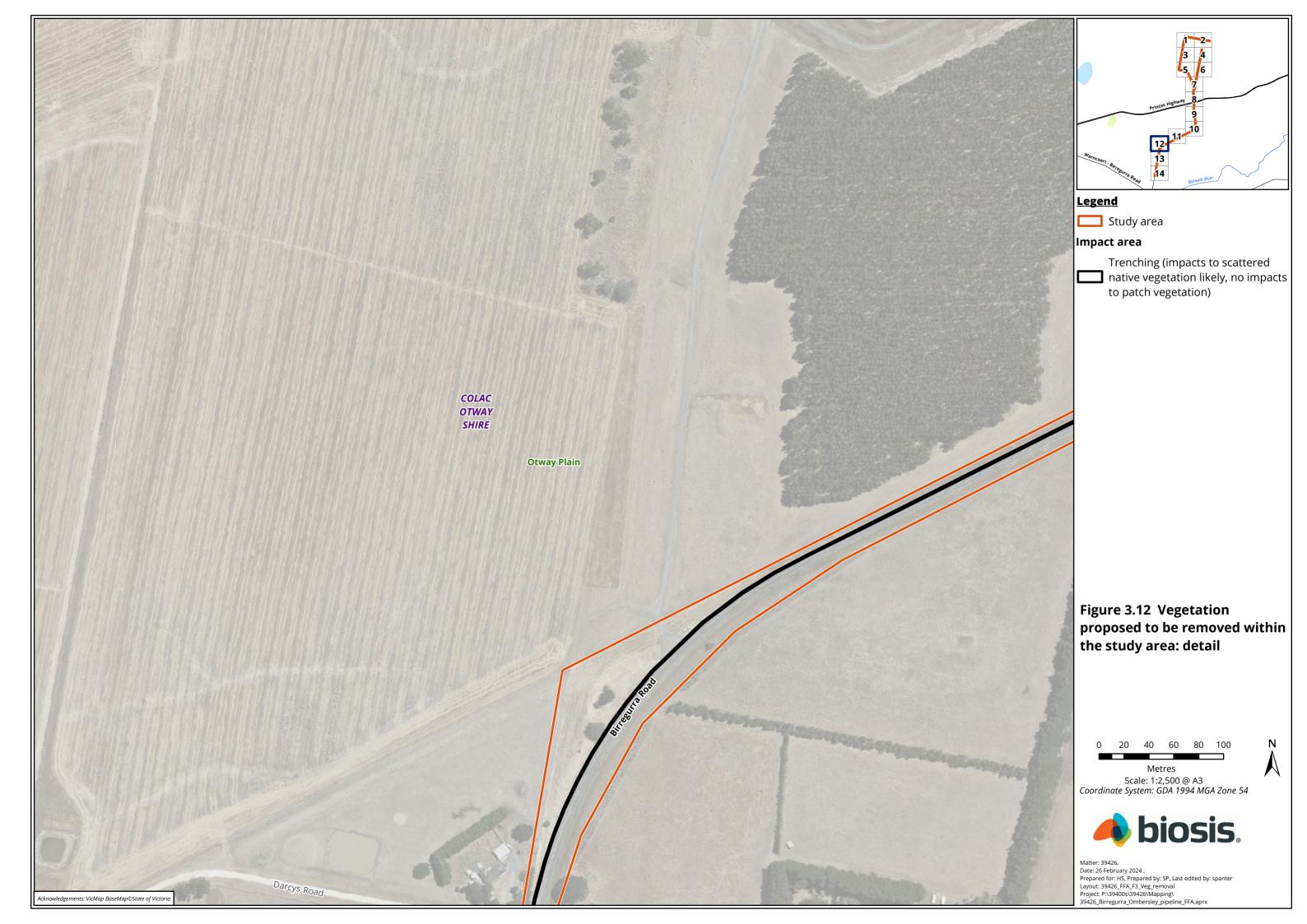




















6. Key ecological values and recommendations

This section identifies the key ecological features of the study area, provides an outline of potential implications of proposed development on those values and includes recommendations to assist Spirecom to design a development to minimise impacts on biodiversity.

The primary measure to reduce impacts to biodiversity values within the study area is to avoid and minimise removal of native vegetation and terrestrial and aquatic habitat. It is critical that this be considered during the design phase of the project, when key decisions are made about the location of infrastructure including sheds, access roads, parking areas, services and temporary material storage. The results of this assessment should therefore be incorporated into the project design, by adding the flora and fauna mapping information into the planning maps and investigating options to retain as much of the mapped vegetation/habitats as possible.

A summary of potential implications of development of the study area and recommendations to minimise impacts during the **design phase** of the project is provided in Table 7.

Ecological feature (Figure 2)	Implications of development	Outcomes / Recommendations
Native vegetation	Native patch vegetation and native trees are not proposed to be impacted by the current design of the all-weather road and pipeline installation (as of 14 December 2023). Scattered native vegetation will be impacted by the construction of the road in the un- named road reserve and by the installation of the pipeline.	No-go fencing will need to be installed around native vegetation that occurs within the vicinity of the trenches and bore points for the installation of the pipeline. Fencing has already been erected in the un-named road reserve. This will avoid unintentional impacts to the vegetation from machinery, trampling etc. during construction. Long-term protection of vegetation adjacent the all-weather road should also be considered to ensure vegetation is protected during on-going use.
Threatened species and ecological communities	 Eight fauna species of national significance were assessed as having a medium or higher likelihood of occurrence within the study area: Gang-gang Cockatoo (recorded in planted vegetation overhanging the study area) Blue-winged Parrot Grey-headed Flying-fox Growling Grass Frog Southern Bent-wing Bat Striped Legless Lizard White-throated Needletail 	Current design proposes to use directional drilling to install the pipeline above the concrete structure of Birregurra Road, below the road surface crossing the Birregurra Creek. This will avoid impacts to the creek and the associated habitat and vegetation. This will eliminate the need to survey for River Swamp Wallaby-Grass as it is only likely to occur along the margins of the creek, as well as Yarra Pigmy Perch. This method will also minimise impacts to Little Egret, Brolga, Blue-billed Duck, Hardhead and Platypus. Targeted surveys were undertaken for Striped

Table 7Summary of key ecological values, potential implications of developing the study area and
recommendations to minimise ecological impacts during the design phase.



Ecological feature	Implications of development	Outcomes / Recommendations
(Figure 2)		outcomes / Recommendations
	 Yarra Pigmy Perch One EPBC Act listed flora species is assessed as having a medium likelihood of occurrence: River Swamp Wallaby-grass. Nine additional fauna species of state significance are assessed as having a medium or higher likelihood of occurrence within the study area: Grey Goshawk Black Falcon Blue-billed Duck Brolga Hairy Burrowing Crayfish Hardhead 	Legless Lizard in October – December 2023. Striped Legless Lizard were recorded in the unnamed road reserve where works are proposed for an all-weather road. Biosis understands that Spirecom are undertaking a referral for the impacts to Striped Legless Lizard from the construction of the road reserve. Impacts on Growling Grass Frog habitat are currently avoided due to the use of directional drilling beneath the movement corridor between the M1 and Birregurra Creek (Figure 2 and Figure 3). If impacts to Growling Grass Frog habitat cannot not be avoided, targeted surveys and an EPBC Act referral may be required.
	 Little Egret Platypus Tussock Skink None of the vegetation recorded within the study area fulfills the key diagnostic characters of the Threatened Ecological Communities that are modelled to occur within the study area. 	Burrowing Crayfish burrows were observed within the study area, however identity of the species is unknown. Due to the small impact area of the pipe alignment, it is unlikely that the current works will have a significant impact on Hairy Burrowing Crayfish. The pipeline will be installed using directional drilling below areas that support Burrowing crayfish mounds, this will further increase the likelihood of avoiding impacts to the species. The remaining EPBC Act and FFG Act fauna recorded or considered likely to occur within the study area are unlikely to be significantly impacted by the installation of water pipes or road construction along a portion of the unnamed road reserve between the poultry farm and Mooleric Road.

