Grampians Wimmera Mallee Water

East Grampians Rural Pipeline Project

Flora and Fauna Report

April 2019

Executive summary

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.5 and the assumptions and qualifications contained throughout the Report.

Introduction

The Victorian State Government announced it would contribute $32 million towards the construction of the East Grampians Rural Pipeline Project (EGRP). The EGRP objective is to extend the existing rural stock and domestic pipeline networks to deliver water to new areas to enhance the agricultural productivity of the Rural Supply Area (RSA) within the eastern Grampians.

In 2018, a high-level desktop assessment of the RSA was undertaken in conjunction with a more detailed desktop assessment of two reduced scope areas (Cross Supply Area and Loop Supply Area) (GHD 2018). The assessment identified various ecological values likely to persist, despite the highly modified landscape including patches of remnant native vegetation, habitat for threatened flora, fauna and communities.

GWMWater subsequently required flora and fauna surveys and reporting of the EGRP to optimise design of the pipeline network, to minimise environmental impacts, determine unavoidable impacts on ecological values and inform the potential need for permits and referrals.

Assessments were confined to within the Rural Supply Area (RSA) which encompasses an area of approximately 334,000 ha surrounding the township of Ararat, approximately 200 km west of Melbourne.

The RSA is characterised by undulating plains and rolling low hills, with a mosaic of native and introduced vegetation. The RSA has been mostly cleared for agricultural purposes (stock grazing or cropping). Consequently, it is now largely dominated by paddocks comprising non-native grasslands. There are numerous waterways, tributaries and wetlands across the landscape. A broad range of EVCs occurs which can largely be grouped into the following categories: Grassland, Woodland, Scattered Trees, Waterways/Wetlands.

This document presents calculations of native vegetation losses and offset targets according to the *Guidelines for the removal, destruction or lopping of native vegetation* (the Guidelines) (DELWP 2017), discusses implications of relevant environmental legislation, and provides recommendations on how ecological impacts may be mitigated.

Assessment methods used to generate this report include comprehensive desktop and multiple field investigations.

Rapid assessment

A rapid assessment of the proposed pipeline network was conducted in October and November 2018. This assessment used a risk-based approach, where the private property and adjacent roads within the RSA were mapped into categories (traffic light mapping) which determined the level of further survey required. Depending on the ecological values present and the category assigned to an area, some locations did not require further survey. A total of 1765 km of vegetation and habitat for an array of threatened flora, fauna and communities within private property was mapped during the rapid assessment. This equalled a total of 22,561 ha of private property being assessed. Subsequently, further assessment was conducted within approximately 132 ha where categories of 3, 4 or 5 were assigned to the areas intersected by the pipeline alignment corridor.

Ecological values

Vegetation. The Vegetation Quality Assessment (VQA) resulted in mapping a total of 70.98 ha of native vegetation within the corridor. This vegetation was represented by 27 EVCs across five different bioregions, and included areas within 48 modelled DELWP Current Wetlands (7.93 ha). Utilising 47.49 km of horizontal directional drilling (HDD) and deleting some sections of the pipeline alignment has resulted in only 36.505 ha of native vegetation within the corridor required to be removed.

One vegetation community listed under the Commonwealth *Environment Protection and Biodiversity Conservation* (EPBC) Act 1999 and *Flora and Fauna Guarantee* (FFG) Act 1988 was recorded within the corridor (0.28 ha of EPBC Act-*Natural Temperate Grasslands of the Victorian Volcanic Plain* and FFG Act- Western (Basalt) Plains Grassland). This community was able to be avoided by deletion of the pipeline alignment within the area.

Flora. A total of 174 flora species were recorded within the corridor, of these 123 were native and 51 were introduced.

The desktop assessment identified 99 flora species listed as rare or threatened under the EPBC Act, the FFG Act and/or the DELWP Advisory list of Threatened Flora (VROTS). Of these, 29 species had the potential to require targeted surveys under the EPBC Act and/or FFG Act. During October and November 2018, these species were targeted in surveys. A total of seven species listed under either the EPBC Act, FFG Act or VROTS were recorded within the corridor. Avoid and minimise measures have resulted in only three of the seven species being impacted (three listed under VROTS).

Fauna. The study area offers a range of potentially valuable habitats in the form of grasslands, woodlands, scattered trees and waterways and waterbodies. From these habitats, a total of 371 terrestrial fauna species (346 native and 25 non-native) are documented to occur or predicted to occur (Victorian Biodiversity Atlas (VBA) and Protected Matters Search Tool (PMST))[1].

Of the native fauna species identified for the study area, 73 are considered threatened and are listed under the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act 1999, the FFG Act and or the DELWP Advisory list of Threatened Vertebrate or Invertebrate Fauna in Victoria (DSE 2013, 2009)2. Of these threatened species, 25 warranted further consideration and one warranted targeted surveys. Targeted surveys were conducted for the EPBC Act listed Golden Sun Moth (*Synemon plana*), which was documented to occur from 134+ records during the project. One other threatened fauna species (Brolga, *Grus rubicunda*) was also observed during field assessments. Following avoidance and minimisation measures, the risk to the 25 threatened species and their habitat is considered low and ultimately, habitat for threatened fauna is expected to be avoided.

[1] These numbers exclude freshwater (fish and aquatic invertebrates) and marine fauna (e.g. marine mammals, fish, whales, sharks, albatross and other sea birds, marine reptiles). These species are not included in this assessment. The project considers terrestrial fauna only.
[2] Note: these numbers do not include species listed on DELWP Advisory list as either “near threatened” or “data deficient” and are not also listed on any other lists.

Ecological impacts

GWMWater have undertaken a thorough avoidance and minimisation process to avoid impacts on native vegetation and habitat for threatened flora, fauna and communities. A staged approach was used to understand the ecological values that may have been present and which required consideration throughout the project. Steps to avoid and minimise ecological impacts were applied at every stage: desktop assessment, rapid assessment, detailed assessment (Vegetation Quality Assessment (VQA) and targeted survey), ENSYM scenario testing was applied through numerous design iterations to arrive at a potential corridor that meets the objectives of GWMWater, while minimising impact on native vegetation and habitat as much as possible. Based on GHD vegetation mapping and condition assessments, a total of 70.98 ha of native vegetation has the potential to be removed. The current potential construction corridor comprises the following components:

- A total of 25 Habitat Zones intersect with the corridor
- 36.505 ha of native vegetation within the corridor
- Total of 7.93 ha mapped DELWP Current Wetland extent layer
- 71 Large trees within patches of native vegetation

Note: final design aims to further avoid and minimise native vegetation to be removed (e.g. large trees are expected to be avoided through detailed design)

Other potential impacts include the following:

- Introduction and/or spread of weeds and pathogens
- Decline in quality of water sources and habitat
- Noise
- Artificial light
- Injury, illness and death of fauna from proximity of hazards
- Fragmentation of habitats

The ENSYM Scenario test report (Appendix L) states that the following general offsets are required for the removal of native vegetation within the corridor:

- General offsets
  - 15.792 general habitat units to be sourced from within the Glenelg Hopkins, Wimmera Catchment Management Authority (CMA) or Ararat Rural City, Northern Grampians Shire, Pyrenees Shire Council
  - Minimum strategic biodiversity 0.453
  - 71 Large Trees

No listed flora species (EPBC Act or FFG Act) are proposed to be impacted. However, a total of 14 flora species listed as protected under the FFG Act have been recorded to occur within the corridor on private property.

On the basis of habitat type, extent and condition, an array of terrestrial fauna species of conservation significance may make use of the corridor including those listed under the EPBC Act, FFG Act and the *Advisory List of Threatened Vertebrate and Invertebrate Fauna in Victoria (DSE 2013, 2009*), however at this stage habitat for these species has been avoided.

Mitigation measures

It is acknowledged that the extent of impacts, and consequently the mitigation measures, are likely to change as the project proceeds into the detailed design phase. General mitigation measures that may reduce impacts are outlined in Section 8 for vegetation and terrestrial fauna.

A Construction Environmental Management Plan (CEMP) would be developed for the project and implemented in full, in line with actions outlined in Section 8 and 0. The CEMP would include provisions relevant to protecting ecological values within the subject site (and adjacent native vegetation) that are earmarked for retention. Some of the key measures to avoid or minimise impacts on ecological values that are recommended for inclusion in the CEMP are listed below:

- Implement measures, such as fencing, to protect native vegetation to be retained, so that “No Go” Zones are clearly delineated to minimise any accidental damage to native vegetation during construction, beyond the approved project footprint
- Implement the use of sediment control devices such as silt traps and sediment fencing near aquatic habitat and/or waterways during the construction period. Measures to prevent contaminants (e.g. oils, chemicals) from entering any aquatic habitat or waterways as a result of accidental spills should also be included
- Incorporate weed, disease and pest control measures to prevent the spread of existing and/or introduction of new weeds, diseases or pests to the site
- Incorporate measures to minimise noise impacts
- Incorporate measures to minimise and manage light pollution
- Implement management protocols to deal with injury and illness/death to fauna as a result of hazards (e.g. increased traffic)

Legislation

Some ecological values within the study area have the potential to trigger the need for permits, if impacted (e.g. the removal of native vegetation). Relevant legislation and how it may apply to this project is summarised in Section 9 of this report.

Threatened flora, fauna and communities listed under the EPBC or FFG Acts are present within the study area, however measures have been taken to avoid impacts on these values and as such triggers for particular legislation have been avoided. However, it is acknowledged that the EGRP has not yet undergone detailed design and therefore the extent of impacts, next steps and necessary approvals are likely to change.

The key legislative requirements for the project in its current phase are listed below:

- Based on the current assessment, an EPBC Act referral is not considered necessary. However, the need for a referral will need to be reconsidered when an assessment of the remainder of the corridor and associated infrastructure has been completed
- The project triggers the need for a referral under the EE Act based on the individual criterion: Potential clearing of 10 ha or more of Endangered EVC. Combined criteria are also relevant to the EGRP
- Obtain necessary approval under the P&E Act pending a decision on the assessment pathway (i.e. planning permit or PSA)
- Secure suitable vegetation removal offsets for the project. Liaise with DELWP regarding the acceptability of amending offset requirements following construction to allow for the approximately 2500 small impacts sites

- As the assessment considered an alignment on private land only, the FFG Act does not apply. However, a permit under the FFG Act may be required for the removal of threatened or protected species or threatened communities on public land, and this should be considered at the time of assessment of these areas
- A permit under the Wildlife Act 1975 will be required for the handling and removal of fauna from the vegetation to be removed (particularly from hollow bearing trees to be removed or from open trenches during construction)

Glossary

CaLP	Victorian *Catchment and Land Protection Act 1994*
CEMP	Construction Environmental Management Plan
CMA	Catchment Management Authority
CVU	Central Victorian Uplands Bioregion
D	Depleted
DBH	Diameter at Breast Height
DELWP	Victorian Department of Environment, Land, Water and Planning (formerly DEPI)
DEPI	Victorian Department of Environment and Primary Industries (now DELWP)
DEWHA	Commonwealth Department of the Environment, Water, Heritage and the Arts
DOEE	Commonwealth Department of the Environment and Energy (formerly DOTE)
DOTE	Commonwealth Department of the Environment (now DOEE)
DSE	Victorian Department of Sustainability and Environment
DunT	Dundas Tablelands Bioregion
E	Endangered
EE Act	Victorian *Environment Effects Act 1978*
EES	Environmental Effects Statement
EGRP	East Grampians Rural Pipeline Project
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EVC	Ecological Vegetation Class
FFG Act	Victorian *Flora and Fauna Guarantee Act 1988*
GG	Greater Grampians Bioregions
GHD	GHD Pty Ltd
GIS	Geographic Information System
Gold	Goldfields Bioregion
Guidelines	*Guidelines for the removal, destruction and lopping of native vegetation*
GWMWater	Grampians Wimmera Mallee Water
HDD	Horizontal Directional Drilling
LC	Least Concern
LGA	Local Government Authority
MNES	Matters of National Environmental Significance
NVIM	Native Vegetation Information Management System
NVR	Native Vegetation Removal
PMST	Protected Matters Search Tool
RSA	Rural Supply Area

Subsp.	Subspecies
TPZ	Tree Protection Zone
V	Vulnerable
Var.	Variety
VBA	Victorian Biodiversity Atlas
VQA	Vegetation Quality Assessment
VROTS	Species listed on DELWP's *Advisory List of Rare or Threatened Plants in Victoria*
VTWBC	Victorian Temperate Woodland and Bird Community
VVP	Victorian Volcanic Plain Bioregion
Wim	Wimmera Bioregion
WONS	Weed of National Significance

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1. Introduction

1.1 Background and project development

On 30 April 2018, The Victorian State Government announced it would contribute $32 million towards the construction of the East Grampians Rural Pipeline Project (EGRP). The EGRP objective is to extend the existing rural stock and domestic pipeline networks to deliver water to new areas to enhance the agricultural productivity of the eastern Grampians. Much of the eastern Grampians area is currently not serviced with a stock and domestic water supply and is reliant on catchment dams. The area has been significantly affected by low rainfall since mid-2014. Given the ongoing dry conditions experienced currently in the east Grampians region, Grampians Wimmera Mallee Water (GWMWater) is keen to proceed with the project's implementation.

The Rural Supply Area (RSA) is located in the Hopkins Catchment of the Western District, western Victoria. The RSA surrounds the township of Ararat, with a radius of approximately 45 kilometres (km) and includes approximately 334,000 hectares (ha) of farm land and township land.

The proposed method of water delivery is supply via a reticulated pipeline network which is expected to enhance the productivity of the region, with the water sourced from larger storages in reliable catchments.

In 2018, a high level desktop assessment of the RSA was undertaken by GHD Pty Ltd (GHD) (2018) in conjunction with a more detailed desktop assessment of two reduced scope areas (Cross Supply Area and Loop Supply Area). The GHD (2018) desktop assessment identified various ecological values likely to persist despite the highly modified landscape including patches of remnant native vegetation and habitat for threatened flora, fauna and communities.

GWMWater subsequently required flora and fauna surveys and reporting of the EGRP to optimise design of the pipeline network to minimise environmental impacts, determine unavoidable impacts on ecological values and inform the potential need for permits and referrals.

The project aims to connect as many landholders to the EGRP as possible, however where there are constraints (ecological values, topography, landholder consent) the pipeline alignment may be adjusted or deleted.

1.2 Purpose of report

GWMWater plans to design and construct a pipeline network with minimal impacts on ecological values. The identification of ecological values in the area will aid the design of the pipeline network. Subsequently the purpose of this report is to document this process, quantify the extent and quality of native vegetation and fauna habitat that are likely to be impacted by the proposed works, and to outline the environmental legislative implications for the project.

1.3 Scope

The ecological assessment for this project involved:

- Desktop review of known or predicted ecological values within the study area
- Development of field methods
- Rapid drive-by assessment (herein referred to as rapid assessment) of a 20 m corridor within private property along approximately 1477 km of roads (surveying both sides)
- Rapid assessment of the Great Western Offtake to Ararat at locations where the existing pipeline network intersected roads
- Traffic light mapping of areas subject to rapid assessment to determine areas for subsequent assessment for native vegetation or threatened species or community habitat
- Vegetation Quality Assessment (VQA) of areas where native vegetation was identified, including:
  - Mapping all of the scattered trees within the proposed corridor of impact (recording the diameter at breast height (DBH), species, and the presence of hollows)
  - Mapping all of the Large Trees within the proposed corridor of impact (recording the DBH, species, and the presence of hollows)
  - Undertaking a Habitat Hectare Assessment of all patches of native vegetation within the proposed corridor of impact
- EnSym Native Vegetation Regulation scenario testing
- Targeted surveys for threatened flora, fauna or communities
- Preparation of a report to document the results of the ecological assessment. The report includes:
  - A description of the vegetation, flora and fauna of the proposed corridor of impact
  - Confirmation of the extent of impacts on native vegetation and fauna habitat
  - Determination of offset requirements for the proposed works
  - Summary of the potential ecological legislative implications for the project
  - Recommendations for the next stages of the project

1.4 Study area

The study area for the assessment was the RSA which encompasses approximately 334,000 ha and includes private and public land and the major township of Ararat, approximately 200 km west of Melbourne. The northern point of the RSA is near Great Western and the southern point is near Lake Bolac, with the RSA stretching from Lake Muirhead in the west nearly to Beaufort in the east.

The RSA is located within:

- Six bioregions (Dundas Tablelands, Central Victorian Uplands, Goldfields, Greater Grampians, Victorian Volcanic Plain, and Wimmera)
- Four shires or council areas (Pyrenees Shire, Ararat Rural City, Northern Grampians Shire and Southern Grampians Shire)
- Two Catchment Management Authority areas (Glenelg Hopkins and Wimmera)

The project involved the following components:

1. 1477 km of roads within the RSA. Assessment of both sides of the road for a 20 m corridor within private property along the private property/road reserve property boundary
2. 509 km of tracks within the RSA. Assessment of both sides of the track for a 20 m corridor within private property along the private property/road reserve property boundary. Only a portion of these tracks were assessed to allow for realignment of roads where values were observed
3. 17 km of the Great Western Offtake to Ararat. Assessment of areas where the existing pipeline intersected roads only
4. 8 pump stations (PS) (Lake Fyans PS, PS1, PS2, PS2B, PS3, PS7, PS8, PS10)

Infrastructure associated with the EGRP is expected to span both private and public property to accommodate the pipeline which will be largely aligned within private property, with valves and meters installed within the road reserves. However, this assessment was limited to areas within private property only. For the most part, road reserves and waterways are expected to be directionally drilled to connect the pipeline between properties.

A nominal corridor of works of eight metres width has been applied to both the trunk and distribution pipelines when considering potential impact to areas of native vegetation or threatened species habitat as a part of this assessment.