Construction and post-construction management

Specific detail relating to preventing impacts to retained native vegetation and aquatic and terrestrial habitat should be addressed in a site-specific Construction Environmental Management Plan. This will include issues relating to contractors such as environmental inductions, installation of temporary fencing/signage, drainage and sediment control.



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APPENDICES

Appendix A. Flora

The following abbreviations and symbols are relevant to this Appendix.

Code	Meaning	Reference				
National listi	ngs (EPBC Act)					
EX	Extinct					
CR	Critically endangered					
EN	Endangered	Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)				
VU	Vulnerable					
PMST	Protected Matters Search Tool					
State listings	(FFG Act)					
x	Extinct					
cr	Critically endangered	Victorian <i>Flora and Fauna Guarantee Act 1988</i> (FFG				
е	Endangered					
v	Vulnerable	Act)				
t	Threatened					
Р	Protected (public land only)					
SP	State prohibited species					
RP	Regionally prohibited species	Victorian Catchment and Land Protection Act 1994				
RC	Regionally controlled species	(CaLP Act)				
R	Restricted species					
Other						
#	Native species outside its natural range	Victorian Biodiversity Atlas (VBA)				



Appendix A.1. Flora species recorded from the study area

Table 8Flora species recorded from the study area

Status	Scientific Name	Common Name				
Indigenous spe	cies					
	Acacia melanoxylon	Blackwood				
	Acaena spp.	Sheep's Burr				
	Amphibromus spp.	Swamp Wallaby-grass				
	Austrostipa spp.	Spear Grass				
Р	Calocephalus citreus	Lemon Beauty-heads				
	Carex spp.	Sedge				
	Cynodon dactylon	Couch				
	Drosera hookeri	Branched Sundew				
	Eleocharis acuta	Common Spike-sedge				
	Epilobium billardiereanum	Variable Willow-herb				
	Eragrostis spp.	Love Grass				
	Eryngium ovinum	Blue Devil				
	Eucalyptus spp.	Eucalypt				
	Geranium spp.	Crane's Bill				
	Isolepis fluitans	Floating Club Sedge				
	Juncus bufonius	Toad Rush				
	Juncus spp.	Rush				
Р	Laphangium luteoalbum	Jersey cudweed				
	Lythrum hyssopifolia	Small Loosestrife				
	Montia australasica	White Purslane				
	Poa labillardierei	Common Tussock-grass				
	Ranunculus spp.	Buttercup				
	<i>Rytidosperma</i> spp.	Wallaby Grass				
	Themeda triandra	Kangaroo Grass				
Introduced spe	ecies					
	Agrostis capillaris	Brown-top Bent				
	Brassica spp.	Turnip				
	Briza maxima	Large Quaking-grass				
	Bromus diandrus	Great Brome				





Status	Scientific Name	Common Name
	Bromus hordeaceus	Soft Brome
	Centaurium erythraea	Common Centaury
RC	Cynara cardunculus subsp. flavescens	Artichoke Thistle
	Cyperus eragrostis	Drain Flat-sedge
	Erigeron bonariensis	Flaxleaf Fleabane
	Holcus lanatus	Yorkshire Fog
	Hypochaeris glabra	Smooth Cat's-ear
	Lactuca serriola	Prickly Lettuce
	Lepidium africanum	Common Peppercress
	Lolium rigidum	Wimmera Rye-grass
RC	Lycium ferocissimum	African Box-thorn
R	Nassella neesiana	Chilean Needle-grass
R	Oxalis pes-caprae	Soursob
	Paspalum distichum	Water Couch
	Phalaris aquatica	Toowoomba Canary-grass
	Plantago coronopus	Buck's-horn Plantain
	Plantago lanceolata	Ribwort
	Romulea rosea	Onion Grass
RC	Rosa rubiginosa	Sweet Briar
RC	Rubus anglocandicans	Common Blackberry
	Sanguisorba minor	Salad Burnet
	Solanum nigrum s.s.	Black Nightshade
	Sporobolus africanus	Rat-tail Grass
	Trifolium arvense var. arvense	Hare's-foot Clover
RC	Ulex europaeus	Gorse
R	Verbascum thapsus subsp. thapsus	Great Mullein
	Vicia sativa subsp. cordata	Common Vetch



Appendix A.2. Listed flora species

The following table includes threatened flora species that have potential to occur within the study area. The list of threatened species is sourced from the VBA and PMST (accessed on 8 May 2023). Where years are specified for the most recent database records, these refer to records from the VBA unless otherwise specified. Where no year is specified, the PMST has predicted that the species has potential to occur. A proportion of the flora habitat descriptions have been reproduced with permission from the Royal Botanic Gardens Victoria (RBGV 2020).

Table 9Threatened flora species recorded or predicted to occur within 5 km of the study area

Scientific name	Common name	Conser status	vation	Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
National significa	ince							
Amphibromus fluitans	River Swamp Wallaby-grass	ΥU			PMST	Swampy areas, mainly along the Murray River between Wodonga and Echuca with scattered records from southern Victoria.	Medium	No recent or historical records within 5 km. However, an <i>Amphibromus</i> species was recorded within the Birregurra Creek. It is not the correct time of year to identify to species level. As a result, further surveys are recommended to determine the species if impacts to Birregurra Creek cannot be avoided.
Dianella amoena	Matted Flax- lily	EN	cr	2013	PMST	Lowland grassland and grassy woodland, on well- drained to seasonally waterlogged fertile sandy loam soils to heavy cracking clays.	Low	Several recent records within 5 km. Vegetation within the study area too heavily modified to support this species.
Dodonaea procumbens	Trailing Hop- bush	VU			PMST	Sandy or clay soils in low- lying, winter-wet areas in grasslands, woodlands,	Low	No recent or historical records within 5 km. Woodlands and open forests absent from the study area. Low-lying wet areas are

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Scientific name	Common name	Conservation status		ation Most recent		Habitat description	Likely occurrence	Rationale for likelihood ranking
						and low-open forest.		predominantly swamped by Toowoomba Canary- grass.
Glycine latrobeana	Clover Glycine	VU	V	2016	PMST	Grasslands and grassy woodlands, particularly those dominated by Kangaroo Grass.	Low	Several recent records within 5 km. Vegetation within the study area too heavily modified to support this species.
Lachnagrostis adamsonii	Adamson's Blown-grass	EN	е		PMST	Low-lying, seasonally wet or swampy areas of plains communities, often in slightly saline conditions.	Low	No recent or historical records within 5 km. Swampy areas are dominated by Toowoomba Canary-grass.
Lepidium aschersonii	Spiny Peppercress	VU	е		PMST	Heavy clay soils near salt lakes on the volcanic plains; disjunct records near Lake Omeo.	Negligible	No recent or historical records within 5 km. Salt lakes not present within the study area.
Lepidium hyssopifolium s.s.	Basalt Pepper-cress	EN	e		PMST	Basalt plains grassland and woodland communities.	Low	No recent or historical records within the study area. Plains Grassland habitat too modified to support suitable habitat for this species.
Leucochrysum albicans subsp. tricolor	White Sunray	EN	е		PMST	Grasslands of the Victorian Volcanic Plains, primarily on acidic clay soils derived from basalt, with occasional occurrences on adjacent sedimentary, sandy-clay soils.	Low	No recent or historical records within 5 km. The species is restricted to only a handful of populations. Modified vegetation within the study area unlikely to support suitable habitat for this species.



Scientific name	Common name	Conser status	vation	Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
Pimelea spinescens subsp. spinescens	Spiny Rice- flower	CR	cr		PMST	Primarily grasslands featuring a moderate diversity of other native species and inter-tussock spaces, although also recorded in grassland dominated by introduced perennial grasses.	Low	No recent or historical records within 5 km. Swards of Toowoomba Canary-grass too dense to also support this species.
Poa sallacustris	Salt-lake Tussock-grass	VU	cr		PMST	Grasslands and herblands on the sloping verges of saline lakes.	Negligible	No recent or historical records within 5 km. Sloping verges of saline lakes are not present within the study area.
Prasophyllum spicatum	Dense Leek- orchid	VU	cr		PMST	Heath and heathy woodlands.	Negligible	No recent or historical records, heathland habitat is not present within or adjacent to the study area.
Pterostylis chlorogramma	Green-striped Greenhood	VU	e		PMST	Heathy woodland; more specific habitat requirements are poorly known.	Negligible	No recent or historical records, heathland habitat is not present within or adjacent to the study area.
Rutidosis leptorhynchoides	Button Wrinklewort	EN	е		PMST	Higher quality Plains Grassland and Grassy Woodland in Western Victoria, particularly those with fertile soil and light timber cover.	Low	No recent or historical records within 5 km. Vegetation within the study area too modified to support this species.
Senecio macrocarpus	Large-headed Fireweed	VU	cr		PMST	Grassland, shrubland and woodland habitats on heavy soils subject to waterlogging and/or	Low	No recent or historical records within 5 km. Dominance of weeds such as Toowoomba Canary-grass across most of the study area makes it unlikely to support this species.



Scientific name	Common name	Conser status	vation	Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
						drought conditions in summer.		
Senecio psilocarpus	Swamp Fireweed	VU			PMST	Seasonally inundated herb-rich swamps, growing on peaty soils or volcanic clays.	Low	No recent or historical records within 5 km. The wetland vegetation within the study area is not herb-rich and lacks native species diversity.
Swainsona murrayana	Slender Darling-pea	VU	е		PMST	Around lakes and on flats that are subject to seasonal inundation.	Negligible	No recent or historical records within 5 km. Lakes and flats do not occur within the study area.
Thelymitra epipactoides	Metallic Sun- orchid	EN	e		PMST	Moist or dry sandy loams or loamy sands, primarily in coastal heaths, grasslands and woodlands, but also in similar communities at drier inland sites.	Low	No recent or historical records within 5 km. Coastal habitats absent from the study area.
Thelymitra matthewsii	Spiral Sun- orchid	VU	е		PMST	Typically on well-drained soils on slightly elevated sites, but also on coastal sandy flats. Often in open situations following disturbance.	Low	No recent or historical records within 5 km. Coastal habitats absent from the study area.
Xerochrysum palustre	Swamp Everlasting	VU	cr		PMST	Sedge-swamps and shallow freshwater marshes and swamps in lowlands, on black cracking clay soils.	Low	No recent or historical records within 5 km. the swamps dominated by Common Spike-sedge lack native diversity and have a high cover of weeds. As a result, there is little suitable habitat for this species.



Scientific name	Common name	Conser status	vation	Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
Calotis anthemoides	Cut-leaf Burr- daisy		cr	2010		Scattered north and west of Melbourne (e.g. Sunshine, Camperdown, Moyston, Dunkeld, Numurkah regions) on heavy soils prone to waterlogging, but now rather rare due to habitat depletion.	Low	One recent record within 4 km. Vegetation within the study area too heavily modified to support suitable habitat for this species. Swampy vegetation supported very low species diversity.
Comesperma polygaloides	Small Milkwort		cr	2010		Grasslands on the western basalt plains; less commonly in grassy woodlands between Bendigo and the Wimmera.	Low	Two recent records within 4 km. Vegetation within the study area either highly modified or swamped by Toowoomba Canary-grass. As a result, there is no suitable habitat for this species.
Coronidium gunnianum	Pale Swamp Everlasting		cr	2011		Widespread and sometimes locally common, particularly in high-rainfall areas of Victoria; often in moist sites in open forests and woodlands.	Low	Many recent records within 5 km of the study area. Open forest and woodland habitats do not occur within the study area. Soils prone to inundations were also dominated by weeds or a single native species.
Cullen parvum	Small Scurf- pea		е	1973		Lowland grasslands, including pastures and occasionally in otherwise disturbed grassy areas.	Low	One historical record within 4 km. Given the low number of records within 5 km and the heavily modified vegetation with the study area, there is unlikely to be any suitable habitat for this species.
Lachnagrostis semibarbata var. filifolia	Purple Blown- grass		e	2011		Wet marshes and slightly saline swamps and depressions, on heavy	Low	Two recent records within 4 km. Swampy vegetation within the study area limited to degraded drainage lines along roadsides

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Scientific name	Common name			Most Other recent records		Habitat description Likely occurrence		Rationale for likelihood ranking	
						soils away from the coast.		dominated by weeds and often with very low native species diversity.	
Lachnagrostis semibarbata var. semibarbata	Purple Blown- grass		е	2011		Wet marshes and slightly saline swamps and depressions in plains communities.	Low	Many records within 5 km in relatively intact grasslands to the north of the study area. Study area separated from these properties by several paddocks and roadsides. Study area itself also heavily modified and unlikely to support the species.	
Melaleuca armillaris subsp. armillaris	Giant Honey- myrtle		e	2008		Near coastal heath/scrub, rocky coast and foothill outcrops.	N/A	Any records of this species within 5 km are likely to be planted and occur well outside the natural distribution of the species.	
Microseris scapigera s.s.	Plains Yam- daisy		cr	2013		Damp depressions in grasslands, woodlands, stream banks, alpine herbfields and around the margins of saline lakes and flats.	Low	One recent record within 5 km. The vegetation within the study area is highly modified and unlikely to support this species.	
Tripogonella Ioliiformis	Rye Beetle- grass		e	2010		Dry sites in association with escarpments and rocky outcrops.	Low	One recent record within 5 km. Escarpments and rocky outcrops are not present.	



Appendix A.3. Threatened ecological communities

The following table includes the threatened ecological communities that have potential to occur within the project area. The list of threatened ecological communities has been compiled with reference to characteristics of FFG Act threatened communities (SAC 2013) and predictive output from the PMST (accessed on 8 May 2023).