The following terminology is used in this report to describe different aspects of the project:

- Pipeline alignment (includes both trunk and distribution networks). The alignment is only proposed at this stage, the alignment is expected to be updated throughout detailed design
- Corridor (includes a 4 m buffer either side of the pipeline alignment). The corridor is only proposed at this stage, the corridor is expected to be updated throughout detailed design in response to changes to the proposed pipeline alignment
- Study area (includes the whole RSA plus a buffer of 1 km). This description covers a much broader area than the expected zone of impact, and the additional information captured has been used to provide context to determine the significance of ecological features identified within the pipeline alignment or the corridor. The broader study area was only assessed at a desktop level, while the pipeline alignment and corridor were assessed on the ground by ecologists

1.5 Assumptions, limitations and qualifications

This report has been prepared by GHD Pty Ltd (GHD) for Grampians Wimmera Mallee Water (GWMWater) and may only be used and relied on by GWMWater for the purpose agreed between GHD and GWMWater as set out in Section 0 of this report.

GHD otherwise disclaims responsibility to any person other than GWMWater arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The following assumptions, limitations and qualifications were made for this assessment and report:

General

- The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations stated in this section and also set out in the report
- The services undertaken by GHD in connection with preparing this report were limited to an ecological assessment of vascular plant species (ferns, conifers and flowering plants) and terrestrial vertebrate fauna (mammals, birds, reptiles and frogs). Non-vascular flora (e.g. mosses, liverworts, lichens), fungi and terrestrial invertebrates have not been considered in detail as part of this assessment, except where listed threatened species are known or suspected to occur, or where bryophytes comprise part of the EVC benchmark used for the Habitat Hectare assessment (e.g. cover of Bryophytes)
- Aquatic fauna (fish and aquatic invertebrates) and marine fauna have not been considered within this assessment. It is GHD's understanding that waterways will be directionally drilled
- Field assessments were limited to areas of private property, large areas of crown land were outside of the scope of this assessment. Public land/crown land (such as road reserves, waterway crossings) are expected to be managed through HDD and details will be included in the next iteration of assessment report following detailed design
- The assessment does not include assessment of any infrastructure expected to be located within road reserves, e.g. firefighting tanks, pressure reducing valve stations, air valves, customer meters, scour valves, stop valves and hydrants. The current native vegetation impact of 36.5 ha does not include the impacts associated with any infrastructure located within the road reserve. GWMWater are currently liaising with DELWP to determine an acceptable method for impact estimation in these areas
- GWMWater intend to have the all areas of vegetation or habitat outside of the scope of work of this report assessed on ground and included in a Native Vegetation Removal (NVR) Report once the final footprint has been determined. This will include: vegetation within the corridor, pump stations, firefighting tanks, pressure reducing valve stations, air valves, customer meters, scour valves, stop valves and hydrants
- Involved the use of Collector for ArcGIS version 10.3.3 mapping application to record site information. This mapping tool was accurate to within ten metres on site
- Did not include a detailed assessment of planning implications with relation to legislation outside those considered from an ecological perspective. A detailed assessment of planning overlays (and other sources of legislative information) was not undertaken as part of this project unless otherwise discussed

The opinions, conclusions and any recommendations in this report are based on conditions encountered, observations made and information reviewed up to the date of preparation of the report. As GHD was only present at specific points within the relevant sites on specific dates and certain time periods, this report is only indicative (and not definitive) of flora and fauna present on the sites. Flora and fauna (whether in type or quantity) can also change and fluctuate at different times throughout the year (due to factors including seasonal changes, external events or third-party intervention), and it is generally not possible to observe such changes or fluctuations where only discrete site visits have taken place. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

GHD has prepared this report on the basis of information provided by GWMWater and others (including Government authorities). GHD has not independently verified or checked this information beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD and described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

Rapid assessment

The rapid assessment:

- Is a risk based approach and it is recognised that this approach may result in errors either by over or under estimating the values a property may contain
- Was undertaken from a car (drive-by) and did not involve ground-truthing
- Was limited to private property, adjacent to roads. Both sides of the road were assessed for a 20 m width on the private property side of the private property/road reserve property boundary
- Was limited to roads and tracks identified by GWMWater, with the exclusion of tracks that were not accessible or were ‘dry weather only’ roads
- Did not aim to collect information on individual scattered trees or small patches of native vegetation, but rather categorise entire lengths of property frontage
- If, during rapid assessment, a private property contained scattered trees only, it may have been mapped as a low category (1 or 2) suggesting that the pipeline could fit without impacts. It does not reflect that no values exist in the property at all
- Assumed that waterways will be directionally drilled unless it was obvious that the waterway no longer exists
- Was undertaken with the assumption that any native vegetation within category 2 areas will be avoided, e.g. avoid TPZs of scattered trees, small discrete patches or strip of native vegetation or habitat
- For the Great Western Offtake to Ararat was only assessed at spot locations where the pipeline intersected roads
- Was used to inform further assessment and the results of this assessment are not intended to be produced as a separate report
- Included a rapid assessment field investigation during mid spring, to map the proposed pipeline alignment into categories to reflect their potential for native vegetation and habitat for threatened species and communities. This is not an ideal time for grassland assessments; if areas were not distinguishable as native or non-native due to the lack of identifying plant material then they were be identified as requiring further assessment

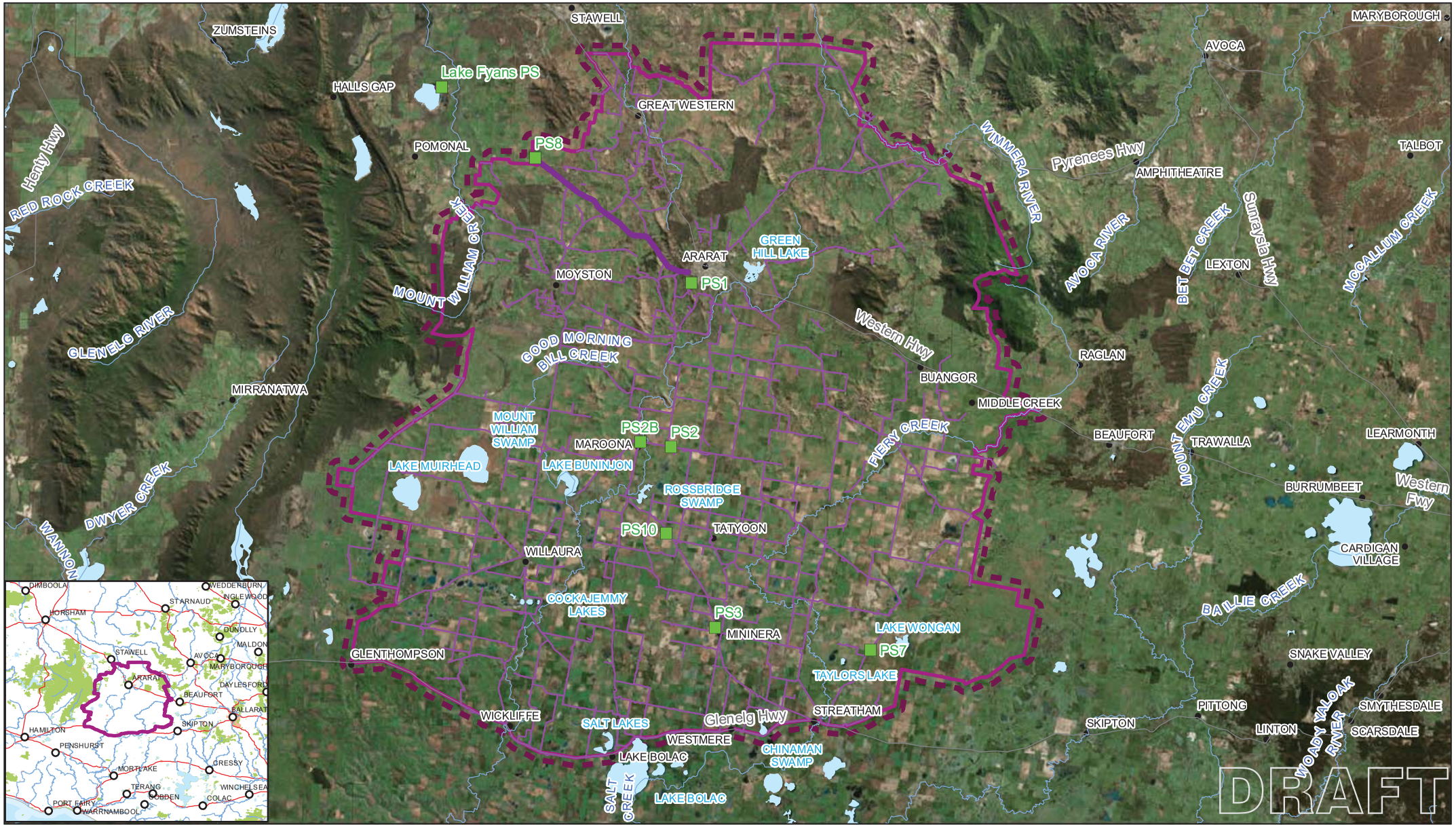
VQA and targeted surveys

- A corridor of 8 m wide (4 m either side of proposed pipeline alignment) was assessed
- Access to private property was confirmed by GWMWater. Where access was denied, VQA and targeted surveys were not completed
- GWMWater identified polygons proposed to be impacted, to inform the location of VQA and targeted survey
- VQA was limited to private property and only in areas where the corridor intersected the rapid assessment polygons
- Were confined to areas where category 3, 4 or 5 rapid assessment polygons intercepted with the corridor except where native vegetation polygons or targeted assessment polygons are explicitly mapped outside of this interception
- VQA and targeted surveys were completed within areas of the corridor only and did not extend to any other associated infrastructure e.g. pump stations, valves, etc, as their location was not known at the time
- No VQA was completed for works proposed at the existing Lake Fyans pump station, all works are proposed to be within the existing footprint
- The TPZ of road reserve trees was not considered during the VQA. It is understood that GWMWater intend to realign the corridor further into private property to avoid these
- GHD is aware that other organisations were also conducting Golden Sun Moth surveys within the study area during the course of the project. These records are not reflected within this report as they are not yet accessible through online databases
- Scattered trees have not been included within the ENSYM even if they or their TPZ was determined to be within the corridor. GWMWater has determined that they will be able to avoid scattered trees when constructing
- Modelled DELWP Wetland Layers, where intersected, have not been assessed using the VQA method as the wetlands were not in the appropriate condition (inundated) during the survey period. The weighted average modelled native condition score has been used to determine extent and quality
- Areas mapped as X_Impact, X_Wetland, X_Native Vegetation or HDD are assumed to result in no impacts to native vegetation or habitat
- Included habitat hectare assessments as part of the ecological assessment during late spring and summer, which is considered to be a suitable time of year for conducting flora assessments in the area. However, some native flora are still difficult or impossible to locate or identify due to a lack of reproductive material and/or the seasonal nature of some species (in particular, native orchids and forbs that may flower for limited periods during spring or flower at other times of the year). Additional native species are likely to be recorded at the site at other times of the year. Therefore, it is considered possible that additional threatened flora may be present, but were not detected during the survey because of the timing of the survey. This limitation is somewhat overcome by consideration of records from the Victorian Biodiversity Atlas (VBA) databases and the determination that targeted surveys be conducted in areas where suitable habitat exists

1.6 Acknowledgements

GHD acknowledges the assistance, advice and/or information provided by the following:

- The Victorian Department of Environment, Land, Water and Planning (DELWP) for access to the VBA database and NatureKit and provision of local information
- The Commonwealth Department of the Environment and Energy (DOEE) for access to the Protected Matters Search Tool (PMST)



Paper Size A4

0 5,000 10,000 20,000

Metres

Horizontal Datum: GDA 1994
Grid: GCS GDA 1994

N

LEGEND

- Township point
- Pump Stations
- Great Western Off Take to Ararat
- Potential Construction Corridor
- Major water course
- Major road
- Major water area
- Study Area
- Rural Supply Area Boundary

Grampians Wimmera Mallee Water
GWMWater East Grampians Pipeline Ecology Surveys

Job Number 31-36625
Revision C
Date 27/02/2019

Study Area

Figure 1

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Data source: DEWLP, VicMap, Grampians Wimmera Mallee Water, 2018-2019; Imagery source: Esri, DigitalGlobe,Geoeye, Earthstar Geographics CNES/Airbus DS,USDA,USGS,AeroGRID,IGN and the GIS User Community, GHD, 2019 Created by: Cjauniau

2. Methods

2.1 Desktop assessment

A desktop review was undertaken to determine ecological values known or predicted to be encountered within the study area (1 km buffer of the RSA, see Figure 1).

The primary data sources accessed during the desktop review included:

- The Victorian Biodiversity Atlas (VBA) (DELWP 2018a) [3] database, which provides data on flora and fauna previously recorded
- The *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* Protected Matters Search Tool (PMST)[4] – which can be used to provide reports that identify *Matters of National Environmental Significance* (MNES) listed under the EPBC Act that may occur within the area of interest
- NatureKit – which provides GIS mapping, maintained by DELWP (DELWP 2018b)[5], including modelled mapping of extant and pre-1750 Ecological Vegetation Classes (EVCs) (DELWP 2018c), Location Mapping and known threatened species records
- NVIM – Which provides GIS mapping maintained by DELWP (DELWP 2015)[6], including Location Mapping, Modelled Condition Score data and Current Wetland extent
- Aerial imagery

2.2 Rapid assessment

The rapid assessment was conducted between 8 October and 2 November 2018. This assessment is a risk-based approach where the pipeline alignment is mapped into traffic light categories which determine the level of further survey required; depending on the category mapped in any given area, some locations were not surveyed further. It is acknowledged that this approach may result in errors from over or under estimating values within a property.

The rapid assessment was limited to private property, adjacent and parallel to roads. Both sides of the road were assessed for a 20 m width on the private property side of the private property/road reserve property boundary (usually the fenceline). The traffic light mapping was split into six categories, as defined within Table 1.

The rapid assessment was undertaken from a vehicle and involved no ground-truthing. A whole-of-property approach was taken, with each property mapped according to the highest relevant traffic light mapping category. Consequently, not all ecological features (e.g. scattered trees) were mapped across the entire area.

The rapid assessment was undertaken by teams of two, comprised of a botanist and a zoologist, to enable each assigned traffic light category to reflect both flora and fauna values.

A standard, pre-determined buffer was applied to waterways, which spanned the width of the parcel boundary if within crown land, or extended 25 m either side of the waterway if within private property. Traffic light categories were assigned if waterways no longer existed (e.g., had been cultivated and cropped).

[3] https://www.environment.vic.gov.au/biodiversity/victorian-biodiversity-atlas (Accessed February 2019)
[4] http://www.environment.gov.au/epbc/pmst/index.html (Accessed February 2019)
[5] http://maps.biodiversity.vic.gov.au/viewer/?viewer=NatureKit (Accessed February 2019)
[6] https://nvim.delwp.vic.gov.au/ (Accessed February 2019)

Areas mapped as a DELWP current wetland layer were mapped as a minimum of category 3; current wetlands must be considered a patch of native vegetation (see section 2.3.1.1).

Rapid assessment of the Great Western Offtake to Ararat was limited to private property areas adjacent where the existing pipeline network intersected roads.

Rapid assessment of pump stations involved mapping the proposed footprint and a small area around the footprint of each pump station (only where in private property) if the surrounding values were lower, to enable the footprint to be moved as required to avoid impacts on ecological values.

Rapid assessment did not include areas within crown land, including road or rail reserves.

In some instances, the pipeline alignment was shown to occur within a designated road but no formed road existed at that location. In these cases, no assessment was undertaken.

No private property was accessed on foot during the rapid assessment, therefore if locked gates were encountered, those areas were not assessed.

Table 1 Traffic light mapping categories used for the rapid assessment

Traffic Light Category	Explanation
1 – Dark Green	Areas where no further assessment is required. Examples include: • Cropped/cultivated paddock • Non-native vegetation that is not habitat for threatened species
2 – Light Green	Cropped paddock, cultivated paddock or non-native vegetation which is suitable for the pipeline but which requires some values to be avoided. Examples include: • Paddocks or non-native vegetation with native Scattered Trees that will require further assessment in order to avoid • Cropped paddocks with a strip of uncultivated vegetation around the boundary, which contains native vegetation and/or habitat for threatened species or communities. Further assessment may be required to avoid.
3 – Yellow	Low quality native vegetation. Examples include: • Patches that are modified or not structurally diverse (either devoid of a canopy layer, or patches of canopy trees without any native understorey or midstorey). • Patches that contain >25% cover of perennial native vegetation, but consist of regrowth or recently planted native vegetation (would still require offsets if removed, but has relatively low biodiversity values) Habitat for state listed species or communities. Need to consider if: • State listed flora species might be present (Appendix H) • State listed fauna might be present • State listed (FFG) communities might be present
4 – Amber	Moderate to High quality native vegetation. Example: • Native Vegetation that is structurally/ species diverse (containing 2-3 intact structural layers: understorey / midstorey / canopy layer) Habitat for state listed species or communities. Need to consider if: • state listed flora species might be present (Appendix H) • State listed (FFG) fauna might be present • State listed (FFG) communities might be present

Traffic Light Category	Explanation
5 – Red	Areas with potential to support significant ecological values, particularly EPBC Act listed flora or fauna or communities. This may include native and/or non-native vegetation.
6 – Blue	Wetland or dam that is not mapped as a DELWP current wetland or already mapped as a waterway.

2.3 Vegetation quality assessment

Vegetation quality assessments (VQA) were conducted within the corridor between 2 and 23 November 2018.

Areas where polygons were mapped as category 3 or higher (i.e., 3 – 5) during the rapid assessment were assessed further to document the extent and quality of native vegetation and/or threatened species/community habitat. Category 6 polygons were not assessed further and were mapped to assist in avoidance.