Community Name	Conservation status	Source	Description
National significance			
White Box-Yellow Box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	PMST	The key diagnostic canopy species for this Threatened Ecological Community (White Box, Yellow Box and Blakely's Red Gum) do not occur within or adjacent the study area. The treed vegetation that occurs alongside the study area is largely planted.
Natural Temperate Grassland of the Victorian Volcanic Plain	Critically Endangered	PMST	This community is considered present in Grassland vegetation where at least one native grass genera provide the dominant cover (for example Poa or Kangaroo grass). While these requirements are fulfilled in some mapped patches of vegetation, the patches are all well below 0.05 hectares and therefore do not qualify as the threatened community. As a result, this community is not present.
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	Critically Endangered	PMST	While some of the key defining characters are present (such as native grasses as the dominant species) the patches are all well below 0.5 hectares and therefore do not qualify.
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically Endangered	PMST	The wetlands identified within the study area are too small, have too few native species and are dominated by a contra- indicative species (Common Spike-sedge).
State significance			
Coastal Moonah (Melaleuca lanceolata subsp. lanceolata) Woodland Community	Threatened		This community is not present within the study area.
Western Basalt Plains (River Red Gum) Grassy Woodland Floristic Community 55-04	Threatened		The study area lacks a sparse layer of canopy trees and EVCs synonymous with this community (Plains Grassy Woodland EVC 55, Grassy Woodland EVC 175) are not present. As a result, this community does not occur within the study area.



Appendix B. Fauna

The following abbreviations and symbols are relevant to this Appendix:

Code	Meaning	Reference				
National l	istings (EPBC Act)					
EX CR	Extinct Critically endangered	Commonwealth Environment Protection and Biodiversity Conservation				
EN	Endangered	<i>Act 1999</i> (EPBC Act)				
VU NT	Vulnerable Near threatened					
CD	Conservation dependent					
PMST	Protected Matters Search Tool					
State listin	ngs (FFG Act)					
x	Extinct	Victorian Flora and Fauna Guarantee Act 1988				
cr	Critically endangered	(FFG Act)				
е	Endangered					
v	Vulnerable					
t	Threatened					
Р	Protected (fish only)					



Appendix B.1. Fauna species recorded from the study area

Table 11 Vertebrate fauna recorded from the study area (present assessment)

Status	Scientific name	Common name
Indigenous speci	es	
	Accipiter novaehollandiae	Grey Goshawk
	Acritoscincus duperreyi	Eastern Three-lined Skink
	Anas superciliosa	Pacific Black Duck
	Anthochaera carunculata	Red Wattlebird
	Anthus novaeseelandiae	Australasian Pipit
	Aquila audax	Wedge-tailed Eagle
EN, e	Callocephalon fimbriatum	Gang-gang Cockatoo
	Corvus mellori	Little Raven
	Cracticus tibicen	Australian Magpie
	Crinia signifera	Common Froglet
VU, e	Delma impar	Striped Legless Lizard
	Egretta novaehollandiae	White-faced Heron
	Elanus axillaris	Black-shouldered Kite
	Eolophus roseicapilla	Galah
	Falco berigora	Brown Falcon
	Falco cenchroides	Nankeen Kestrel
	Macropus giganteus	Eastern Grey Kangaroo
	Malurus cyaneus	Superb Fairy-wren
	Limnodynastes tasmaniensis	Spotted Marsh Frog
	Litoria ewingii	Southern Brown Tree Frog
	Ocyphaps lophotes	Crested Pigeon
e	Pseudemoia pagenstecheri	Tussock Skink
	Ptilotula penicillata	White-plumed Honeyeater
	Rhipidura leucophrys	Willie Wagtail
Introduced speci	es	
	Acridotheres tristis	Common Myna
	Alauda arvensis	European Skylark
	Carduelis carduelis	European Goldfinch



Appendix B.2. Listed fauna species

The following table includes a list of threatened fauna species that have potential to occur within the study area. The list of threatened species is sourced from the VBA and PMST (accessed on 8 May 2023). Where years are specified for the most recent database records, these refer to records from the VBA unless otherwise specified. Where no year is specified, the PMST has predicted that the species has potential to occur.

Scientific name	Common name	Conser status	vation	Most recent database	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	record			in study area	
National significa	ance							
Pedionomus torquatus	Plains- wanderer	CR	cr	1927	PMST	Native grassland with a sparse, open structure.	Negligible	Study area is outside the species current range. Species extent within Victoria is limited to northern arid grasslands.
Climacteris picumnus	Brown Treecreeper	VU			PMST	Open eucalypt forests, woodlands and Mallee, often where there are stands of dead trees.	Negligible	No local records. No suitable wooded habitat within the study area.
Anthochaera phrygia	Regent Honeyeater	CR	cr		PMST	A range of dry woodlands and forests dominated by nectar- producing tree species.	Negligible	No suitable habitat and no previous local records.
Eulamprus tympanum marnieae	Corangamite Water Skink	EN	e		PMST	Basalt rock outcrops and stonewalls associated with remnant vegetation and adjacent to permanent or ephemeral wetlands.	Low	No suitable habitat and no previous local records. Study area is outside the known distribution of the species.

Table 12 Infredience faund species recorded of predicted to occur within 5 km of the study drea	Table 12	Threatened fauna species recorded of	r predicted to occur within 5 km of the study area
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Scientific name	Common name	Conser status	vation	Most recent database	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	record			in study area	
Dasyurus maculatus maculatus (SE mainland population)	Spot-tailed Quoll	EN	е		PMST	Rainforest and wet and dry sclerophyll forests and woodlands.	Negligible	No local records. No suitable wooded habitat within the study area. Species unlikely to persist in cleared agricultural landscapes.
Botaurus poiciloptilus	Australasian Bittern	EN	cr	1994	PMST	Shallow freshwater and brackish wetlands with abundant emergent aquatic vegetation.	Low	No suitable habitat within study area.
Nannoperca obscura	Yarra Pygmy Perch	VU	V		PMST	Lakes, pools and slow-flowing streams with abundant aquatic vegetation.	Medium	No local records, but some potential suitable habitat in Birregurra creek and connections to records in the broader catchment.
Falco hypoleucos	Grey Falcon	VU	V		PMST	Lightly timbered plains and Acacia scrub.	Negligible	No local records. No suitable coastal heathy woodland or semi-arid habitat within the study area.
Rostratula australis	Australian Painted-snipe	EN	cr		PMST	Shallows of well-vegetated freshwater wetlands.	Low	No local records, and no suitable habitat within study area.



Scientific name	Common name	Conser status	vation	Most recent database	Other records			Rationale for likelihood ranking
		EPBC	FFG	record			in study area	
Pseudomys novaehollandiae	New Holland Mouse	VU	e		PMST	Coastal heathland, heathy woodland and dry sclerophyll forest.	Negligible	No local records. No coastal heathy woodland habitat.
Prototroctes maraena	Australian Grayling	VU	е		PMST	Adults inhabit cool, clear, freshwater streams.	Low	No records within the local area. Occurs in the Barwon River but closest records within the catchment are over 60 km downstream, and species requires connectivity to the ocean.
Pteropus poliocephalus	Grey-headed Flying-fox	VU	V		PMST	Rainforest, wet and dry sclerophyll forest, woodland and urban areas.	Medium	Study area is approx. 20 km from a camp at Colac Botanic Gardens. Species may occasionally forage in flowering eucalypts along roadside.
Lissolepis coventryi	Swamp Skink	EN	е		PMST	Densely vegetated swamps and associated watercourses, and adjacent wet heaths, sedgelands and saltmarshes.	Low	No local records. No suitable vegetated swamp or saltmarsh habitat.