The rapid assessment and the VQA were not conducted in the same areas. Rapid assessments were focused on the property boundary (see section 2.2) and were used to inform the pipeline alignment and the location of further assessment. As such the pipeline alignment and the rapid assessment polygons do not match up. VQA was confined to areas where the pipeline alignment corridor (8 m wide: 4 m either side of the pipeline alignment) overlapped rapid assessment polygons.

Areas where the corridor intercepted crown land (i.e., not private property) or extended beyond the rapid assessment polygon were not assessed. These areas are extensive and GWMWater intends to have them assessed prior to construction. Additionally, private properties that did not grant access were not assessed.

Figure 2 shows an example of areas that were or were not assessed for the VQA. For this example, the VQA is limited to areas where the corridor intercepts rapid assessment polygons of category 3 or higher. Areas of crown land, areas within category 1 or 2 rapid assessment polygons and areas outside a rapid assessment polygon are not assessed.

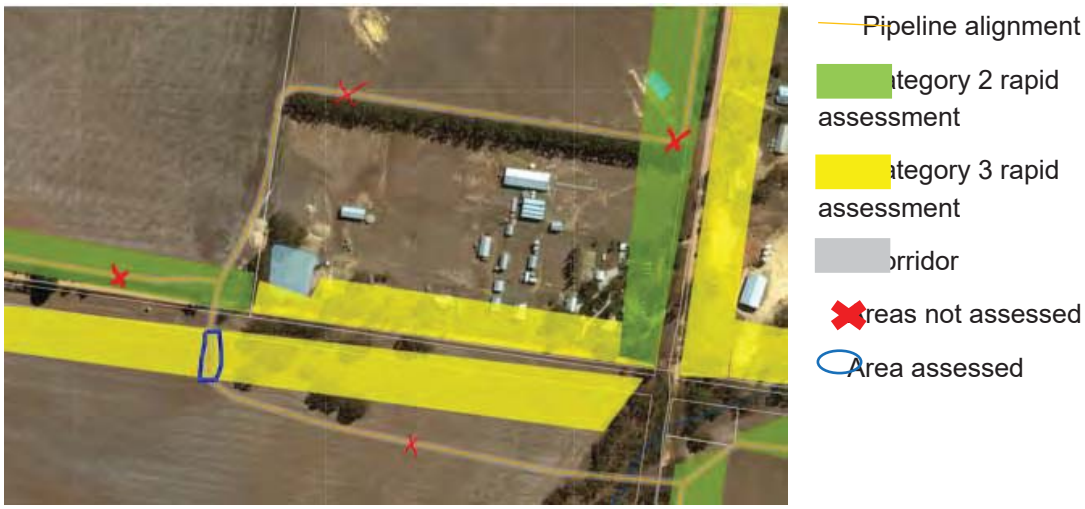


Figure 2 Example of application of VQA with respect to corridor and rapid assessment polygons

A total of 146 km of corridor length was considered assessed and subject to VQA assessment. Based on the rules above 1492 km of corridor length is considered not assessed. This is largely made up of areas that were mapped as category 1 or 2 during the rapid assessment so did not require further assessment. Excluding areas of intercept of the corridor and category 1 and 2 polygons, 554.75 km of corridor length remain that have not been assessed.

The VQA was undertaken on foot by two ecologists, including at least one DELWP-accredited native vegetation assessor (botanist) and included:

- Mapping the extent and condition of native vegetation present within the areas where the corridor and rapid assessment polygons overlapped, including:
  - Undertaking Habitat Hectare (HabHa)[7] Assessments for Habitat Zones (HZ) (as described below)
  - Mapping and measuring all Canopy Trees that met the EVC benchmark for Large Trees
- Mapping Scattered Trees and recording species name and DBH (Diameter at Breast Height)
- Determining if native or non-native vegetation was present within areas classified as wetlands by the 'current wetland' layer, though condition was not assessed
- Collecting an inventory of incidental observations of native and non-native flora species encountered during the field assessment, along with conservation status and origin
- Identifying the presence of significant weed species including those declared or recognised as noxious species under relevant State and national legislation, policy or strategy, e.g. Victorian *Catchment and Land Protection Act 1994 (CALP Act)* and National Weeds Strategy. Due to the extent of weed species present at some parts of the site, the location of every Weed of National Significance (WoNS) or CaLP Act listed species was not recorded, however significant infestations and some other incidental, notable records were mapped

All field investigations for flora were undertaken in accordance with GHD's FFG Act Permit to take Protected Flora (#10008653, expiry date 28 February 2021).

During the site assessments, the quality and quantity of native vegetation within the corridor was assessed using the Habitat Hectare approach, in accordance with the *Vegetation Quality Assessment Manual – guidelines for applying the habitat hectare scoring method* (DSE 2004) and following the *Assessor's handbook Applications to remove, destroy or lop native vegetation* (DELWP 2017) amendment to the definition of a habitat zone. Native vegetation was assessed using version 1.3 of the 'Vegetation Quality Field Assessment Sheet' provided by DELWP and EVC benchmarks for the relevant Bioregion within the study area. EVCs at a particular location were determined based on the biophysical characteristics outlined in the EVC benchmarks such as geology, vegetation structure and species composition, and taking into consideration the pre-1750 (i.e. pre-European settlement) modelled EVC.

[7] https://www.environment.vic.gov.au/native-vegetation/native-vegetation/biodiversity-information-and-site-assessment (Accessed February 2019)

2.3.1.1 Notes regarding use of DELWP Wetland Extent layer

According to the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017), mapped wetlands (i.e. Current wetland layer in NVIM) are considered as patches of native vegetation, and consequently, must be included in the extent of native vegetation removal if proposed to be impacted. The weighted average modelled condition score is assigned to these wetlands[8]. As with VQA, the DELWP current wetland layer was confined to areas where the corridor intersected a rapid assessment polygon of 3, 4 or 5.

2.3.1.2 Weeds

During the field surveys, a list of all flora species observed within the study site was compiled (Appendix A). This includes environmental weeds, which are noxious weeds listed under the *Catchment and Land Protection Act* 1994 and recognised as Weeds of National Significance.

The *Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants* is a listed key threatening process under the EPBC Act. In addition, *Invasion of native vegetation by 'environmental weeds'*, is a listed potentially threatening process under the FFG Act.

2.4 Targeted surveys

The desktop assessment identified threatened (EPBC Act and FFG Act) flora, fauna and vegetation communities that had the potential to occur within some parts of the study area. During the rapid assessment, potential habitat for threatened flora, fauna and vegetation communities was identified as polygons requiring further surveys – targeted surveys.

GWMWater refined the pipeline alignment following targeted surveys, by altering the construction techniques in places to Horizontal Directional Drilling (HDD) or deleting sections of the pipeline alignment (X_Impact). Any areas where impacts on threatened communities or species' habitat (actual or potential) was still likely, despite the change of construction technique, were subsequently converted to X_Impact by GHD.

The following sections describe the methods used for targeted surveys.

2.4.1 Flora and vegetation communities

Habitat suitable for EPBC Act and FFG Act listed flora, EPBC Act-listed ecological communities, and FFG Act-listed 'communities of flora and fauna' was identified as polygons during the rapid assessment. GWMWater then selected polygons for targeted flora survey where those polygons intercepted the corridor or offered a potential alternative route to avoid other known constraints. Fourteen polygons were surveyed for threatened flora and vegetation communities.

As explained in section 2.3, surveys were limited to the area of intercept of the rapid assessment polygons and the corridor. Targeted flora surveys were split into two rounds to target the flowering times of particular species. Round 1 surveys were carried out in late October and early November. Round 2 surveys were carried out in November (Table 2).

Each survey was undertaken by two ecologists experienced in targeted flora surveys and involved walking parallel transects within the corridor; typically more than one pass was required (depending on the target species) to cover the whole corridor.

Targeted surveys for vegetation communities were coupled with threatened flora surveys and assessments were undertaken by a DELWP-accredited native vegetation assessor (GHD botanist).

[8] Advice received from DELWP on 8/01/2019

Table 2 Targeted flora and vegetation community survey timing

Round	Date	Personnel	Polygon #^
1	30/10/2018 31/10/2018 01/11/2018	Kelly Dalton and Fiona Coates	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
2	19/11/2018 22/11/2018	Kelly Dalton and Jordan Whitmore	7, 14

^ The location of polygon numbers within the table are detailed in Appendix C

2.4.2 Fauna

Potential habitat for threatened fauna was identified during the rapid assessment stage. Typically, threatened fauna habitat polygons were identified as being potentially suitable for Golden Sun Moth, Striped Legless Lizard, Growling Grass Frog and/or woodland species.

As waterways, wetlands and woodlands were for the most part avoided, no targeted surveys were carried out for species that use those habitats.

In order to prove absence of Striped Legless Lizards, survey are typically conducted over a period of 6 months to allow time for tiles to establish and then checked over the active season. Without adequate survey there is a reduced in the confidence of any negative result. Given the project timelines and the extensive survey effort and time required for adequate surveys for the Striped Legless Lizard over such an extensive area, targeted surveys for the Striped Legless Lizard were not undertaken and presence was assumed.

Golden Sun Moth surveys were undertaken in a number of rapid assessment polygons where the identified habitat intersected the corridor. Methods used for these surveys are described below.

2.4.2.1 Golden Sun Moth

Fourteen rapid assessment polygons were identified as containing suitable habitat for Golden Sun Moth and selected by GWMWater for survey because they were either intercepted by the corridor or they offered a potential alternative route to avoid other known constraints.

Methods used to survey for the Golden Sun Moth (GSM) were in accordance with the EPBC Act Policy Statement 3.12 - Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (*Synemon plana*)[9] and its supporting Background Paper[10]. Surveys were undertaken as follows:

- Undertaken during the local flying season (late October to early January, unless otherwise extended by DELWP)
- Undertaken only during days where the moths are active, by using flight observations made on the day at an appropriate reference site where they are known to occur[11] (Table 3)
- Conducted in pairs on parallel transects (5 m apart) by suitably trained observers
- Repeated on four separate occasions (rounds) at approximately weekly intervals (Table 3)

[9] DEWHA 2009. Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (*Synemon plana*).
[10] DEWHA 2009. Background Paper to EPBC Act Policy Statement 3.12 – Nationally Threatened Species and Communities. Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (*Synemon plana*).
[11] Note that GHD did not visit the reference site and relied on information being available from other properties across the state through the network of Victorian GSM observers.

- Carried out during suitable conditions which are:
  - On warm to hot days (above 20°C by 1000 hrs)
  - During the warmest part the day (between 1000 to 1400[12] hrs)
  - On days that have mostly cloudless skies with relatively still wind conditions during the survey period
  - At least two days since substantial rain, not including light showers

Table 3 Golden Sun Moth survey rounds

Round	Date	Personnel	Polygon #^	Reference Location/s
1	01/12/2018	Kelly Dalton and Jordan Whitmore	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	Beaufort, Broadmeadows Valley Park
2	06/12/2018	Kelly Dalton and Chantal Millis	1, 2, 3, 4, 7, 8, 9, 10, 11, 12, 13, 14	Beaufort, Rokewood, Kyneton, Somerton, Yan Yean, Ballyrogan
3	12/12/2018	Kelly Dalton and Mariah Murphy	1, 2, 3, 4, 7, 8, 10, 11, 12, 13, 14	Beaufort, Dunkeld, Little River, Yan Yean, Mickleham, Epping
4	19/12/2018	Kelly Dalton and Zac Billingham	1, 2, 3, 4, 7, 8, 10, 11, 12, 13, 14	Rokewood, Craigieburn

^ The location of polygon numbers within are detailed in Appendix D

If Golden Sun Moth were observed within any of the targeted survey polygons then those polygons were not resurveyed in subsequent rounds.

If Golden Sun Moth were observed incidentally during other field assessments, then the habitat surrounding the record was mapped. Habitat mapping alterations were limited to property boundaries and did not involve re-categorisation of other surrounding rapid assessment polygons.

2.5 ENSYM scenario testing

During the project, ENSYM reports were run periodically on the pipeline alignment, incorporating changes made, for the purposes of estimating the extent of native vegetation loss and offset obligations for the project. This was referred to as ENSYM scenario testing.

GWMWater is not currently at a point where a final alignment of the pipeline can be identified, and the existing corridor includes extensive areas that have not been assessed. As such, the results from this report do not represent the final calculations of native vegetation impacts. GWMWater intends to assess all vegetation to be removed from the whole corridor and associated infrastructure before preparing and submitting a NVR Report to DELWP. The following areas require further consideration to be able to form a more complete understanding of the native vegetation that is required to be accounted for within an NVR Report: areas of the corridor not yet assessed, X_Wetland, X_Native Vegetation, pump stations, firefighting tanks, pressure reducing valve stations, air valves, customer meters, scour valves, stop valves and hydrants.

It is expected that the information provided in the ENSYM (Appendix N) will be sufficient to inform the next steps for the project.

[12] If moths are still being observed at 1400 hours, surveys can continue up until 1500 hours.

For the ENSYM scenario testing, the following calculations, rules and assumptions were used:

- The weighted average modelled condition score was used for any DELWP current wetlands that were intersected
- Results from the VQA in the form of Habitat Hectare scores and mapped polygons were used for vegetation assessed by GHD
- Parts of the corridor that were not assessed by GHD during the VQA were excluded from the ENSYM scenario testing
- All scattered trees were excluded from the ENSYM scenario testing as GWMWater have indicated that they will avoid all scattered trees
- Native vegetation to be impacted did not include TPZ impacts on trees within the road reserve or National Parks/State Parks/Forests/Reserves adjacent to the alignment GWMWater have advised that the TPZ impacts will be considered and the pipeline alignment moved to avoid impacts
- Areas mapped as being horizontal directionally drilled (HDD) or mapped as X_Impact were excluded. These are areas that GWMWater has excluded from the alignment to avoid ecological issues
- Areas mapped as X_Wetland were excluded. These are areas GWMWater have identified as avoidable but haven't yet determined if they will be HDD, X_Impact or deviate the alignment to avoid.
- Areas mapped as X_Native Vegetation were excluded. These are areas GWMWater have identified as avoidable but haven't yet determined if they will be HDD, X_Impact or deviate the alignment to avoid. These typically represent areas where native vegetation impacts just the edge of the corridor and are easily avoidable.

As a method of avoiding and minimising native vegetation impacts, two ENSYM scenario tests were run. The first ENSYM was run directly after the VQA with the assumption that the entire pipeline alignment would be trenched. Using the ENSYM data and polygons, GWMWater was then able to avoid and minimise impacts on native vegetation (utilising HDD, pipeline alignment amendments and identifying values that they are confident they can avoid). A second ENSYM was run with the refined pipeline alignment which had a reduced native vegetation impact. The results of the second ENSYM are discussed in Section 6 and the report is located in Appendix N.

2.6 Terminology, nomenclature and conservation status

2.6.1 Flora

Unless otherwise noted, common and scientific names for flora follow the VBA database.

Flora conservation status was determined in accordance with the Commonwealth EPBC Act, the Victorian *Flora and Fauna Guarantee (FFG) Act 1988*, and the *Advisory List of Rare or Threatened Plants in Victoria* – 2014 (DEPI 2014).

Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses'. For the purpose of the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017a), native vegetation is classified into two categories, a **Patch** of vegetation or a **Scattered Tree**:

- A **patch** of native vegetation is:
  - An area of native vegetation where at least 25% of the total perennial understorey plant cover[13] is native, or
  - An area with three or more native canopy trees[14] where the drip line[15] of each tree touches the drip line of at least one other tree, forming a continuous canopy, or
  - Any mapped wetland included in the Current wetlands map (available on DELWP online mapping tools)
- A **scattered tree** is a native canopy tree that does not form part of a patch

Other forms of vegetation include:

- **Planted native vegetation,** which includes non-indigenous native species and areas of revegetation
- **Scattered native plants**, which include patches of vegetation dominated by introduced species where less than 25% of the total perennial understorey plant cover is native
- **Non-native vegetation**, which includes vegetation that comprises entirely introduced flora species

2.6.2 Vegetation communities

Native vegetation in Victoria is mapped in units known as Ecological Vegetation Classes (EVCs). EVCs are described according to a combination of floristic, life form and ecological characteristics, and through an inferred fidelity to particular environmental attributes. Each EVC occurs under a common regime of ecological processes within a given biogeographic range, and may contain multiple floristic communities.

Other vegetation types that may occur in Victoria include vegetation communities listed as threatened under the EPBC Act and/or the FFG Act. These have separate vegetation classification systems, each of which is also separate to the EVC classification system. As such, any single patch of native vegetation occurring within the study site (or anywhere in Victoria) will be classifiable as a particular EVC, and may also be separately classified as a different ecological community under the EPBC Act, and/or as another vegetation community under the FFG Act.

[13] Plant cover is the proportion of the ground cover that is shaded by vegetation foliage when lit directly from above. Areas that include non-vascular vegetation (such as mosses and lichens) but otherwise support no native vegetation are not considered to be patch for the purpose of the Guidelines. However, when non-vascular vegetation is present with vascular vegetation, it does contribute to the cover when determining the percentage of perennial understorey plant cover.
[14] A native canopy tree is a mature tree (i.e. it is able to flower) that is greater than 3 metres in height and is normally found in the upper layer of the relevant vegetation type.
[15] The drip line is the outer most boundary of a tree canopy (leaves and/or branches) where the water drips on to the ground.

2.6.3 Fauna species

Unless otherwise noted, common and scientific names for fauna follow the VBA database.