Scientific name Common name		Conser status	vation	Most recent database	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	record			in study area	
Calidris ferruginea	Curlew Sandpiper	CR	cr		PMST	Large intertidal sandflats, banks, mudflats, estuaries, inlets, sewage farms, saltworks, harbours, coastal lagoons and bays.	Low	No local records. Species is primarily coastal, unlikely to visit the study area. No suitable shallow wetland habitat.
Numenius madagascariensis	Eastern Curlew	CR	cr		PMST	Large intertidal sandflats, banks, mudflats, estuaries, inlets, coastal lagoons and bays.	Low	No local records. Species is primarily coastal, unlikely to visit the study area. No suitable shallow wetland habitat.
Callocephalon fimbriatum	Gang-gang Cockatoo	EN	е	2016	PMST	S Vic to E NSW. Forests and woodlands from coast to alpine areas. Autumn-winter dispersal from highlands to lower elevations. Forages in eucalypts, acacias and some exotic garden trees and shrubs.	Recorded	Recorded using the eucalypts along Mooleric Road.
Neophema chrysostoma	Blue-winged Parrot	VU		2002	PMST	A range of coastal, sub-coastal and semi-arid regions throughout south-eastern Australia. Nests in tree hollows in coastal eucalypt forests and woodlands. Feeds on seeds of a range of native grasses and herbs.	Medium	Numerous records from the broader region. Individuals may utilise the study area on occasion.



Scientific name	Common name	Conser status	vation	Most recent database	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	record			in study area	
Hirundapus caudacutus	White- throated Needletail	VU	V	1977	PMST	An almost exclusively aerial species within Australia, occurring over most types of habitat, particularly wooded areas.	Medium	Species is highly mobile and widely distributed across eastern Australia. Species is likely to fly over the study area occasionally.
lsoodon obesulus obesulus	Southern Brown Bandicoot	EN	е		PMST	Heathland, shrubland, sedgeland, heathy open forest and woodland; also exotic vegetation, such as blackberry thickets and rank grasses where native vegetation has been removed.	Negligible	No local records. No suitable heathy woodland habitat.
Aphelocephala leucopsis	Southern Whiteface	VU			PMST	Open forests and woodlands with a grassy and/or shrubby understorey.	Low	No local records. Minimal wooded habitat within the study area, negligible grassy and/or shrubby understorey.
Petaurus australis	Yellow-bellied Glider	VU	V		PMST	Sclerophyll forest with large hollow-bearing trees, prefers mature eucalypt dominated forest and woodland. Distributed along South- eastern Australia.	Negligible	No local records. No suitable tall contiguous forest within the study area.

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Scientific name Common name		Conser status	vation	Most recent database	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	record			in study area	
Miniopterus orianae bassanii	Southern Bent-winged Bat	CR	cr		PMST	Woodlands, grasslands, pasture especially near wetlands. Roosts in caves, crevices in cliff faces and in mines.	Medium	No suitable roosting habitat in study area, but may forage over the study area at night.
Grantiella picta	Painted Honeyeater	VU	V	2020	PMST	Dry open woodlands and forests. Typically forages for fruit and nectar in mistletoes and in tree canopies.	Low	Outside core distribution. Minimal woodland and forest habitat. No Mistletoes recorded within the study area.
Stagonopleura guttata	Diamond Firetail	VU	v	1941	PMST	Open forests and woodlands with a grassy ground layer.	Negligible	Over 80 years since last local record. No suitable grassy woodland habitat.
Galaxiella pusilla	Dwarf Galaxias	VU	е		PMST	Slow-flowing or still freshwater wetlands such as swamps, drains and backwaters of streams.	Low	No local records, not known from the broader catchment area.
Perameles gunnii	Eastern Barred Bandicoot	EN	е	1949		Natural temperate grasslands and grassy woodlands.	Negligible	Occurrence is highly localised and linked to reintroduction and recovery efforts. Nearest extant population occurs over 85 km north-east.
Potorous tridactylus trisulcatus	Long-nosed Potoroo	VU	V		PMST	Forest, heathy woodlands and heathlands.	Negligible	No local records and no suitable habitat.
Delma impar	Striped Legless	VU	е	2008	PMST	Natural temperate grassland,	Recorded	Grassland in road easement running



Scientific name	Scientific name Common name	Conser status	vation	Most recent database	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC FFG record		in study area				
	Lizard					grassy woodland and exotic grassland.		from East to West from chicken farm site to Mooleric Road has some potential habitat, especially close to lightly embedded rocks. Unlikely to occur elsewhere within the study area.
Melanodryas cucullata	Hooded Robin	EN	v		PMST	Woodlands of eucalypt, Mallee, semi-cleared farmland.	Low	No local records. Minimal wooded habitat within the study area.
Pseudomys fumeus	Smoky Mouse	EN	е		PMST	Coastal heath and heathy woodland, wet forest, sub- alpine heath and dry sclerophyll forest.	Negligible	No suitable habitat in study area.
Litoria raniformis	Growling Grass Frog	VU	v	2020	PMST	Still or slow-flowing waterbodies and surrounding terrestrial vegetation.	Medium	Several recent local records. Potential habitat for movement corridors in roadside drains on Birregurra Road between M1 and Birregurra Creek. Birregurra Creek contains seasonally suitable habitat.
Synemon plana	Golden Sun Moth	VU	V	2017	PMST	Natural temperate grassland, grassy woodland and pasture supporting spear grasses and wallaby grasses and exotic	Low	Recent records in local area, but no suitable habitat in study area.



Scientific name	Common name	Conser status	vation	Most recent database	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	record			in study area	
						grassland dominated by Chilean needle grass.		
Lathamus discolor	Swift Parrot	CR	cr		PMST	A range of forests and woodlands, especially those supporting nectar-producing tree species. Also well-treed urban areas.	Low	No local records. Minimal suitable foraging habitat is fragmented, low quality, and isolated in cleared landscape.
Antechinus minimus maritimus	Swamp Antechinus	VU	V		PMST	Dense wet heath and heathy woodland, sedgeland and dense tussock grassland.	Low	No local records and no suitable habitat, species considered unlikely to occur within the study area.
State significance								
Actitis hypoleucos	Common Sandpiper		V		PMST	Migrates to Australia from Eurasia in August where it inhabits a wide variety of coastal and inland wetlands with muddy margins before departing north in March.	Negligible	No local records. No suitable wetlands with muddy margins.
Lewinia pectoralis	Lewin's Rail		v	1911		Swamps, dense riparian vegetation and saltmarsh.	Negligible	No local records since 1911 or suitable habitat present in study area.



Scientific name	c name Common name	Conservation status		Most recent database	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	record			in study area	
Ardeotis australis	Australian Bustard		cr	1921		Grassland, open dry woodlands of Mallee and mulga, arid heathland saltbush and bluebush.	Low	No local records since 1921.
Grus rubicunda	Brolga		е	2021		Shallow freshwater and brackish wetlands, crops, grassland and pasture.	Medium	Local recent records. Some suitable foraging habitat in Birregurra Creek and adjacent floodplain, and in floodplain between Moorleric Road and Darcy's Lane.
Egretta garzetta	Little Egret		е	2002		Swamps, billabongs, floodplain pools, mudflats, mangroves and channels; breeds in trees standing in water.	Medium	Suitable habitat in Birregurra Creek.
Anseranas semipalmata	Magpie Goose		V	1994		Swamps, lakes, sewage ponds, flooded pasture, dams.	Low	No recent records in local area, but some suitable habitat on Birregurra Creek.
Spatula rhynchotis	Australasian Shoveler		V	2019		Variety of wetlands, with a preference for large, permanent, freshwater lakes/swamps with dense fringing vegetation.	Low	Minimal suitable wetland habitat. Species prefers large densely vegetated wetland habitat.