For this report, fauna of conservation significance includes species and communities that are:

- Listed as threatened or Migratory under the EPBC Act; and/or
- Listed as threatened under the FFG Act; and/or
- Listed as vulnerable, endangered or critically endangered on the DELWP *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2013) or the *Advisory List of Threatened Invertebrate Fauna in Victoria* (DSE 2009) (species listed as "near-threatened" or "data deficient" are not considered, unless they are also included on the FFG or EPBC Act lists)

2.6.4 Fauna communities

The EPBC Act and the FFG Act list a number of threatened fauna communities, at a national or state scale, respectively. Fauna communities known or potentially occurring within the study area are only considered if they are listed under one or more of these Acts.

2.7 Data collection and management

A range of devices and online tools were used to manage and collect data for the project. Data were collected in the field using an offline version of the mapping application *Collector for ArcGIS* (Collector) version 18.0.2 on hand-held mobile GIS devices or tablets. Location data were collected using MGA 54 GDA94 datum with an accuracy of +/- 10 m.

Mapping with Collector for the rapid assessment stage was undertaken during drive-by assessments, with the aim of guiding the location of further survey rather than accurately depicting the location of individual values. Traffic light polygons were typically drawn to property boundaries, fences or other obvious features in the landscape.

Data were downloaded at least daily onto live ArcGIS online web maps.

Printed maps were used in conjunction with the ArcGIS collector in the field to aid navigation.

2.8 Communication and consultation

2.8.1 Property owners

Access to private properties was integral to the VQA and targeted surveys. GWMWater notified property owners in writing that their properties may be accessed by GHD. Property owners who denied access to their properties were identified in Collector so that all GHD staff were aware of access constraints. GHD did not knowingly enter any properties where property owners specifically requested no access to their property or deemed conditions to be unsafe.

2.8.2 GWMWater

Face-to-face meetings and phone conferences were conducted during the rapid assessment, VQA and targeted surveys to enable GWMWater to make pipeline alignment changes to avoid and minimise native vegetation impacts.

To assist GWMWater to avoid and minimise ecological values, GWMWater staff had access during the rapid assessment, VQA and targeted surveys to a secured Web Map which shows the data collected in the field on Collector. This allowed GWMWater to provide additional information or instruction as the work proceeded.

2.8.3 DELWP

Staff from GWMWater, GHD and DELWP met in Ararat at the commencement of field work. This meeting was attended by Dean Robertson (GWMWater, Environmental Officer), Kelly Dalton (GHD, Project Manager and Senior Zoologist), Fiona Coates (GHD, Senior Botanist), Lisa Macaulay (DELWP, Approvals), Felicity Christian (DELWP, Biodiversity Officer) and Andrea Keleher (DELWP, Biodiversity Officer). During the meeting, the field assessment methods were discussed and the threatened species being considered during rapid assessment habitat mapping were confirmed.

3. Ecological values – flora and vegetation

3.1 Rapid Assessment

Rapid assessments were conducted between 8 October and 2 November 2018, these were conducted by a team of two consisting of a botanist and zoologist. These assessments are a risk based approach where the pipeline alignment is mapped into traffic light categories which determine the level of further survey required. It is recognised that this approach may result in errors both by either over or under estimating the ecological values a property may contain.

The rapid assessment was limited to private property, parallel to roads. Both sides of the road were assessed for a 20 m width on the private property side of the private property/road reserve property boundary. The traffic light mapping was split into six categories described within Table 1. Figure 5 provides a summary of the Traffic light mapping throughout the study area.

3.1.1 Ecological values of the study area and prioritisation

The rapid assessment mapped a total of 1765 km of vegetation in private property. This equated to a total of 22561 ha of private property being assessed. A break-down of the total area mapped within the study area for each traffic light category is provided in Figure 3

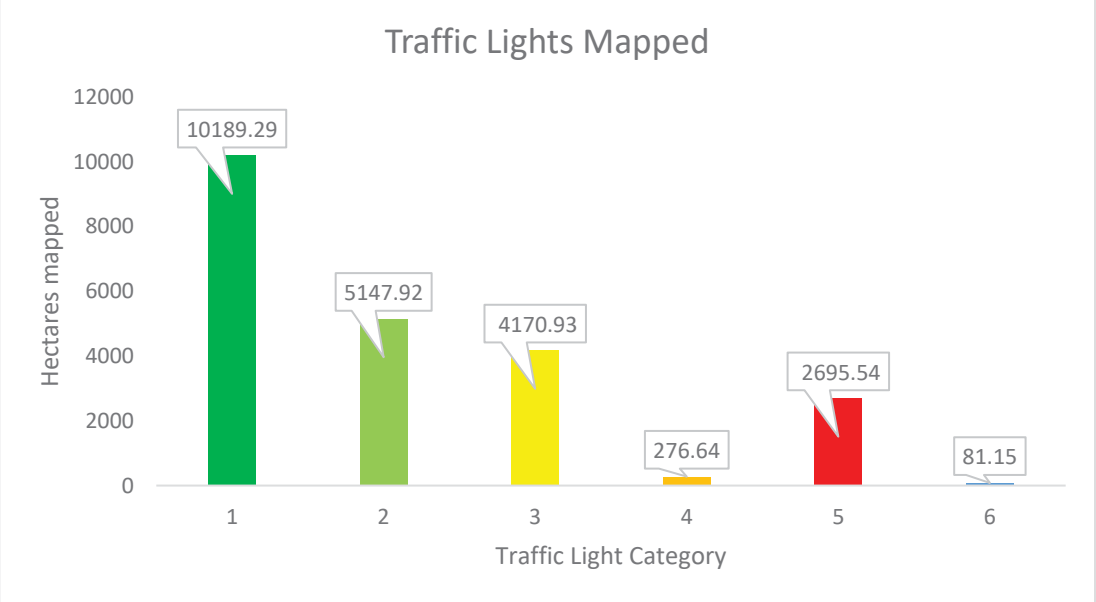


Figure 3 Rapid Assessment polygons mapped within the study area

An example of vegetation mapped as category 1 is shown in Plate 1 where non-native vegetation was dominate These polygons may have been represented by a crop (e.g. vineyard, canola or cereal), a domestic garden/yard, or contain no vegetation (e.g. a house, farm shed). In category 2 the polygons were dominated by non-native vegetation (Plate 2); however, there may be some ecological constraints (e.g. scattered trees or TPZ on road reserve). In Plate 3 category 3, 4 and 5 were dominated by native vegetation. This may range in quality and size of patch, but there will be an impact to native vegetation if the corridor were to intersect.

Plate 1 Traffic Light category 1

Plate 2 Traffic light category 2

Plate 3 Traffic Light category 3,4 and 5

From Figure 5 a broad understanding of the ecological values of the study area can be summarised:

- The southern half of the study area has a higher proportion of vegetation mapped as category 1 and 2 polygons which is aligned with the large scale cropping that dominates this area. Category 3 and above polygons are mainly constrained to the wetlands, swamps and grasslands that remain in a small proportion
- The northern half of the study area has a higher proportion of vegetation mapped as category 3 and above mapped polygons, which can be attributed to grazing being the primary form of agriculture in this area. Grazing polygons often had remnant patches of native vegetation within the private property

Using the rapid assessment, a corridor for the pipeline alignment was produced to avoid and minimise impacts to native vegetation, threatened flora, fauna and communities. By utilising category 1 and 2 polygons in some cases, the corridor was able to avoid higher value category 3 and above polygons.

3.1.2 Flora and vegetation

Figure 4 provides data on the total area of corridor (assessed and not assessed) that is within each Traffic Light Category.

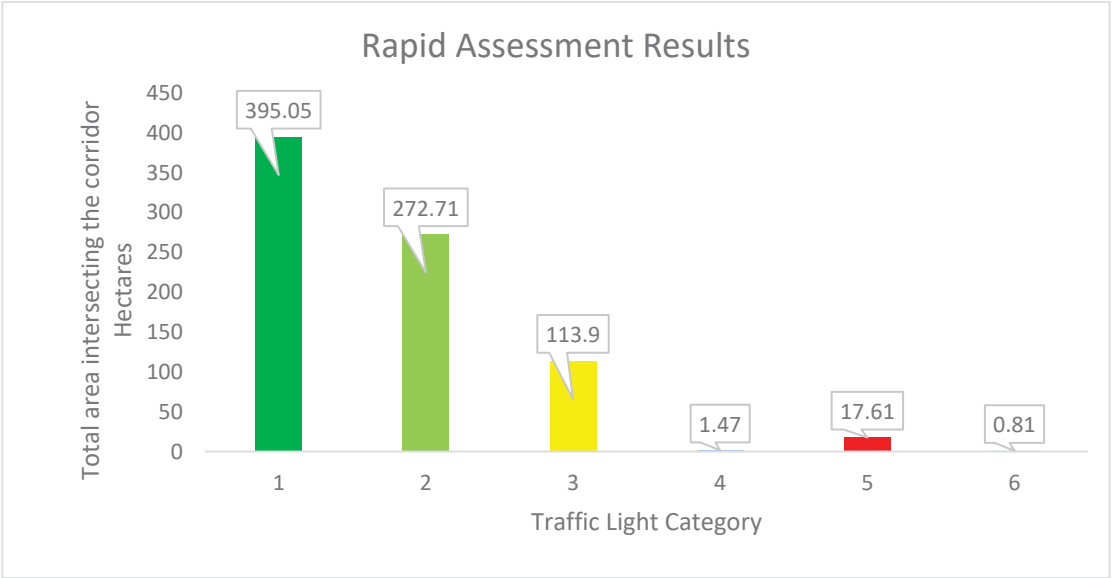


Figure 4 Rapid Assessment polygons within the corridor

Categories 3, 4 and 5 represent polygons that (as per Table 1) appeared to support native vegetation, which may also be habitat for threatened species and or communities. As threatened species and communities are more commonly present within intact high quality native vegetation, these three categories allowed for differentiation between quality and prioritisation for threatened species and communities surveys.

The corridor intersected a total of 132.98 ha of vegetation mapped as Category 3 and above. This area is split into the following categories:

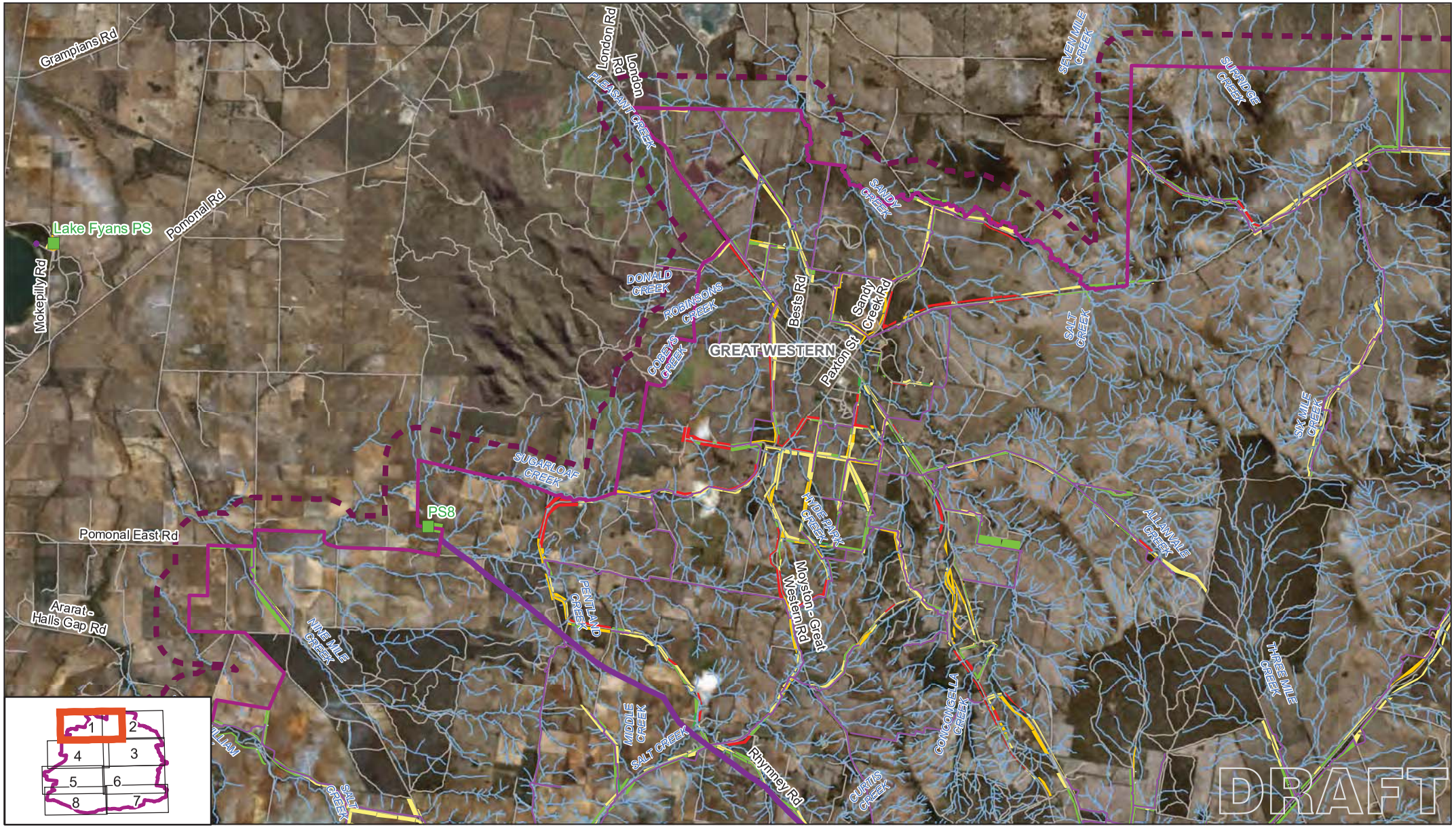
- 113.90 ha of category 3 vegetation required to be assessed to map native vegetation, and to determine presence of any state listed (FFG) flora or communities
- 1.47 ha of category 4 vegetation required to be assessed to map moderate quality native vegetation and to determine the presence of any state listed (FFG) flora or communities
- 17.61 ha of Category 5 vegetation required to be assessed to map high quality native vegetation and to determine the presence of any EPBC Act, FFG Act species and communities

The rapid assessment polygons formed the base data for further surveys throughout the corridor. All polygons marked as category 3 and above were re-visited for either targeted surveys or VQA surveys. Results of these further surveys are discussed in Sections 3.2 and 3.4.

3.1.3 Wetlands and waterways

During the rapid assessment, non-modelled wetlands, waterways and dams were mapped as polygons of category 6. A total of 0.81 ha of the corridor was mapped as category 6.

DELWP Current wetlands were mapped during the rapid assessment as polygons of a minimum of category 3, 4 or 5. As the VQA assessments did not occur during inundation of the wetlands, modelled native vegetation condition scores were required to be used to account for the vegetation within the wetlands. During the VQA assessment a total of 30.1 ha of DELWP current wetlands was mapped within the corridor. Pipeline alignment amendments and the inclusion of HDD as a construction method and identifying other wetlands that could reasonably be avoided (X_Wetlands – see section 2.5) resulted in a decrease in the total area of DELWP current wetlands being impacted (7.93 ha).



Paper Size A4

0 1,250 2,500 5,000

Metres

Horizontal Datum: WGS 1984
Grid: GCS WGS 1984

N

LEGEND

- Township point
- Pump Stations
- Great Western Off Take to Ararat
- Pipeline Alignment

Rapid Assessment

- 1-no further assessment
- 2-Paddock useable but need to avoid issues
- 3-Low quality native vegetation or habitat
- 4-High quality native vegetation or habitat
- 5-Habitat for EPBC Act listed species or com
- 6-Wetland or Dam
- Study Area
- Rural Supply Area Boundary
- Road

Watercourse

- Stream

Waterbodies

- Swamp

Grampians Wimmera Mallee Water
GWMWater East Grampians Pipeline Ecology Surveys

Job Number 31-36625
Revision D
Date 28/02/2019

Rapid Assessment

Figure 5.1

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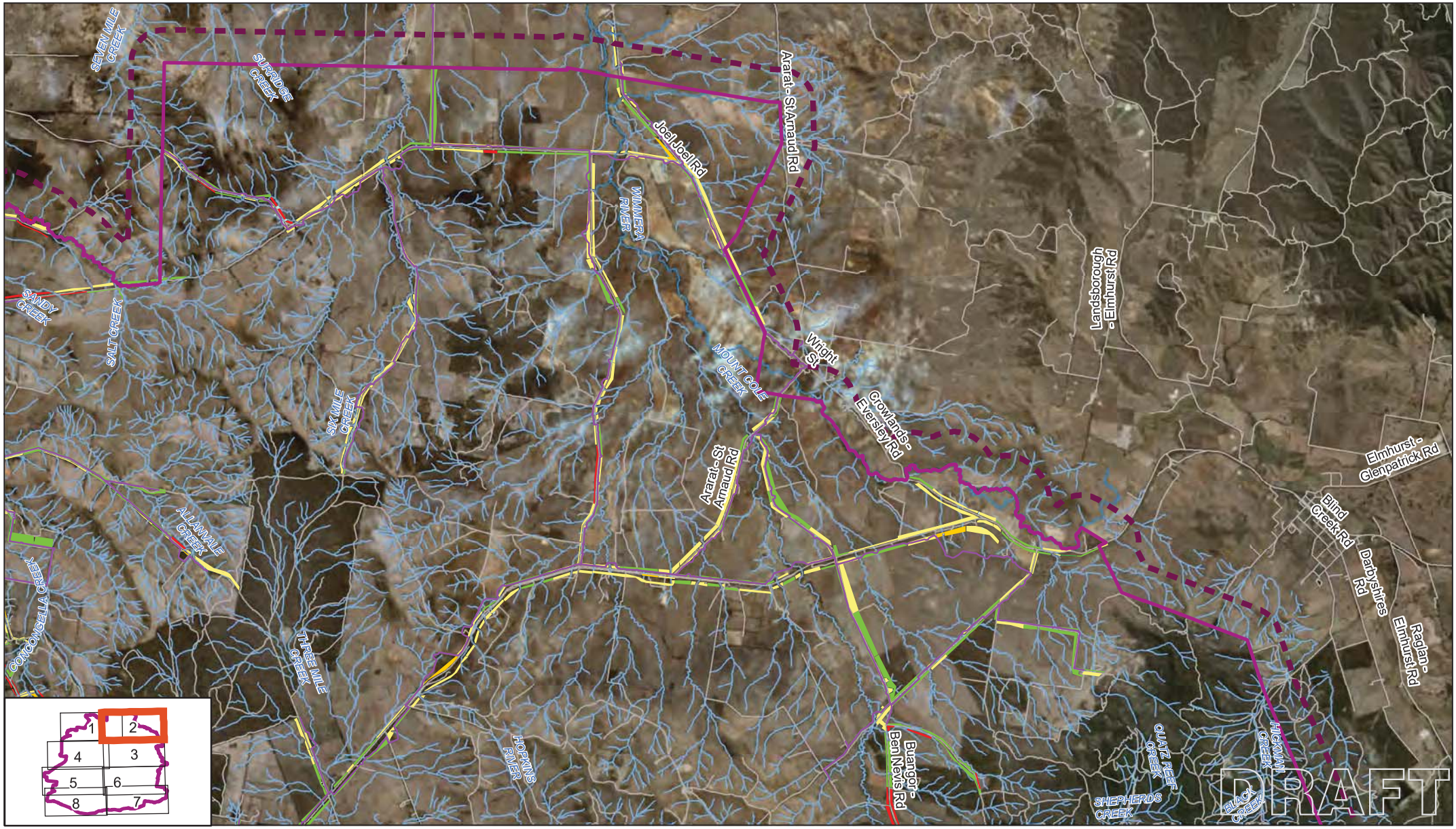
180 Lonsdale Street Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com W www.ghd.com