Scientific name	Scientific name Common name	Conser status	vation	Most recent database	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	record		in study area		
Stictonetta naevosa	Freckled Duck		e	1994		Large freshwater wetlands, generally with dense vegetation.	Low	No recent local records. Some suitable habitat in Birregurra Creek.
Aythya australis	Hardhead		V	2018		Deep freshwater swamps and wetlands, with abundant aquatic and terrestrial vegetation for roosting. Can occur in sheltered estuaries.	Medium	Recent local records. Some suitable habitat in Birregurra Creek.
Oxyura australis	Blue-billed Duck		v	2017		Open or densely vegetated wetlands.	Medium	Recent record in local area. Some suitable habitat in Birregurra Creek.
Biziura lobata	Musk Duck		v	1979		Deep, permanent freshwater wetlands with areas of open water and patches of dense aquatic vegetation.	Low	No recent records in local area. Birregurra Creek is not permanently flowing.
Accipiter novaehollandiae	Grey Goshawk		е	2016		Rainforest, gallery forest, tall wet forest and woodland. Also partially cleared agricultural land.	Recorded	Species is occasionally recorded within the region and was recorded in tall pine trees during project investigations. Overall lack of trees in the study area mean that there is little habitat and the species is unlikely to be resident.



Scientific name	Common name	Conser status	vation	Most recent database	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	record			in study area	
Falco subniger	Black Falcon		cr	2019		Woodlands, open country and around terrestrial wetlands areas, including rivers and creeks. Primarily occurs in arid and semi-arid zones in the north, north-west and west of Victoria.	Medium	Several records throughout the region. Species may hunt over the study area occasionally.
Tyto novaehollandiae	Masked Owl		cr	1995		A variety of lowland forests and woodlands.	Negligible	No suitable forest and woodland habitat in study area.
Gelochelidon macrotarsa	Australian Gull-billed Tern		е	1996		Floodplains, saltmarsh, claypans and flooded pasture.	Low	No recent local records. Species may occasionally pass through the study area, or forage within flooded pasture on occasion.
Hydroprogne caspia	Caspian Tern		v	1955		Estuaries, inlets, bays, lagoons, inland lakes, flooded pasture, sewage ponds.	Low	Historic record from 1955. May use Birregurra Creek when flooded.
Tringa nebularia	Common Greenshank		e	1978	PMST	A variety of ephemeral and permanent inland wetlands and sheltered coastal wetlands.	Low	No recent local records. No suitable shallow marshy wetland habitat.



Scientific name Common name		Conservation status		Most recent database	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	record			in study area	
Sminthopsis crassicaudata	Fat-tailed Dunnart		V	2011		Inhabits sparse grasslands and open shrubland habitats, usually where there is a significant component of bare ground and suitable refuge sites such as surface rocks or logs where it constructs nests of grass or other dried plant material.	Low	Not enough habitat structure (e.g. rocks) within the grassy sections of the study area to support this species.
Ornithorhynchus anatinus	Platypus		V	2002		A variety of freshwater waterbodies, particularly those with stable banks suitable for burrows, and shallow waters for foraging.	Medium	Records in Barwon River. Area may be used as a movement corridor, however water within Birregurra Creek in study area is ephemeral and does not contain enough overstory vegetation and for it to be used a permanent habitat.
Pseudemoia pagenstecheri	Tussock Skink		e	2008		On the ground in a range of grasslands or sparse grassy woodlands from alps to coast.	Medium	Grassland in road easement running from East to West from chicken farm site to Mooleric Road has some potential habitat, but it is highly grazed and tussocks are patchy.
Chelodina expansa	Broad-shelled Turtle		е	1999		Typically found in turbid water at the bottom of rivers and permanent streams and waterholes, lying concealed among debris or among root- mats.	Low	Out of range records from Barwon River from 1999, but Birregurra Creek is not a permanent water body so is not suitable for this species.



Scientific name Common name	Conser status	vation	Most recent database	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking	
		EPBC	FFG	record			in study area	
Hyridella narracanensis	Narracan Corrugated Mussel		е	1931		Found in areas that are well- shaded by overhanging vegetation, in shallow water with moderate currents over sandy, compacted substrata with low organic content. It requires clean, clear water that is permanently flowing and where there is a water current flowing steadily over a sandy bed	Negligible	No suitable habitat in study area.
Engaeus sericatus	Hairy Burrowing Crayfish		V	2008		Burrows are connected to the water table, typically adjacent to creeks or on floodplains. Although it is widespread in Victoria, most records are found in an area extending from the Otways, west to Port Fairy and north to Ballarat.	Medium	Burrowing Crayfish burrows were observed in drainage lines within the study area, however we are unable to determine the species from the burrow.



Appendix B.3. Migratory species (EPBC Act listed)

Scientific name	Common name	Most recent record
Migratory species		
Gallinago hardwickii	Latham's Snipe	2018
Plegadis falcinellus	Glossy Ibis	2018
Hirundapus caudacutus	White-throated Needletail	1977
Apus pacificus	Fork-tailed Swift	PMST
Pandion haliaetus	Osprey	PMST
Hydroprogne caspia	Caspian Tern	1955
Charadrius bicinctus	Double-banded Plover	1980
Numenius madagascariensis	Eastern Curlew	PMST
Actitis hypoleucos	Common Sandpiper	PMST
Tringa nebularia	Common Greenshank	1978
Calidris ferruginea	Curlew Sandpiper	PMST
Calidris ruficollis	Red-necked Stint	1980
Calidris acuminata	Sharp-tailed Sandpiper	2003
Calidris melanotos	Pectoral Sandpiper	PMST
Motacilla flava	Yellow Wagtail	PMST
Rhipidura rufifrons	Rufous Fantail	1911
Myiagra cyanoleuca	Satin Flycatcher	PMST

Table 13 Migratory fauna species recorded or predicted to occur within 5 km of the study area



Appendix C. Photos of the study area



Photo 1 Potential Striped Legless Lizard habitat on road easement at the northern end of the study area. Photo taken 5 July 2023 facing west.



Photo 2 Potential Growling Grass Frog habitat (left) and movement corridor (right). Photos taken 5 July 2023 facing west and south (respectively).





Photo 3 Example of planted natives in neighbouring properties that might be impacted by works in the road reserve. Photo taken 5 July 2023 facing south.



Photo 4 Swamp Wallaby-grass (potentially an EPBC Act listed species) occurring on the banks of the Birregurra Creek.





Photo 5 Plains Sedgy Wetland vegetation in shallow drainage lines. Photo taken on 5 July 2023 facing south.



Photo 6 Plains Grassy Woodland vegetation. Photo taken 5 July 2023 facing south







Photo 7 Grassy Woodland vegetation. Photo taken 5 July 2023 facing north.











VEHICLE MOVEMENTS

Birregurra FARM

Application for Planning Permit – 2 x 12 Shed Free Range Broiler Farms and associated development.

Government Road-Birregurra

Report Number 3-101-25 (a)

September 2023

Pro Ten Pty Ltd Suite1103/ Level 11/ 99Mount Street, North Sydney, NSW 206

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1.0 Introduction

Pro Ten Pty Ltd propose to develop a Free-Range Broiler Production farm in Birregurra, together with associated buildings and works, including access tracks.