Data source: DEWLP, VicMap, Grampians Wimmera Mallee Water, 2018-2019; Imagery source: Esri, DigitalGlobe,Geoeye, Earthstar Geographics CNES/Airbus DS,USDA,USGS,AeroGRID,IGN and the GIS User Community, GHD, 2019 Created by: Cjauniau



Paper Size A4

0 1,250 2,500 5,000

Metres

Horizontal Datum: WGS 1984
Grid: GCS WGS 1984

N

LEGEND

Pipeline Alignment

Rapid Assessment

- 1-no further assessment
- 2-Paddock useable but need to avoid issues
- 3-Low quality native vegetation or habitat
- 4-High quality native vegetation or habitat
- 5-Habitat for EPBC Act listed species or com
- 6-Wetland or Dam
- Study Area
- Rural Supply Area Boundary
- Road

Watercourse

- River
- Stream

Grampians Wimmera Mallee Water
GWMWater East Grampians Pipeline Ecology Surveys

Job Number 31-36625
Revision D
Date 28/02/2019

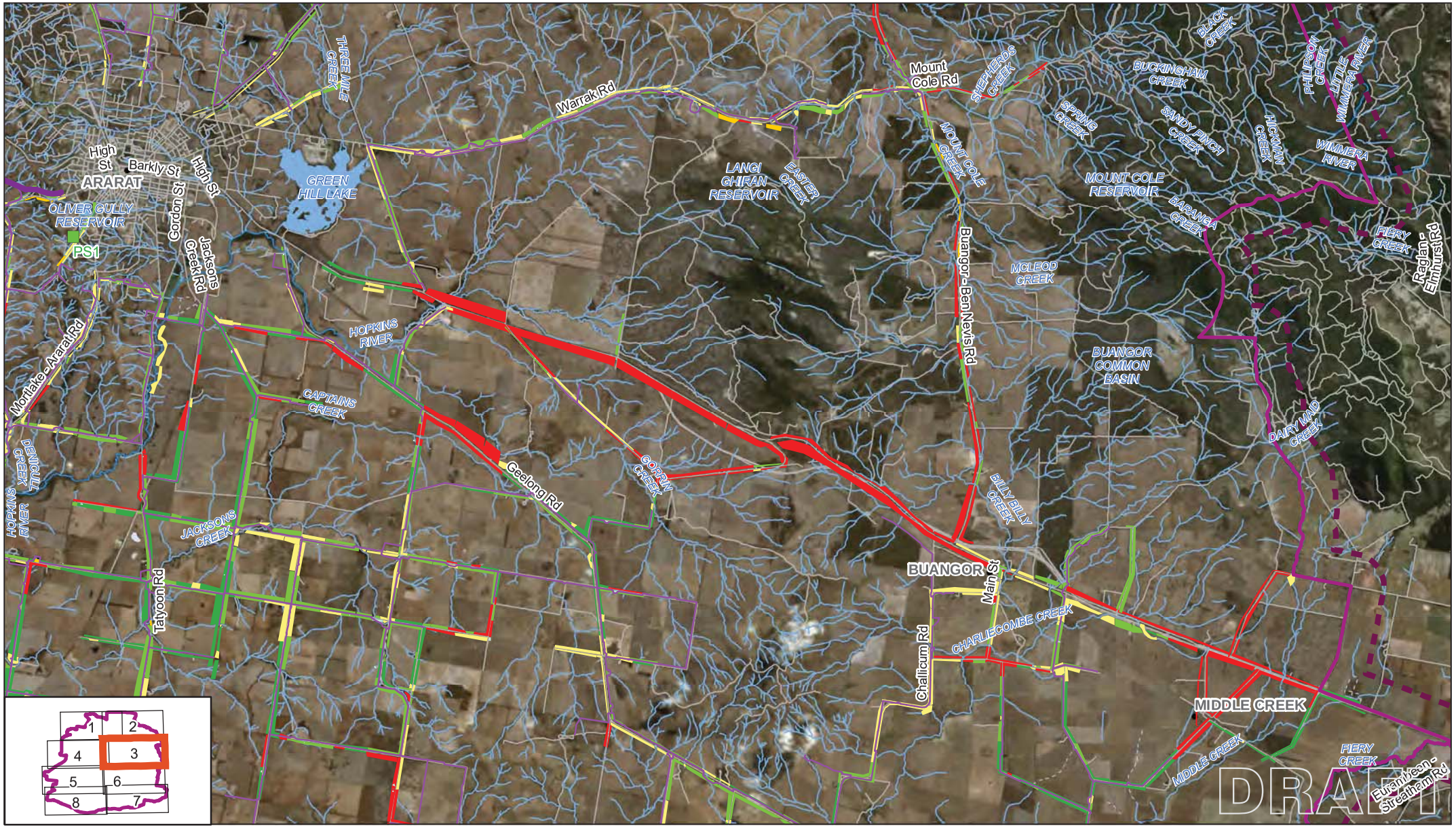
Rapid Assessment

Figure 5.2

G:\31\36625\GIS\Maps\Deliverables\3136625_KBM_A4L.mxd

180 Lonsdale Street Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com W www.ghd.com

Data source: DEWLP, VicMap, Grampians Wimmera Mallee Water, 2018-2019; Imagery source: Esri, DigitalGlobe,Geoeye, Earthstar Geographics CNES/Airbus DS,USDA,USGS,AeroGRID,IGN and the GIS User Community, GHD, 2019 Created by: Cjauniau



Paper Size A4

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Metres

Horizontal Datum: WGS 1984
Grid: GCS WGS 1984

N

LEGEND

- Township point
- Pump Stations
- Great Western Off Take to Ararat
- Pipeline Alignment

Rapid Assessment

- 1-no further assessment
- 2-Paddock useable but need to avoid issues
- 3-Low quality native vegetation or habitat
- 4-High quality native vegetation or habitat
- 5-Habitat for EPBC Act listed species or com
- 6-Wetland or Dam
- Study Area
- Rural Supply Area Boundary
- Road

Watercourse

- River
- Stream
- Drain/Channel/Other

Waterbodies

- Flat
- Lake

GHD

Grampians Wimmera Mallee Water
GWMWater East Grampians Pipeline Ecology Surveys

Job Number 31-36625
Revision D
Date 28/02/2019

Rapid Assessment

Figure 5.3

G:\31\36625\GIS\Maps\Deliverables\3136625_KBM_A4L.mxd

180 Lonsdale Street Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com W www.ghd.com

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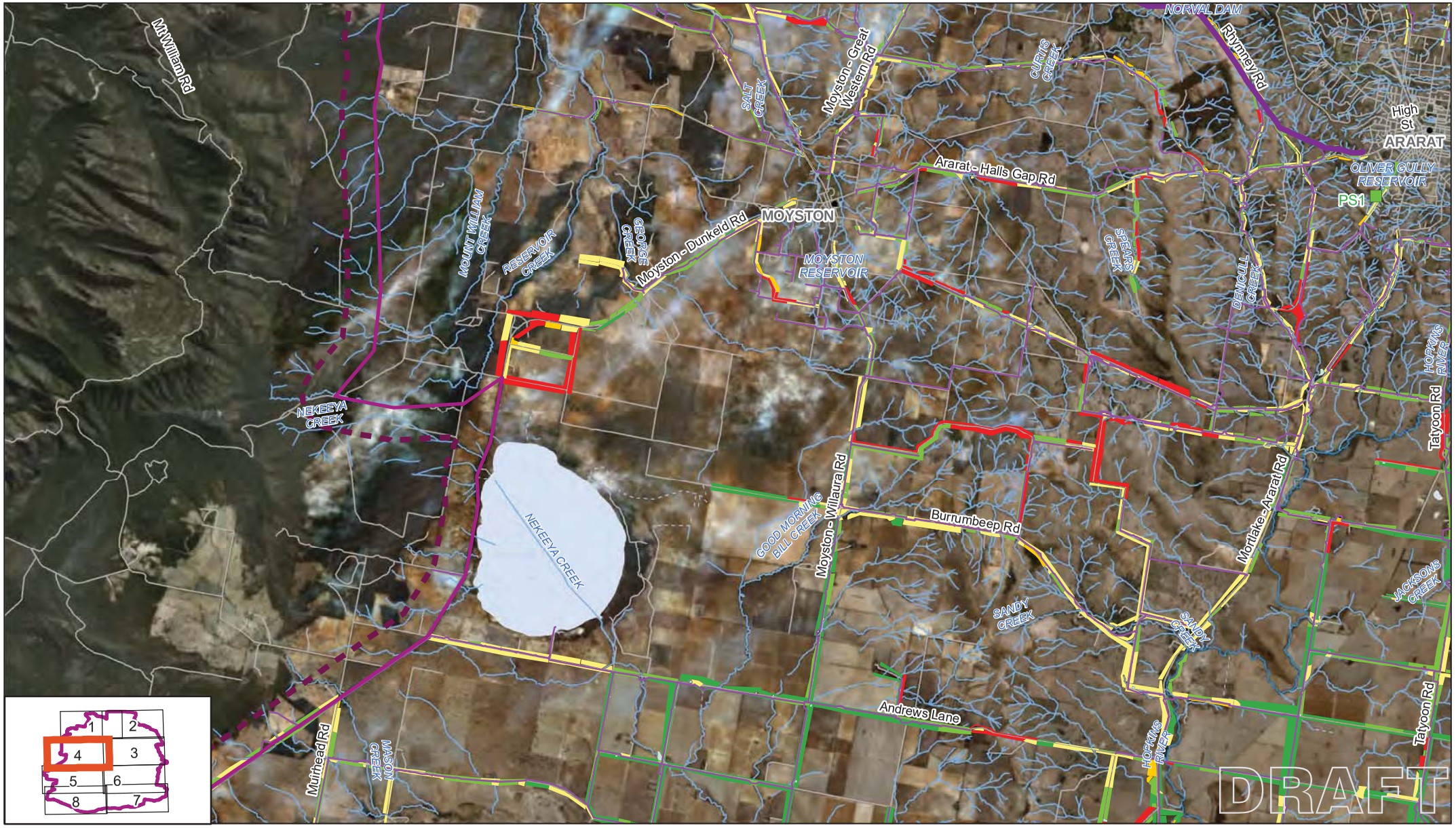

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Metres

Horizontal Datum: WGS 1984
Grid: GCS WGS 1984

N

LEGEND

- Township point
- Pump Stations
- Great Western Off Take to Ararat
- Pipeline Alignment

Rapid Assessment

- 1-no further assessment
- 2-Paddock useable but need to avoid issues
- 3-Low quality native vegetation or habitat
- 4-High quality native vegetation or habitat
- 5-Habitat for EPBC Act listed species or com
- 6-Wetland or Dam
- Study Area
- Rural Supply Area Boundary
- Road

Watercourse

- River
- Stream
- Drain/Channel/Other

Waterbodies

- Flat
- Lake

GHD

Grampians Wimmera Mallee Water
GWMWater East Grampians Pipeline Ecology Surveys

Job Number 31-36625
Revision D
Date 28/02/2019

Rapid Assessment

Figure 5.4

G:\31\36625\GIS\Maps\Deliverables\3136625_KBM_A4L.mxd

180 Lonsdale Street Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com W www.ghd.com

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Paper Size A4

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Metres

Horizontal Datum: WGS 1984
Grid: GCS WGS 1984

N

LEGEND

- Township point
- Pump Stations
- Pipeline Alignment

Rapid Assessment

- 1-no further assessment
- 2-Paddock useable but need to avoid issues
- 3-Low quality native vegetation or habitat
- 4-High quality native vegetation or habitat
- 5-Habitat for EPBC Act listed species or com
- 6-Wetland or Dam
- Study Area
- Rural Supply Area Boundary
- Road

Watercourse

- River
- Stream
- Drain/Channel/Other

Waterbodies

- Lake
- Swamp

GHD

Grampians Wimmera Mallee Water
GWMWater East Grampians Pipeline Ecology Surveys

Job Number 31-36625
Revision D
Date 28/02/2019

Rapid Assessment

Figure 5.5

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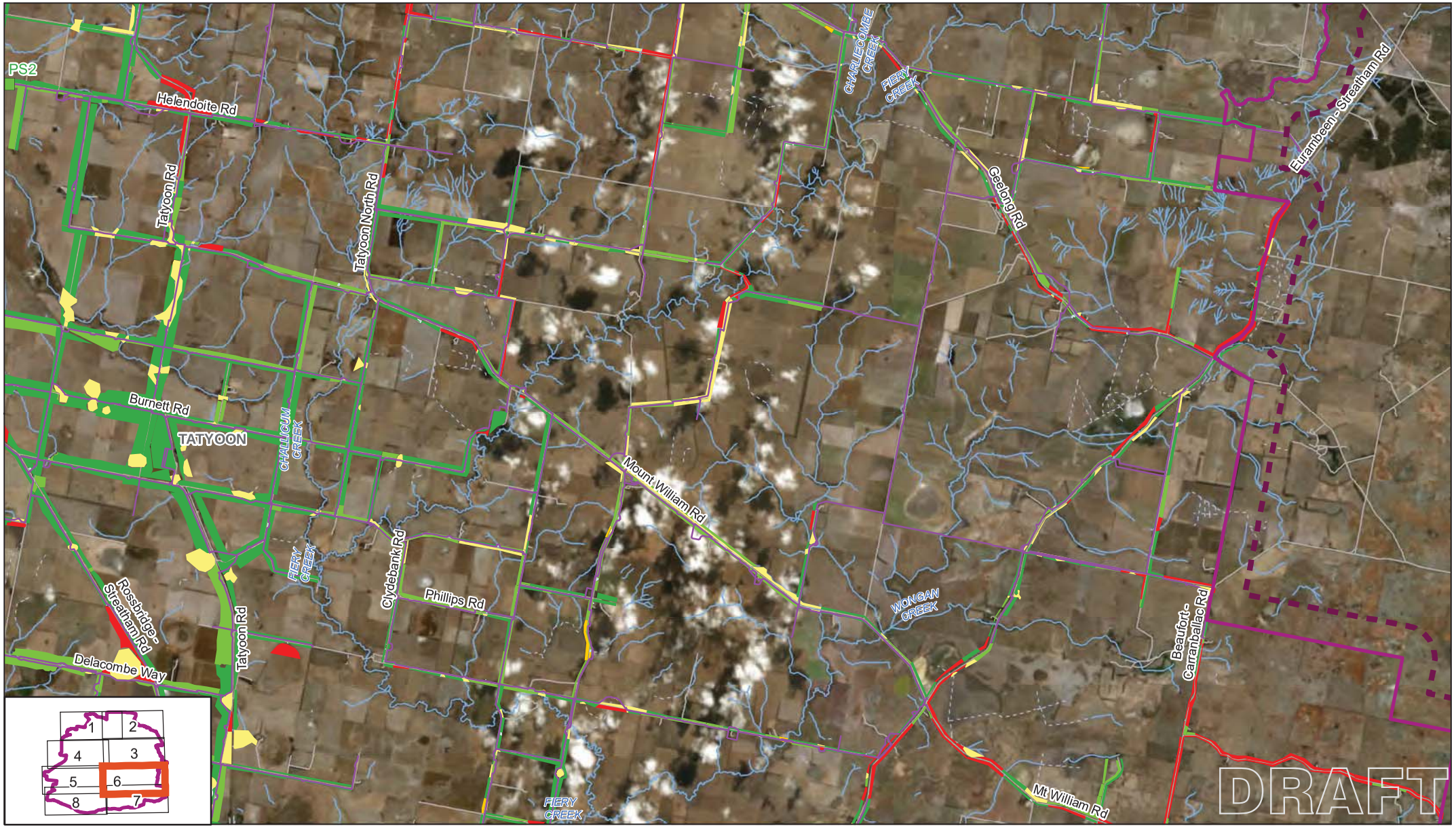
180 Lonsdale Street Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com W www.ghd.com

Data source: DEWLP, VicMap, Grampians Wimmera Mallee Water, 2018-2019; Imagery source: Esri, DigitalGlobe,Geoeye, Earthstar Geographics CNES/Airbus DS,USDA,USGS,AeroGRID,IGN and the GIS User Community, GHD, 2019 Created by: Cjauniau



Paper Size A4

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Metres

Horizontal Datum: WGS 1984
Grid: GCS WGS 1984

N

LEGEND

- Township point
- Pump Stations
- Pipeline Alignment

Rapid Assessment

- 1-no further assessment
- 2-Paddock useable but need to avoid issues
- 3-Low quality native vegetation or habitat
- 4-High quality native vegetation or habitat
- 5-Habitat for EPBC Act listed species or com
- 6-Wetland or Dam
- Study Area
- Rural Supply Area Boundary
- Road

Watercourse

- Stream
- Drain/Channel/Other

Grampians Wimmera Mallee Water
GWMWater East Grampians Pipeline Ecology Surveys

Job Number 31-36625
Revision D
Date 28/02/2019

Rapid Assessment

Figure 5.6

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180 Lonsdale Street Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com W www.ghd.com

Data source: DEWLP, VicMap, Grampians Wimmera Mallee Water, 2018-2019; Imagery source: Esri, DigitalGlobe,Geoeye, Earthstar Geographics CNES/Airbus DS,USDA,USGS,AeroGRID,IGN and the GIS User Community, GHD, 2019 Created by: Cjauniau

Paper Size A4

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Metres

Horizontal Datum: WGS 1984
Grid: GCS WGS 1984

N

LEGEND

- Township point
- Pump Stations
- Pipeline Alignment

Rapid Assessment

- 1-no further assessment
- 2-Paddock useable but need to avoid issues
- 3-Low quality native vegetation or habitat
- 4-High quality native vegetation or habitat
- 5-Habitat for EPBC Act listed species or com
- 6-Wetland or Dam
- Study Area
- Rural Supply Area Boundary
- Road

Watercourse

- River
- Stream
- Drain/Channel/Other

Waterbodies

- Lake

GHD

Grampians Wimmera Mallee Water
GWMWater East Grampians Pipeline Ecology Surveys

Job Number 31-36625
Revision D
Date 28/02/2019

Rapid Assessment

Figure 5.7

G:\31\36625\GIS\Maps\Deliverables\3136625_KBM_A4L.mxd

180 Lonsdale Street Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com W www.ghd.com

Data source: DEWLP, VicMap, Grampians Wimmera Mallee Water, 2018-2019; Imagery source: Esri, DigitalGlobe,Geoeye, Earthstar Geographics CNES/Airbus DS,USDA,USGS,AeroGRID,IGN and the GIS User Community, GHD, 2019 Created by: Cjauniau

Paper Size A4

0 1,250 2,500 5,000

Metres

Horizontal Datum: WGS 1984
Grid: GCS WGS 1984

N

LEGEND

- Township point
- Pipeline Alignment

Rapid Assessment

- 1-no further assessment
- 2-Paddock useable but need to avoid issues
- 3-Low quality native vegetation or habitat
- 4-High quality native vegetation or habitat
- 5-Habitat for EPBC Act listed species or com
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- Study Area
- Rural Supply Area Boundary
- Road

Watercourse

- River
- Stream
- Drain/Channel/Other

Waterbodies

- Lake

GHD

Grampians Wimmera Mallee Water
GWMWater East Grampians Pipeline Ecology Surveys

Job Number 31-36625
Revision D
Date 28/02/2019

Rapid Assessment

Figure 5.8

G:\31\36625\GIS\Maps\Deliverables\3136625_KBM_A4L.mxd

180 Lonsdale Street Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com W www.ghd.com

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3.2.3 Habitat hectare results

Each assessor assessed discrete areas within the study area. The scores listed in Appendix G represent the Habitat Hectares scores of each habitat zone defined within the corridor. Some EVCs are represented by multiple habitat zones as these were assessed as discrete to other habitat zones or have a difference in site condition score greater than 15 points.

In summary; of the 25 habitat zones intersected with the corridor, habitat hectare scores range from 0.11 to 0.51. This relatively low range reflects the degraded and patchy quality of native vegetation within the study area. Native vegetation with a higher score generally occurred in areas where there were large patches of remnant native vegetation nearby. Lower scoring patches were often found along fence lines of property boundaries, where previous clearing and or grazing had occurred.

A total of 71 large trees were mapped within the habitat zones. These trees have been assessed as being impacted by the proposed works, however further design works are expected to avoid all large trees.

All DELWP current wetlands were mapped as a habitat zone, however no VQA was completed due to the wetlands not being in the correct condition to be assessed (inundated). Therefore the weighted average modelled native condition score was used to determine quality in the modelled wetlands.

3.2.4 Scattered trees

The Rapid Assessment highlighted polygons that had scattered trees being potentially impacted within the corridor. During the VQA assessment, all scattered trees within and nearby (less than 15 m) were measured and mapped. Through GIS analysis the TPZ was calculated for each tree. This was used to determine if the tree would be impacted by the works within corridor (i.e. if more than 10% of the TPZ was projected to be impacted).

Appendix H contains data on each scattered tree mapped. GWMWater have subsequently indicated that they will avoid all scattered trees and none have been included within the ENSYM.

3.3 Listed vegetation communities

Ten vegetation communities listed under either the *Flora and Fauna Guarantee Act* (FFG Act) or the *Environment Protection Biodiversity Conservation Act* (EPBC Act) have been considered as potentially occurring within the study area. Targeted surveys for these communities were conducted during October and November following the rapid assessment which highlighted potential polygons that would support these communities. Appendix C highlights the areas that were assessed during the rapid assessment as potential habitat for the listed vegetation communities and where these communities were mapped.

3.3.1 EPBC Act-listed ecological communities

The PMST identified five threatened ecological communities listed under the EPBC Act that are either known or likely to occur within the study area (See Table 5)

Table 5 EPBC Act listed vegetation communities

Listed Nationally Threatened Ecological Communities	National Status	Likelihood of Occurrence
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	Critically Endangered	Known to Occur
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Likely to Occur
Natural Temperate Grasslands of the Victorian Volcanic Plain	Critically Endangered	Likely to Occur
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically Endangered	Likely to Occur
White Box-Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Likely to Occur

Targeted surveys for the EPBC Act-listed ecological communities identified one community present within the corridor. Further detailed design of the pipeline alignment has resulted in no listed ecological communities being impacted. Table 6 identifies the ecological community that was found within the corridor. Appendix J shows the location of targeted surveys for threatened communities and the location of identified and mapped ecological communities.

Table 6 EPBC Act listed ecological communities identified

Listed Nationally Threatened Ecological Communities	Area impacted at time of survey	Area impacted after further detailed design
Natural Temperate Grasslands of the Victorian Volcanic Plain	0.28 ha	0 ha (all to be HDD)

3.3.2 FFG Act-listed communities of flora and fauna

Derived from the EVC mapping and the descriptions of the threatened 'communities of flora and fauna' listed under the FFG Act, five listed communities are predicted to occur within the study area (Table 7).

Table 7 FFG Act-listed 'communities of flora and fauna'

Threatened Flora Communities Listed under the FFG Act
Creekline Grassy Woodland (Goldfields)
Grey Box - Buloke Grassy Woodland
Western (Basalt) Plains Grassland
Western (Basalt) Plains (River Red Gum) Grassy Woodland
Red Gum Swamp Community No.1

The targeted surveys for threatened vegetation communities identified one community to be present within the corridor. Further detailed design of the corridor has resulted in no vegetation communities being impacted. Table 8 identifies the vegetation community that were present within the corridor.

Table 8 FFG Act listed vegetation identified

Threatened FFG Act Flora Communities	Area impacted at time of survey	Area impacted after further detailed design
Western (Basalt) Plains Grassland	0.28 ha	0 ha all to be HDD

3.4 Flora species

3.4.1 Desktop assessment

The VBA database contains records of 1436 flora taxa from within 1 km of the study area. These records include 1093 native taxa and 343 introduced taxa.

A total of 99 listed flora (EPBC Act, FFG Act, VROTS) have been either previously recorded (VBA) or predicted (PMST) to occur within 1 km of the study area (Appendix I).

A review of the 99 flora identified that 29 have the potential to require targeted surveys under the EPBC Act and/or FFG Act, owing to the presence of potentially suitable habitat within the corridor. During October and November targeted surveys were conducted for these species, with survey dates determined by the flowering window of each species (Appendix B). All species, but one (*Pimelea spinescens* subsp. *spinescens*) were captured by these two windows of targeted surveys.

3.4.2 Field assessment

During the VQA and targeted surveys, incidental flora observations were recorded within the corridor. A total of 172 flora were recorded within the corridor, and of these, 121 were native and 51 introduced. (Appendix A)

A total of six species listed under either the EPBC Act, FFG Act or VROTS were recorded within the corridor. A summary of the species that were recorded within the corridor is provided in Table 9 and shown in Appendix J. Section 0 to Section 3.4.6 describes each species in relation to its legislation and habitat requirements.

Table 9 Threatened Species recorded

Scientific name	Common Name	Classification	Records of Species in Corridor	Impacted after further amendments to corridor
Lachnagrostis adamsonii	Adamson's Blown-grass	EN vu L	✓	×
Pimelea spinescens subsp. *spinescens*	Spiny Rice-flower	CR en L	✓	×
Leptorhynchos orientalis	Lanky Buttons	en L	✓	×
Alternanthera sp.1	Plains Joyweed	k	✓	✓
Poa labillardierei var. (Volcanic Plains)	Basalt Tussock-grass	k	✓	✓
Rytidosperma monticola	Small Flower Wallaby Grass	r	✓	✓ (some avoided)

Key:

EN	Endangered under EPBC Act	k	Poorly Known under VROTS
CR	Critically Endangered under EPBC Act	r	rare under Vrots
en	endangered under VROTS	L	Listed as Threatened under FFG Act.
vu	vulnerable under VROTS		

3.4.3 Environment Protection and Biodiversity Conservation Act 1999 - Threatened species

Of the 29 species that were identified to require targeted surveys, 18 were listed under the EPBC Act. The rapid assessment was used to identify polygons that may provide habitat for any of the 18 species. These species subsequently had targeted surveys completed within the identified polygons during their flowering period (Appendix C).

The targeted surveys conducted within the identified polygons during October and November resulted in two EPBC Act species being observed within the corridor:

- *Lachnagrostis adamsonii* (Adamson's Blown-grass) - Endangered
- *Pimelea spinescens* subsp. *spinescens* (Spiny Rice-flower) - Critically Endangered

Lachnagrostis adamsonii (Adamson's Blown-grass)

Lachnagrostis adamsonii is listed as Endangered (EPBC), vulnerable (VROTS), and Listed as Threatened (FFG). This species is a tufted or rarely shortly stoloniferous annual or short-lived perennial grass. It occurs in and around saline depressions on the Volcanic Plain from Portarlington to the South Australian border (RBGV 2019 a).

This species was identified during the rapid assessment as having the potential to occur in the corridor. During the October survey of polygon 7 no positive identification was able to be confirmed due to the lack of fertile material. The road reserve adjoining the property also contained the same habitat and composition of species and contained immature *Lachnagrostis adamsonii* too. During the November survey this species habitat was surveyed for presence again; however, it had been heavily grazed during the month between surveys. The road reserve was surveyed and a positive identification allowed for assumed presence within the corridor based on the presence of similar adjacent habitat. The population within the corridor would be approximately 50 individuals. This species has been avoided by the pipeline alignment avoiding this area.

Pimelea spinescens subsp. *spinescens (Spiny Rice-flower)*

Pimelea spinescens subsp. *spinescens* is listed as Critically Endangered (EPBC), endangered (VROTS) and listed as Threatened (FFG). This species is a deeply taprooted, long-lived subshrub. It occurs in grassland, open shrubland and occasionally woodland, usually on basalt-derived soils. It occurs west of Melbourne (RBGV 2019b).

Potential habitat for Spiny Rice-flower was identified during the rapid assessment. Although targeted surveys were not scheduled for this species until winter, none were observed within the polygons identified during October and November. However, this species was observed within the corridor when it had undergone a change in alignment during the VQA period (Geelong Road). The species was not flowering at the time of observation, but all other aspects of the specimen led to a positive identification of five individuals. This species has been avoided by the pipeline alignment avoiding this area.

During the rapid assessment a patch of what is most likely *Dianella amoena* (Matted Flax-lily) was observed on a roadside within the study area. This was not within the current corridor, and the specimen could not have its identification confirmed due to the lack of flowering/fruiting material.

It is important to note that threatened species may be present nearby the corridor, or were not able to be observed during the targeted survey. If there are corridor changes further targeted surveys may be required.

3.4.4 Flora and Fauna Guarantee Act 1988 - Threatened species

Of the 29 species that were identified to require targeted surveys, 28 were listed under the FFG Act as Threatened Species. The rapid assessment identified polygons of potential habitat for any of the 28 species. These species subsequently had targeted surveys completed during their flowering period (Appendix C).

The targeted surveys conducted in October and November identified one species additional to the above three EPBC Act species within the corridor.

- *Leptorhynchos orientalis* (Lanky Buttons), listed as endangered (VROTS) and listed as Threatened (FFG Act), was observed within a patch of the EPBC Act-listed ecological community, National Temperate Grasslands of the Victorian Volcanic Plain. This species is an annual herb which grows to 30 cm high in open grassland communities (RBGV 2019c). Six specimens of this species was observed during the targeted surveys. Fertile material was present to make a positive identification. This species has been avoided

3.4.5 Flora and Fauna Guarantee Act 1988 – Protected species

During the VQA survey a list of incidental flora species observed was compiled. From this a total of 14 species were observed that are listed as Protected under the FFG Act. The species listed in Table 10 have been observed from within the corridor, within private property.

Table 10 FFG Protected Species

Scientific Name	Common Name
Acacia hakeoides	Hakea Wattle
Acacia mearnsii	Black Wattle
Acacia pycnantha	Golden Wattle
Astroloma humifusum	Cranberry Heath
Brunonia australis	Blue Pincushion
Caladenia spp.	Caladenia
Calocephalus citreus	Lemon Beauty-heads
Calocephalus lacteus	Milky Beauty-heads
Chrysocephalum apiculatum	Common Everlasting
Leptorhynchos squamatus	Scaly Buttons
Senecio quadridentatus	Cotton Fireweed
Solenogyne dominii	Smooth Solenogyne
Thelymitra spp.	Sun Orchid
Vittadinia gracilis	Woolly New Holland Daisy

3.4.6 DELWP Advisory List (VROTS)

During the VQA and targeted surveys, six species were observed that are listed under the DELWP Advisory list (VROTS). Table 11 lists the species that were observed, with three of these species previously discussed in Section 0 under the EPBC Act and FFG Act sections.

Table 11 DELWP Advisory List Species identified

Scientific name	Common Name	Classification
Lachnagrostis adamsonii	Adamson's Blown-grass	EN vu L
Pimelea spinescens subsp. *spinescens*	Spiny Rice-flower	CR en L
Leptorhynchos orientalis	Lanky Buttons	en L
Alternanthera sp.1	Plains Joyweed	k
Poa labillardierei var. (Volcanic Plains)	Basalt Tussock-grass	k
Rytidosperma monticola	Small Flower Wallaby Grass	r

***Alternanthera* sp.1** listed as poorly known under the DELWP Advisory list (VROTS), is a prostrate herb which flowers in October-March. The taxonomic status of this entity is uncertain, although readily distinguishable from *Alternanthera denticulata* (RBGV 2019d). This taxon was recorded from only one location within the study area (Briggs Lane). The patch of *Alternanthera* sp. 1 is on the edge of the current corridor.

***Poa labillardierei* var. (Volcanic Plains)** listed as poorly known under the DELWP Advisory list (VROTS), is a distinctive form of *Poa labillardierei* with completely glabrous lemmas, and lacking a web. It occurs near drainage lines of the Volcanic Plain (e.g. Derrinallum, Darlington, Warrnambool, Dunkeld, Shelford areas). This varient is often more robust than typical forms of the variety which may grow in association with it (RBGV 2019e). This species was recorded from a number habitat zones (FC HZ5 and FC HZ4) within the corridor.

Rytidosperma monticola listed as rare under the DELWP Advisory list, is a compact tufted perennial grass which flowers from September to December. It occurs is dryish grassy woodlands through central and north-eastern Victoria (RBGV 2019f). This species was observed within non-native vegetation and native vegetation during the VQA survey.(Hurleys Lane and polygon 10).

3.5 Noxious weeds

Of the 51 introduced species observed during the VQA, eight of these are listed as a Noxious weeds under the *Catchment and Land Protection Act* (CaLP Act) and three are listed as a Weed of National Significance (WONS). Table 12 shows each noxious weed and its relevant classification in the relevant Catchment Management Authority area for which it was found to occur.

Table 12 Noxious weeds observed during VQA

Scientific Name	Common Name	Classification		
		WONS	Glenelg Hopkins	Wimmera
Cirsium vulgare	Spear Thistle		R	R
Genista monspessulana	Montpellier Broom	WONS	R	C
Hypericum perforatum subsp. *veronense*	St John's Wort		C	C
Juncus acutus subsp. *acutus*	Spiny Rush		C	C
Oxalis pes-caprae	Soursob		R	R
Rosa rubiginosa	Sweet Briar		C	C
Rubus fruticosus spp. agg.	Blackberry	WONS	C	C
Ulex europaeus	Gorse	WONS	C	C

4. Ecological values – fauna

4.1 Desktop assessment

A total of 371 terrestrial fauna species (346 native and 25 non-native) are documented to occur or predicted to occur within the study area (VBA and PMST)[16].