The proposed development, Birregurra Farm, will consist of two lots of ten (12) Free range Broiler Production sheds of 176m in length and 18.7m wide, storage rooms, amenities / office buildings, workshops, managers housing and mains generator sheds. Access road and hardstands will also be constructed, connecting the sheds and associated buildings together.

This report considers the traffic impact of the proposed development during construction and the facilities operation. This report has been prepared to establish best access routes to the site and to confirm the condition of the existing roads.

The report is based on the existing available traffic volumes on the road network and road condition information obtained from VicRoads, a drive through survey of selected council / public roads in the vicinity and an assessment of the likely traffic volumes generated by the construction and operation of the Birregurra Farm.

2.0 Location and Land Use

The Development Site is located approximately 15.4km west of Winchelsea (Distances taken in a straight line from the town of Winchelsea). It is positioned within the Plan and Lot 1\TP247757, Lot 4\TP247757, Lot 6\TP247757, Lot 3\TP372519 and Lot 4\TP 372519 and comprises approximately 126 hectares (ha) of rural land (Farming Zone) within the Colac Otway Shire. The general locality of the Development Site is shown on Figure 2.1 and shows the extent of the Birregurra Farm complex.

The current land use is agricultural, primarily, Cropping and livestock grazing and there is a residence on the property. The current zone identified by the Colac Otway Shire Planning Scheme is 'Farming'.

The topography of the site is generally very gentle lasered sloping to the northeast at the top (Northern area) of the farm and sloping South at the bottom (Southern area) of the farm with a higher lying area down the centre of the farm. A typical elevation of 122m AHD in the south and north of the property and 125 AHD in the centre area of the property.

The centre of the property coordinates is 38°16'27.43"S and 143° 49'00.81"E in DMS (Degrees Minutes Seconds).

Traffic, site access, on farm roads and parking

Access to the property for all vehicles, including heavy vehicles will be via Mooleric Road and current unused Government Road.

Access to the site is proposed via Mooleric Road.

The proposed site access has been designed in accordance with Austroads Guide to Road Design Part 4A. The turning treatment design has been undertaken using a design speed of 80 km/h on Mooleric Road and 40km/h on the Government Road once this road is constructed.

A rural basic right-turn treatment has been proposed for approaching northbound vehicles. The treatment will provide vehicles, including B doubles, turning right onto the Government Road from Mooleric Road and then right onto the site from the Government Road.

This Report includes an assessment of traffic volumes, site distances and proposed access from Mooleric Road and Government Road.

The internal driveway will be constructed to accommodate heavy vehicles in all-weather events.

Anticipated vehicle movements to be generated by the proposal will include:

- Traffic generated by on site employees, full time employees and necessary part time employees to assist with placement and pick-up of birds.
- Chick delivery.
- Gas delivery
- Bedding in.
- Litter out.
- Feed delivery
- Bird pick-up.

Based on analysis contained within this Report there is an estimated 12.6 vehicle movements per day.

The additional vehicle movements generated by the proposed activity is negligible, the estimated vehicle movements can be accommodated by the surrounding road network and intersections and the proposed access to the site accords with the relevant design standards.

Figure 2.1 Birregurra Farm Location



3.0 Transport Route

The major arterial road near the site is the Princess Highway which is under the care and management of VicRoads to the south of the new development This is a TRZ2 designated road . Secondary double lane sealed road is the Mooleric Road – TRZ3, situated at the west of the property, which is under care of the shire. Princess Highway runs east west to the south of the property. Mooleric Road has a safe designated B-Double intersection with Princess Highway and runs towards the north passing west of the property. The Government Road when developed, will be an all-weather unsealed road and will be used as an access to sites 1 and 2 development sites. Construction of Birregurra Farm will involve transportation of both raw construction materials and individual components to site. Raw construction material deliveries will come from Melbourne / Geelong and will access site from the west, via the Princess Highway and then along, Mooleric Road onto Government Road onto the property to each site entrances for the new developments.

Potential transport routes to the site from Geelong were researched using VicRoads *B- doubles & Higher Mass Limits Trucks (May 2004)* publication.

3.1 Transport to site

Construction vehicles that are transporting materials to the site will primarily use the Princess Highway and then turn right into to Mooleric Road then onto Government, until they reach the entrance to Birregurra farm. The trucks will then enter the site using the entrance onto the property, for site 1 and 2 Government Road onto the Birregurra Farm sites 1 and 2 construction sites.

3.2 Road Classification and Condition

The above-mentioned roads up to the development sites are approved Over Dimensional Routes. In addition, the roads have been used for the construction materials and other heavy transport materials to and from the adjacent Quarry. The Princess Highway is currently used as existing over Dimensional Route being double carriageway sealed vehicle road, this road is satisfactory for the transportation of construction materials.

4.0 Access Route

4.1 Access Considerations

As previously mentioned, the major arterial road to the site is the Princess Highway, which is under the care and management of VicRoads – TRZ 2 road. All other roads within and surrounding the site are local roads under the care and management of Colac Otway Shire TRZ 3 and TRZ 4 roads.

The existing condition of the current access road was determined by a visual assessment of the roads surrounding the site. The inspection involved a visual drive through to observe the pavement condition of the current access road combined with on-foot inspections to measure traffic lane widths and shoulders at the significant intersection- proposed farm entrance. The site inspection considered the following:

- Sight distances achievable along intersection road -
 - $\circ~$ Proposed farm entrance/exit to Government Road sites 1 and 2
- Horizontal and vertical alignment of the road,
- Width of the road reservation, and
- Presence of roadside vegetation.

4.2 Site Investigation

The alignment of the Government Road to Mooleric Road, the exit is generally straight and very flat with good visuals all around. For rural roads with a speed limit of 60km/h and grade 2% or less, AUSTROADS *Guide to Traffic Engineering Practice – Part 5 – Intersections at Grade* specifies an Approach Stopping Distance (ASD) of 210 meters and a Safe Intersection Sight Distance (SISD) of over 300 meters. Accordingly, potential intersection locations easily achieved the minimum site distance of 300m.

The access locations examined during the visual inspection are highlighted in Figure 4.1 and a summary of the results are presented in Table 4.1. Detailed observations recorded during the inspection taken to supplement the observations are provided in Appendix A and B.

Figure 4.1 Potential access roads to farm 1 and 2 inspected on site visit.

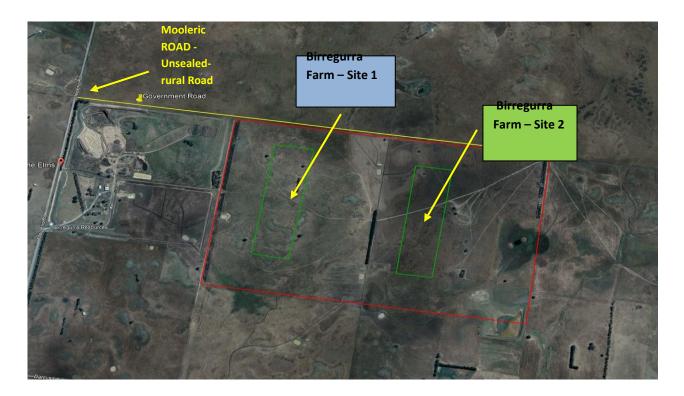


Table 4.1 Access Location

From	Onto	Description
Princess Highway From Geelong or Colac Dual double lane sealed carriage way. (100 km / hour road)	Mooleric Road Dual sealed carriage way up to 320 Mooleric Road and then all- weather unsealed dual carriage way to the Government Road junction. (60 km / hour road)	 Sight distance is 300 plus meters in both directions. No vegetation needs to be removed.
Mooleric Road All-weather unsealed dual carriage way onto the unused Government Road junction. (60 km / hour road)	Government Road Currently unused - PROPOSED – All weather unsealed single carriage way constructed on the unused Government Road. Birregurra Farm - Site 1 Entrance / Exit Road (40 km / hour road - PROPOSED)	 Sight distance is 300 nlus meters in both directions. No vegetation needs to be removed. Government Road to be developed to Single all weather carriage way.

Government Road Currently unused - PROPOSED – All weather unsealed single carriage way constructed on the unused Government Road. (40 km / hour road - PROPOSED)	Birregurra Farm - Site 1 Entrance / Exit Road PROPOSED – All weather unsealed single carriage way constructed (20 km / hour road - PROPOSED)	 Sight distance is 300 plus meters in one direction (R) road ends at entrance / exit of the farm site. No vegetation needs to be removed. Government Road to be developed to Single all weather carriage way.
Birregurra Farm - Site 1 Entrance / Exit Road PROPOSED – All weather unsealed single carriage way constructed (20 km / hour road - PROPOSED)	Government Road Currently unused - PROPOSED – All weather unsealed single carriage way constructed on the unused Government Road. (40 km / hour road - PROPOSED)	 Sight distance is 300 nlus meters in one direction (L) Road ends at entrance /exit of the farm site. No vegetation needs to be removed. Government Road to be developed to Single carriage way.
Government Road Currently unused - PROPOSED – All weather unsealed single carriage way constructed on the unused Government Road. (40 km / hour road - PROPOSED)	Mooleric Road All-weather unsealed dual carriage way onto the unused Government Road junction. (60 km / hour road)	 Sight distance is 300 nlus meters in both directions. No vegetation needs to be removed. Double carriage way – All weather unsealed road.
Mooleric Road Dual unsealed all weather carriage way up to 320 Mooleric Road and then sealed dual carriage way to Princess Highway junction. (60 km / hour road)	Princess Highway To Geelong or Colac Dual double lane sealed carriage way. (100 km / hour road)	 Sight distance is 300 plus meters in both directions. No vegetation needs to be removed. Double Dual cartridge way – sealed Road

5.0 Traffic Impacts

Traffic generated by the site will mainly be construction vehicles delivering materials, and construction workers during the construction phase. It is assumed that the construction phase of the project may take up to 12 months. When the farm comes into operation traffic generation is anticipated to be as per the table of vehicle movements provided.

5.1 Construction Phase

A relatively small amount of traffic will be generated by the construction of the Free-Range Broiler Production sheds - Birregurra Farm.

The general construction activities involved are likely to include:

- Construction of the internal access tracks to the farm sites / shed's locations.
- Stripping and stockpiling of topsoil,
- Excavation and construction of the foundations and hardstands for the farm sheds,

- Erection of the sheds and associated buildings.
- Installation of underground amenities e.g., cabling, and water
- The reinstatement of the site.
- Construction of the Government Road for access to sites 1 and 2

5.1.1 Traffic Generation

All the construction activities will require employees to travel each day to and from the site. It is expected that there will be on average 10 workers on site during most of the construction period.

The number of construction trucks to the site is estimated to be approximately 284 during the construction period, and light vehicles used by construction staff will be approximately 10 vehicles per day, as outlined in Table 5.1.

Table 5.1 Construction related vehicles visiting the two construction sites (single way traffic only)

Materials	No. of Construction Trucks	
Shed Materials	40	
Sand and aggregate	100	
Cement	140	
Water tankers (On site water supply)	4	
TOTAL	284	
Construction staff	10 light vehicles per day during construction	

5.1.2 Traffic Distribution

Based on proximity to the site, it has been assumed that most construction workers will travel from Geelong / Colac, however some may travel from towns to the east of the site.

Trucks bringing structural materials to the site would most likely travel from Geelong via Winchelsea. While concrete trucks and non-structural equipment will be from Colac.

5.1.3 Proposed Access Road Upgrades

The truck and vehicle traffic generated by the construction of the Birregurra Farm will result in an increase in the average daily traffic volumes on the surrounding road network over the construction period. This impact will however not be enough to warrant an upgrade (widening of the road) of the roads in the areas.

5.2 Operational Phase

The operational phase of the Birregurra Farm (Per site) is not expected to generate significant volumes of traffic (See traffic volumes per site on supplied table 6). The number of permanent staff on site is not expected to exceed 5 people per site and therefore no further measures would be required to manage this traffic.

Table 6 Estimated Traffic Generation per Production Year (PER SITE)

Activity	Vehicle Type	Vehicles (One Way Vehicle Trips) PER ANNUM, PER SITE
Heavy Vehicles		
Delivery of shed bedding material – Free Range sheds	Twin axle rigid truck	110
Delivery of chicks	Twin axle rigid truck	67
Delivery of feed- Free Range sheds	Semi-trailer	416
Delivery of gas (LPG)	Rigid tanker	32
Broiler pick up	Semi-trailer	875
Removal of shed litter material	Semi-trailer	165
Removal of dead birds	Twin axle rigid truck	11
	Heavy Vehicle Sub-Total	1679
Light Vehicles		
Staff visits and catching crew	Car	730
Tradesman	Ute/Van	58
Maintenance	Van	26
Shed litter material removal contractors	Car	93
Shed wash down contractors	Car	187
	Light Vehicle Sub-Total	1094
	TOTAL	2773

6.0 Conclusion

This assessment of the traffic issues for the construction of the Proposed Birregurra Farm at Government Road Birregurra, VIC, 3242, has concluded the following:

- The farm will generate a maximum demand of approximately 3 staff vehicles and 5 trucks per day during operational phase.
- The main access point is off the Government Road.
- All the above-mentioned roads in Table 4.1 can absorb the additional vehicles in the peak hour.
- Vehicles departing the site are expected to experience no delays.

As per the data contained herewith regarding traffic movements provided, we request that the Shire should Take the details herewith supplied into consideration that there are no traffic related reasons why a planning permit for the Birregurra Farm should not be issued.

Photo 1 Turnoff from Government Road onto Birregurra Farm Entrance / Exit to farm Site 1 and 2

FROM SITE 1 EXIT ENTRANCE ONTO GOVERNMENT ROAD



Photo 2 Eastern view from Government Road towards Birregurra Farm Entrance / Exit to farm Sites 1 and 2

GOVERNMENT ROAD TO MOOLERIC ROAD INTERSECTION



Photo 3 Mooleric Road unsealed shoulders onto Government Road to be constructed.

MOOLERIC ROAD AND GOVERNMENT ROAD INTERSECTION



Photo 4

Mooleric Road All weather unsealed Road up to Quarry entrance.

MOOLERIC ROAD TOWARDS PRINCESS HIGHWAY INTERSECTION



Photo 5 Intersection – Mooleric Road and Princess Highway



Photo 6 a and 6 b

Eastern view Princess Hwy from Geelong to right turn into meridian strip and view to the left Princess Hwy from Colac to enter Mooleric Road



Photo 7 Intersection – Mooleric Road and Princess Highway from direction of Geelong



Photo 8 Intersection – Mooleric Road and Princess Highway from direction of Colac