Of the native fauna species, 73 are considered threatened and are listed under the EPBC Act (20), the FFG Act (46) and/or the DELWP *Advisory list of Threatened Vertebrate or Invertebrate Fauna in Victoria* (DSE 2013, DSE 2009) (72)[17]. All threatened fauna species relevant to this project are listed in Appendix K.

Of the fauna species identified for the project, 25 species of native birds are listed as Migratory under the EPBC Act. The Marine status of fauna species (as indicated under the EPBC Act) was not considered because the study area is not in or near a Commonwealth marine area.

4.2 Field assessment

4.2.1 Fauna habitats

An assessment of fauna habitat within the RSA was undertaken during the rapid assessment.

Habitat for fauna in the RSA covers a broad range of descriptions, but can be categorised into the following four main types: grassland, woodland, scattered trees and waterways and waterbodies. These are described in more detail below and example photos of habitats are displayed within Table 13.

Grassland

Much of the RSA has been cleared for agricultural purposes. Consequently, the RSA is now dominated by non-native grasslands. The condition of the grassland in regard to fauna habitat ranges from very poor to good. Most of the grasslands in the RSA are dominated by non-native flora species, and show evidence of frequent or occasional disturbance. Most of the grassland areas are used for grazing of cattle, horses and/or sheep. Some paddocks have been cultivated and cropped, and others showed evidence of being recently harvested for hay.

Only small patches of grassland appeared to support high proportions of native flora species and very little unmodified grassland remains in the RSA. The intact grassland that remains tends to be restricted to road reserves, rail reserves or other parcels of crown land which were outside of the scope of this assessment.

Typically, many fauna would utilise native grassland habitat for foraging, breeding and dispersing across the landscape. As well as supporting a range of common grassland species, this habitat within the RSA has the potential to provide suitable habitat for threatened species including, but not limited to: Striped Legless Lizard (*Delma impar*) and Golden Sun Moth (*Synemon plana*). The Golden Sun Moth (listed as Critically Endangered under the EPBC Act) was recorded in a number of locations across the RSA during VQA and targeted assessments.

[16] These numbers exclude freshwater (fish and aquatic invertebrates) and marine fauna (e.g. marine mammals, fish, whales, sharks, albatross and other sea birds, marine reptiles). These species are not included in this assessment. The project considers terrestrial fauna only.
[17] Note these numbers do not include species listed on DELWP Advisory list as either “near threatened” or “data deficient” and which are not also listed on any other lists.

Woodland

Small parts of the RSA have retained their remnant tree cover, and provide woodland habitat for a wide range of fauna species. Treed habitats occur mostly along roadways and rail lines, but also along some creeklines and in some larger blocks of remnant native woodland habitat. Given that nearly all of the RSA would have supported woodland or grassy woodland prior to European settlement, any remaining woodland now provides important habitat for woodland-dependent fauna, whose habitat has been largely fragmented and isolated. While providing foraging and breeding habitat for some fauna, remaining woodland also provides a network of connectivity for fauna that disperse widely across the landscape (e.g. birds, mobile reptiles and mammals). The condition of woodland within the RSA varies widely. Larger patches of remnant woodland are typically of very high quality for woodland fauna, and have a high likelihood of being used by threatened fauna species and the Victorian Temperate Woodland Bird Community (VTWBC). Smaller and narrower patches tend to be of medium quality, but still of value for fauna dispersal. Patches of planted or non-native woodland are typically of low value for woodland-dependent fauna.

High quality woodland areas may also provide habitat for threatened fauna as outlined within Table 14. As the pipeline is intended to be constructed within private property which is predominately farmland, it is expected that impacts to trees can largely be avoided or limited to minor encroachment on Tree Protection Zones. Of the 221 trees with hollows mapped within proximity of the corridor, only 13 are proposed to be impacted.

Scattered trees

The study site contains numerous scattered indigenous eucalypt trees. Typically, scattered trees have low to moderate value for fauna due to their isolation; however, many of the scattered trees present are large and with hollows, which increases their habitat value for some fauna. Depending on their landscape context (i.e., nearby tree density, isolation, age and maturity), scattered trees may be used to some extent by adaptable birds and other fauna for foraging or protective cover, nesting for resident species and for fauna moving across the landscape. Due to the hollow-bearing nature of the trees, it is possible that they provide habitat for threatened fauna including owls, parrots, Brush-tailed Phascogale (*Phascogale tapoatafa*) and Lace Monitor (*Varanus varius*). Whilst scattered trees occur within the corridor, GWMWater intends to avoid all scattered trees.

Waterways and waterbodies

Waterways and wetlands are abundant across the landscape within the RSA (Appendix E).

Waterways range in quality from barely discernible drainage lines or table drains to large flowing rivers such as the Hopkins River and Wimmera River. Waterways within private properties were typically degraded, lacking emergent and fringing riparian vegetation. Although, in some cases large remnant trees persisted along waterways.

GWMWater are expected to horizontally directional drill (HDD) waterways intersected by the corridor with the exception of table drains.

Wetlands (DELWP current wetland layer) are abundant in the landscape, with 1785 within the study area. Wetlands ranged in quality from man-made farm dams with no emergent or fringing vegetation to large intact wetlands such as Nekeeya Swamp, Mount William Swamp, Green Hill Lake and numerous others.

Much of the landscape in the region is interspersed with irrigation channels and farm dams, which means no location is very far from a water source. Some waterways and wetlands are expected to support common frogs and birds and may on rare occasions support threatened frog and bird species such as those outlined within Table 14. However, a majority of wetlands within the RSA were barely discernible as wetlands, having been cropped or grazed beyond recognition. It is acknowledged that under the right conditions, some of these wetlands may re-establish, however in their current state, most do not offer habitat for many fauna.

Table 13 Examples of fauna habitats within the RSA


Grassland – vast expanses of cropping


Grassland – mosaic of native and non-native suitable for threatened grassland species


Grassland – mosaic of native and non-native suitable for threatened grassland species


Grassland with open woodland


Good quality woodland


Non-native grassland with woodland patches and scattered trees


Non-native grassland with scattered tree


Wetland


Waterway

4.3 Fauna of conservation significance

Seventy-three native terrestrial fauna species are considered threatened and are presented within Appendix K. Twenty-five species of native birds listed as Migratory are considered relevant to the project and are presented within Appendix L.

Prior to the field assessment, species likely to warrant further consideration were identified (GHD 2018) from the full list of species considered and those species are shown in Table 14 (full list of species considered is provided within Appendix K). Table 14 has been updated since it was initially prepared for GHD (2018) to reflect the most up-to-date database searches.

For each species, the likely presence of suitable habitat within the corridor was determined, along with the approximate extent of suitable habitat within the surrounding landscape. This was based on the species' history of occurrence and its habitat use, and the author's knowledge of habitats in this part of Victoria. This was coupled with how recently each species had been recorded (if at all) within 1 km of the RSA (i.e. the study area). A preliminary assessment of the potential for the species or its habitat to be impacted was also made based on the assumption that some habitats (e.g. wetlands, intact patches of woodland) will be avoided. During the rapid assessment, an assessment was made regarding whether given areas contained suitable habitat to support species outlined within Table 14 to inform pipeline design.

Table 14 Threatened fauna that warranted further consideration (i.e., could occur within habitats in the corridor)

Common name	Scientific Name	EPBC	FFG	DELWP	No. of records	Date of most recent record	Habitat Type	Potential for impacts without mitigation (desktop assessment)	Potential for impacts without mitigation in areas assessed (post field assessment)
Mammals									
Brush-tailed Phascogale	*Phascogale tapoatafa*		L	VU	35	2016	Woodland/ forest and nearby scattered trees	Medium	Low – Large intact woodland areas are avoided. All scattered trees are avoided. Impacts to woodland EVCs minimised to greatest possible extent.
Birds									
Curlew Sandpiper	*Calidris ferruginea*	CR	L	EN	9	2004	Wetlands/ waterways (typically coastal)	Low	Low – Waterways HDD. Wetlands typically avoided. Larger intact wetlands avoided. A majority of wetlands were barely discernible as wetlands at the time of the assessment. Those that are not avoided will be subject to temporary disturbance.
Swift Parrot	*Lathamus discolor*	CR	L	EN	13	2004	Woodland/ forest and scattered trees	Low	Low – Large intact woodland areas are avoided. All scattered trees are avoided. Impacts to woodland EVCs minimised to greatest possible extent.
Australasian Bittern	*Botaurus poiciloptilus*	EN	L	EN	7	1998	Wetlands/ waterways	Low	Low – Waterways HDD. Wetlands typically avoided. Larger intact wetlands avoided. A majority of wetlands were barely discernible as wetlands at the time of the assessment. Those that are not avoided will be subject to temporary disturbance.
Barking Owl	*Ninox connivens*		L	EN	12	2011	Woodland/ forest and scattered trees	Low	Low – Large intact woodland areas are avoided. All scattered trees are avoided. Impacts to woodland EVCs minimised to greatest possible extent.

Common name	Scientific Name	EPBC	FFG	DELWP	No. of records	Date of most recent record	Habitat Type	Potential for impacts without mitigation (desktop assessment)	Potential for impacts without mitigation in areas assessed (post field assessment)
Blue-billed Duck	*Oxyura australis*		L	EN	51	2004	Wetlands with deeper water	Low	Low - Waterways HDD. Wetlands typically avoided. Larger intact wetlands avoided. A majority of wetlands were barely discernible as wetlands at the time of the assessment. Those that are not avoided will be subject to temporary disturbance.
Freckled Duck	*Stictonetta naevosa*		L	EN	21	1999	Wetlands	Low	Low - Waterways HDD. Wetlands typically avoided. Larger intact wetlands avoided. A majority of wetlands were barely discernible as wetlands at the time of the assessment. Those that are not avoided will be subject to temporary disturbance.
Diamond Firetail	*Stagonopleura guttata*		L	NT	27	2014	Woodland/ forest, scattered trees and grassland	Medium	Low – Large intact woodland areas are avoided. All scattered trees are avoided. Impacts to woodland EVCs minimised to greatest possible extent.
Eastern Great Egret	*Ardea modesta (=alba)*		L	VU	44	2012	Wetlands/ waterways	Low	Waterways HDD. Wetlands typically avoided. Larger intact wetlands avoided. A majority of wetlands were barely discernible as wetlands at the time of the assessment. Those that are not avoided will be subject to temporary disturbance.
Speckled Warbler	*Chthonicola sagittata*		L	VU	24	2005	Woodland/ forest	Low	Low – Large intact woodland areas are avoided. All scattered trees are avoided. Impacts to woodland EVCs minimised to greatest possible extent.
Brolga	*Grus rubicunda*		L	VU	421	2016 (VBA) 2018 (GHD)	Wetlands/ waterways/ grassland	Low	Low – Observed during assessment but highly mobile species. Waterways HDD. Wetlands typically avoided. Larger intact wetlands avoided. A majority of wetlands were barely discernible as wetlands at the time of the assessment. Those that are not avoided will be subject to temporary disturbance.

Common name	Scientific Name	EPBC	FFG	DELWP	No. of records	Date of most recent record	Habitat Type	Potential for impacts without mitigation (desktop assessment)	Potential for impacts without mitigation in areas assessed (post field assessment)
Powerful Owl	*Ninox strenua*		L	VU	31	2014	Woodland/ forest and scattered trees	Low	Low – Large intact woodland areas are avoided. All scattered trees are avoided. Impacts to woodland EVCs minimised to greatest possible extent.
Australasian Shoveler	*Anas rhynchotis*			VU	242	2008	Wetlands	Low	Low - Waterways HDD. Wetlands typically avoided. Larger intact wetlands avoided. A majority of wetlands were barely discernible as wetlands at the time of the assessment. Those that are not avoided will be subject to temporary disturbance.
Hardhead	*Aythya australis*			VU	140	2006	Wetlands	Low	Low - Waterways HDD. Wetlands typically avoided. Larger intact wetlands avoided. A majority of wetlands were barely discernible as wetlands at the time of the assessment. Those that are not avoided will be subject to temporary disturbance.
Musk Duck	*Biziura lobata*			VU	163	2008	Wetlands	Low	Low - Waterways HDD. Wetlands typically avoided. Larger intact wetlands avoided. A majority of wetlands were barely discernible as wetlands at the time of the assessment. Those that are not avoided will be subject to temporary disturbance.
Reptiles									
Corangamite Water Skink	*Eulamprus tympanum marnieae*	EN	L	CR	1	1998	Wetlands/ waterways	High	Low - No habitat observed within corridor.
Striped Legless Lizard	*Delma impar*	VU	L	EN	142	2015	Grassland, open woodland	High	Low – Potential habitat identified within RSA has been avoided.

Common name	Scientific Name	EPBC	FFG	DELWP	No. of records	Date of most recent record	Habitat Type	Potential for impacts without mitigation (desktop assessment)	Potential for impacts without mitigation in areas assessed (post field assessment)
Tussock Skink	*Pseudemoia pagenstecheri*			VU	123	2010	Grassland, open woodland	High	Low – High quality grassland has been avoided as it is potential habitat for Golden Sun Moth and Striped Legless Lizard. In native grassland the corridor of impact has been reduced to no more than eight metres wide.
Lace Monitor	*Varanus varius*			EN	12	2011	Woodland/forest / scattered trees	Low	Low – Large intact woodland areas are avoided. All scattered trees are avoided. Impacts to woodland EVCs minimised to greatest possible extent.
Bearded Dragon	*Pogona barbata*			VU	10	2013	Woodland/forest and grassland	Low	Low - Large intact woodland areas are avoided.
Frogs									
Growling Grass Frog	*Litoria raniformis*	VU	L	EN	34	2011	Wetlands/ waterways	Medium	Low – Potential habitat identified within RSA has been avoided. Waterways HDD. Wetlands typically avoided. Larger intact wetlands avoided. A majority of wetlands were barely discernible as wetlands at the time of the assessment. Those that are not avoided will be subject to temporary disturbance.
Brown Toadlet	*Pseudophryne bibronii*		L	EN	122	2014	Woodland/ forest/ waterways	High	Low – Potential habitat identified within RSA has been avoided. Waterways HDD. Wetlands typically avoided. Larger intact wetlands avoided. A majority of wetlands were barely discernible as wetlands at the time of the assessment. Those that are not avoided will be subject to temporary disturbance.

Common name	Scientific Name	EPBC	FFG	DELWP	No. of records	Date of most recent record	Habitat Type	Potential for impacts without mitigation (desktop assessment)	Potential for impacts without mitigation in areas assessed (post field assessment)
Southern Toadlet	*Pseudophryne semimarmorata*			VU	1	2012	Woodland/ forest/ waterways	Low	Low – Potential habitat identified within RSA has been avoided. Waterways HDD. Wetlands typically avoided. Larger intact wetlands avoided. A majority of wetlands were barely discernible as wetlands at the time of the assessment. Those that are not avoided will be subject to temporary disturbance.
Invertebrates									
Golden Sun Moth	*Synemon plana*	CR	L	CR	213	2012 (VBA) 2018 (GHD)	Grassland, open woodland	High	Low – Potential and actual habitat identified within RSA and avoided.
Glenelg Spiny Cray	*Euastacus bispinosus*	EN	L	EN	1	2001	Waterways	Low	Low – waterways to be HDD.
Western Cray	*Geocharax falcata*			EN	4	2007	Waterways	Low	Low – waterways to be HDD.

CR – Critically endangered, VU – Vulnerable, L – Listed, EN – Endangered, NT – Near Threatened

4.3.1 Environment Protection and Biodiversity Conservation Act 1999 - Threatened species

Of the 27 EPBC Act listed fauna species identified for the project, eight are considered possible to occur in areas of construction and will require consideration during detailed design (Table 14). Whilst the project is not considered to have undergone detailed design, the corridor was refined following the VQA and targeted surveys to avoid areas that were identified as habitat for species listed under the EPBC Act in particular. Following this refinement, the risk of impact on EPBC Act listed species within areas assessed is considered low. Species that were identified as warranting further consideration (Table 14) are discussed in more detail below.

Growling Grass Frog (Vulnerable)

The Growling Grass Frog is known from 34 records within the study area and was most recently recorded in 2011. Growling Grass Frogs are found mostly amongst emergent vegetation including rushes, reeds and sedges, or in or at the well-vegetated edges of slow-flowing waterbodies such as lagoons, swamps, lakes, ponds and farm dams. Growling Grass Frog may utilise permanent or semi-permanent waterbodies. Typical habitats include open vegetated wetlands, flooded paddocks and drains. The Growling Grass Frog is relatively mobile and able to colonise wetlands/waterbodies during suitable conditions.

Habitat suitable for this species was identified during the rapid assessment stage of the assessment (20 polygons, Appendix M); the assessment included all waterbodies within the corridor including dry waterbodies that were identified as a current wetland. The assessment did not include waterways as they are intended to be HDD. Using the rapid assessment information, the corridor was refined to avoid all but 0.2 km of Growling Grass Frog habitat that intersected the corridor. The corridor was further refined to HDD 0.1 km and avoid (X_Impact) the remaining 0.1 km of potential habitat identified.

Curlew Sandpiper (Critically Endangered), Australasian Bittern (Endangered) and Glenelg Spiny Crayfish (Endangered)

These species may occur within the RSA but impacts on individuals are considered unlikely based on the understanding that waterways are expected to be HDD (i.e., impacts avoided); an assumption has been made that if waterways are HDD then adjacent riparian habitat would also be avoided. Wetlands (including DELWP current wetland layer) are abundant in the landscape, with 1785 wetlands identified within the study area. Following avoidance measures, the current corridor intersects 48 of these. A majority of wetlands within the RSA were barely discernible as wetlands, having been cropped or grazed beyond recognition. It is acknowledged that under the right conditions some of these wetlands may re-establish, however in their current state they offer limited habitat for many fauna. As vegetation within current wetlands is not required to be assessed on the ground, wetlands that were identified as suitable habitat for the Growling Grass Frog during the rapid assessment have been used as a surrogate for indicating suitable habitat for other species (i.e. contains emergent or fringing vegetation and currently contained water). All habitat identified for the Growling Grass Frog has been avoided and as such suitable habitat for the Curlew Sandpiper, Australasian Bittern and the Glenelg Spiny Crayfish is also expected to be avoided.

Swift Parrot (Critically Endangered)

The Swift Parrot is a winter migrant to Victoria (and other parts of SE Australia) from breeding areas in Tasmania. In Victoria, it prefers dry, open eucalypt forests and woodlands, especially Box Ironbark Forest in north-central Victoria. This species is expected to utilise flowering Eucalypt trees *en route* to more favourable habitat across western Victoria.

Most of the RSA has been cleared of its woodland. The large intact woodland areas that remain include Langi Ghiran State Park, Mount Buangor State Park Ararat Regional Park and Grampians National Park which are largely avoided by the alignment. Isolated small patches of open woodland occur more so in the northern section of the RSA, especially surrounding some of the larger waterbodies, and throughout parts of the RSA within the Central Victorian Uplands bioregion where agricultural practices tended to be dominated by grazing rather than cropping (the opposite pattern was evident in the southern half of the RSA).

This species is known from 13 records across the study area but was last recorded 15 years ago (last recorded 2004). While Swift Parrots may forage in trees in the area occasionally and opportunistically, there is no evidence to suggest that any part of the area is favoured or visited regularly by this species. Surveys for this species are unlikely to be useful for confirming absence, given the sporadic nature of the species' feeding patterns based on seasonal flowering of food sources.

As the pipeline is intended to be constructed with private property which is predominately cleared farmland, it is expected that impacts on trees can largely be avoided or limited to minor encroachment on Tree Protection Zones. The project expects to be able to avoid all impacts to scattered trees and has minimised impacts to patches to the greatest extent possible. Impacts on the Swift Parrot would be negligible.

Corangamite Water Skink (Endangered)

The Corangamite Water Skink is known from only 1 record within the study area (1998). The species has a highly restricted distribution between Colac and Lake Bolac and if present within the RSA is expected to be restricted to the southern area near Lake Bolac within basalt rocky areas or remnant shrubs near permanent or ephemeral wetlands. Habitat for the species was not observed within areas assessed.

Golden Sun Moth (Critically Endangered)

The Golden Sun Moth is known from 213 records within the study area and prior to this assessment, was recorded most recently in 2012. This species occurs within natural temperate grasslands, grassy woodlands and some exotic grasslands (especially those dominated by tussock forming grass species). Whilst much of the RSA has been subject to cultivation and cropping, areas that still support native grassland and/or non-native grassland that is grazed without a recent history of cropping have the potential to support this species.

The majority of the known records for the Golden Sun Moth in the RSA are around the larger towns or along major roads, which likely reflects the location of previous surveys rather than the true distribution of the species.

The rapid assessment survey focussed on mapping the extent of suitable habitat for this species. Approximately 220 km of potential habitat for the Golden Sun Moth were mapped (Appendix M). From this, GWMWater refined the alignment to avoid almost all of this habitat.

Targeted surveys for Golden Sun Moth were undertaken within 14 polygons identified by GWMWater as difficult to avoid (Appendix M). Surveys were conducted during the flying season under appropriate weather conditions Table 15. Golden Sun Moths were identified within four polygons (Table 16) along St George Rd and St Ethels Road (Appendix D). Golden Sun Moths were also incidentally observed at seven locations during VQA (Table 17). At total of 134+ individual Golden Sun Moths were observed over the course of the project.

Table 15 Golden Sun Moth targeted survey conditions

Date	1/12/2018	6/12/2018	12/12/2018	19/12/2018
Round	1	2	3	4
Observers	KD, JW	KD, CM	KD, MM	KD, ZB
Temperature (ºC)	20.8-27.5	24.1-34.3	25-27.4	18.6-25.8
Humidity (%)	21-38	13-38	38-48	14-64
Wind speed (km/h)	20-30	17-26	15-24	6-28
Cloud cover (%)	0-60	0-5	10-50	70-100
Rain (mm)	0	0	0	0

Table 16 Golden Sun Moth targeted surveys results

Polygon number	Rounds surveyed	Males	Females
1	1, 2, 3, 4	0	0
2	1, 2, 3, 4	0	0
3	1, 2, 3, 4	0	0
4	1, 2, 3, 4	1	0
5	1	1	0
6	1	1	0
7	1, 2, 3, 4	0	0
8	1, 2, 3, 4	0	0
9	1, 2	3	0
10	1, 2, 3, 4	0	0
11	1, 2, 3, 4	0	0
12	1, 2, 3, 4	0	0
13	1, 2, 3, 4	0	0
14	1, 2, 3, 4	0	0

Table 17 Incidental observations of Golden Sun Moth

Location	No. of GSM observed	Date
Geelong Road	1	14/11/18
Garden Gully Road	100+ (inc 2 females)	16/11/18
Mortlake- Ararat Road	6	19/11/18
Deenicull Creek Road	13	20/11/18
Deenicull Creek Road and Ararat-Halls Gap Road	6	20/11/18
Helendoite Road	1	21/11/18
Warrak Road	1	12/11/18

To avoid Golden Sun Moth habitat, GWMWater have used a combination of HDD and complete avoidance (deletion of certain lengths of pipeline alignment). As a result, impacts within any areas where Golden Sun Moth were observed or areas of potential habitat are expected to be avoided.

Striped Legless Lizard (Vulnerable)

The Striped Legless Lizard is known from 142 records within the study area and was recorded most recently within 2015. This species occurs within natural temperate grasslands, grassy woodlands and some exotic grasslands (especially those dominated by tussock forming grass species). Whilst much of the RSA has been subject to cultivation and cropping, areas that still support native grassland and/or non-native grassland that is grazed without a recent history of cropping have the potential to support this species. The Striped Legless Lizard records are distributed throughout much of the RSA though there are no records north of Ararat. This may simply reflect lack of previous survey.

The rapid assessment survey focussed on mapping the extent of suitable habitat for this species. During the rapid assessment, approximately 264 km of potential habitat for the Striped Legless Lizard was mapped (Appendix M). From this, GWMWater refined the alignment to avoid almost all of this habitat.

To further avoid Striped Legless Lizard habitat, GWMWater have used a combination of HDD and complete avoidance (deletion of certain lengths of pipeline alignment). Due to timing constraints and the effort required to determine the presence or absence of this species over the vast RSA, surveys were not done and presence was assumed. All areas where potential habitat for Striped Legless Lizard was observed are expected to be avoided.

4.3.2 Environment Protection and Biodiversity Conservation Act 1999 – listed Migratory Fauna

Twenty-five species (all birds) known or predicted to occur within the study area are listed as Migratory under the EPBC Act (Appendix L).

In terms of the EPBC Act, an action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

- Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species
- Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or
- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species

Given the plethora of wetlands in the study area (1785 current wetlands) an array of Migratory species are expected to make use of some of the available habitats. Following avoidance measures (HDD and deletion of certain lengths of pipeline alignment) the corridor intercepts 48 of these wetlands. A majority of wetlands within the RSA were barely discernible as wetlands, having been cropped or grazed beyond recognition. It is acknowledged that under the right conditions some of these wetlands may re-establish however in their current state offer low value habitat for many fauna. Wetland habitat identified during the rapid assessment as being suitable habitat for the Growling Grass Frog were also considered suitable habitat for Migratory species. All habitat identified for the Growling Grass Frog has been avoided and as such suitable habitat for most Migratory species is also expected to be avoided. In addition, waterways are expected to be HDD. Habitats suitable for terrestrial Migratory species such as Rufous Fantail (*Rhipidura rufifrons*), Yellow Wagtail (*Motacilla flava*), Satin Flycatcher (*Myiagra cyanoleuca*) tend to include the more intact woodland patches which are largely avoided. It is not expected Migratory species will make substantial use of habitats proposed to be impacted or that works would result in impacts on important habitat or on a significant proportion of a population of Migratory species.

4.3.3 Flora and Fauna Guarantee Act 1988 - Threatened species

Of the 46 FFG Act listed fauna species identified for the project, 10 are considered most likely to occur within the study area (Table 14) and have not already been discussed above (section 4.3.1). These species are discussed in more detail below.

Brush-tailed Phascogale

The Brush-tailed Phascogale is a nocturnal, arboreal, carnivorous marsupial which inhabits open dry woodlands and forests with little ground cover. It is known from 35 records within the study area, most recently from 2016. The species is typically associated with box, ironbark and stringybark eucalyptus, but known to use a variety of tree species. Phascogales typically nest within hollows of dead or live trees, though they may also den in nests constructed under bark or in tree stumps.

As the pipeline is intended to be constructed within private property, which in the RSA is predominately cleared farm land, it is expected that impacts on trees can largely be avoided. This species is most likely to occur within the large intact woodland habitats within the RSA (see section 4.2.1) which are expected to be avoided. All scattered trees are also expected to be avoided. Of the 221 trees with hollows mapped within proximity of the corridor, only 13 are proposed to be impacted. Presence of this species is assumed and impacts mitigated by avoidance of trees and pre-clearance of hollows where that is not possible.

Barking Owl and Powerful Owl

The Barking and Powerful Owls are known from 12 and 31 records respectively within the study area. Both of these species may occur across the RSA in open woodlands and forest EVCs. They forage across large areas and rely on relatively large hollows for nesting. As the pipeline is intended to be constructed within private property, which in the RSA is predominately cleared farm land, it is expected that impacts on trees can largely be avoided.

These species are most likely to occur within the large intact woodland habitats within the RSA (see section 4.2.1) which are expected to be avoided. All scattered trees are also expected to be avoided. Of the 221 trees with hollows mapped within proximity of the corridor, only 13 are proposed to be impacted. Presence of these species is assumed and impacts mitigated by avoidance of trees and pre-clearance of hollows where that is not possible.

Blue-billed Duck and Freckled Duck

Threatened ducks such as the Blue-billed Duck and the Freckled Duck are expected to be restricted to the larger, deeper and well-vegetated wetlands. The pipeline alignment is expected to avoid impacts to larger wetlands. So while these species may be present within the RSA, the risk of impact is expected to be low.

Diamond Firetail and Speckled Warbler

The Diamond Firetail and the Speckled Warbler inhabit open woodland and forest environments. The Diamond Firetail may also use grassland habitats.

These species are most likely to occur within or near the large intact woodland habitats within the RSA (see section 4.2.1) which are expected to be avoided. All scattered trees are also expected to be avoided. Presence of these species is assumed and impacts mitigated by avoidance of trees and pre-clearance of hollows where that is not possible.

Eastern Great Egret and Brolga

These two species utilise wetland, waterway and wet grassland habitats. The Eastern Great Egret is known from 44 records within the study area, most recently in 2012. The Brolga is known from over 400 records and was observed during the field assessment for this project flying over a large wetland. Both of these species are expected to occur sporadically across suitable habitat within the RSA.

Waterways are expected to be HDD and a majority of wetlands within the RSA were barely discernible as wetlands, having been cropped or grazed beyond recognition. It is acknowledged that under the right conditions some of these wetlands may re-establish, however in their current state, they do not offer habitat for many fauna. Wetland habitats that were identified during the rapid assessment as suitable habitat for the Growling Grass Frog are also considered suitable habitat for the Eastern Great Egret and Brolga. All habitat identified for the Growling Grass Frog has been avoided and as such quality wetland habitats have been avoided.

These species may also use cropped paddocks, especially when irrigated. Works within grassland habitats would be reinstated and impact on habitats for these species is expected to be temporary and minor. These species are highly mobile and the likelihood of impacts to individuals or as a result of disturbance or habitat loss is low.

Brown Toadlet

Toadlets are small (<30 mm), short-limbed, ground-dwelling frogs in the Family Myobatrachidae (Southern Frogs) that tend to walk rather than jump. Most species have coarse black/brown and white marbling on the belly, and orange or yellow in the groin and/or armpits.

This species is known from moist soaks, depressions, dams and watercourses in woodland and open forest, where there is sufficient litter or other ground cover. Adults are secretive and shelter beneath leaf litter and other debris in damp areas. Males call to attract females in autumn, and eggs are laid on land in damp depressions. Eggs and tadpoles develop in those depressions that flood following autumn rains.

The Brown Toadlet is known from 122 records within the study area, most recently in 2014. Records of this species are abundant along the Western Hwy between Beaufort and Great Western especially within the rail and road reserves that contain woodland areas with drainage lines. The species is likely to occur in suitable habitat throughout the RSA. No suitable habitat that was identified for this species is proposed to be impacted based on the areas assessed to date. Targeted surveys are likely to be required if suitable habitat is present and expected to be impacted, surveys would be limited to the autumn period.

4.3.4 Flora and Fauna Guarantee Act 1988 - Threatened Fauna Community

One listed fauna community, the FFG-listed 'Victorian Temperate Woodland Bird Community', has the potential to occur within the study area based on its geographic distribution and history of VBA records of the relevant bird species. The description of this community includes a number of key indicator bird species (which confirm the presence of the community) and associated bird species (which indicate the potential presence of the bird community). The VBA database has records for 16 key indicator species and 13 associated species from within the study area.

As the pipeline is intended to be constructed within private property, which in the RSA is predominately cleared farm land, it is expected that impacts on trees and woodland can largely be avoided. The species of this community are most likely to occur within the large intact woodland habitats within the RSA (see section 4.2.1) which are expected to be avoided. All scattered trees are also expected to be avoided.

4.3.5 DELWP Advisory Lists – Threatened Species

In addition to the fauna species considered above under the EPBC Act and the FFG Act, eight fauna species known or predicted to occur within the study area are listed as threatened on the DELWP *Advisory List of Threatened Vertebrate or Invertebrate Fauna in Victoria* (DSE 2013, DSE 2009)[18] (Table 14). Following field assessment, the risk of impacts to all DELWP Advisory listed species and their habitat has been reduced to low (Table 14) through habitat avoidance. Species listed only on the DELWP Advisory lists are not protected by additional legislation (unlike species listed under the FFG and EPBC Acts). Habitat for all DELWP Advisory listed species will be considered through DELWP modelled habitat mapping and accounted for in species-specific offsets, if native vegetation is removed and habitat extent thresholds are triggered.

[18] Excluding those listed as "near- threatened" or "data deficient" on this list and not listed elsewhere.

5. Wetlands

5.1 Ramsar wetlands

The EPBC Act enhances the management and protection of Australia's Ramsar wetlands. A 'declared Ramsar wetland' is an area that has been designated under Article 2 of the Ramsar Convention or declared by the Minister to be a declared Ramsar wetland under the EPBC Act.

Ramsar wetlands are recognised as a Matter of National Environmental Significance (MNES) under the EPBC Act. Consequently, an action that has, will have, or is likely to have, a significant impact on the ecological character of a Ramsar wetland must be referred to the Minister and undergo an environmental assessment and approval process.

Two Ramsar sites were identified by the PMST as relevant to the study area:

- Glenelg Estuary and Discovery Bay Wetlands (100-150 km downstream)
- Lake Albacutya (150-200 km downstream)

GWMWater intend to directionally drill waterways and as such impacts to waterway within the RSA are not expected. Consequently, impacts downstream as a result of the project are not expected. A significant impact to a Ramsar site as a result of this project is not expected.

5.2 Current wetlands

According to the Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017a), all mapped wetlands (i.e. Current wetland layer in DELWP's NVIM Maps) proposed to be impacted are considered as remnant patches, and consequently, must be included in the extent of native vegetation removal, if proposed for impacts. The weighted average modelled condition score is assigned to these wetlands.

There are 1785 DELWP current wetlands within study area. Following refinement of the pipeline alignment, corridor route and construction techniques, 48 current wetlands are proposed to be impacted.

Wetlands proposed to be impacted ranged in quality from cropped paddocks to a wetlands dominated by native vegetation. Despite there being no patches of native vegetation present within some of the wetlands at the time of the assessment, any impacts to these wetlands constitutes a loss of native vegetation and would require offsetting according to DELWP (2017). An ENSYM report has been produced to identify the potential offset requirements associated with impacts to these wetlands when considering the intersection of wetlands that occur within the corridor and are intercepted by a rapid assessment polygon (category 3, 4 or 5), excluding impacts in areas mapped as HDD, X_Impact, X_Wetland or X_Native Vegetation.

6. Native vegetation removal Guidelines

GWMWater is in the process of determining whether to apply for a planning permit for the removal of native vegetation, or proceed down the path of acquiring a planning scheme amendment. As such, the following information has been provided to document the extent and quality of native vegetation, outline the avoid and minimisation process, and detail required offsets relevant to either pathway.

The *Guidelines for the removal, destruction or lopping of native vegetation* (the Guidelines) were incorporated into the Victorian Planning Provisions and all planning schemes in Victoria in December 2017 (DELWP 2017).

6.1 Objective of the Guidelines

The purpose of the Guidelines is to guide how impacts on biodiversity should be considered when assessing an application to remove, destroy or lop native vegetation. The Guidelines set out the rules and tools for how the responsible authority (Local Government) and referral authority (DELWP) should consider biodiversity when assessing an application. Adherence to the practices and procedures outlined in the *Guidelines* will help protect native vegetation. They aim to ensure that the proposed removal of native vegetation is appropriately assessed, that opportunities to avoid and minimise removal are considered, and that appropriate offsets are secured (DELWP, 2017).

When native vegetation removal is permitted, an offset must be secured that achieves a no net loss outcome for biodiversity. To achieve this, the offset needs to make a contribution to Victoria's biodiversity that is equivalent to the contribution made by the native vegetation that was removed. Therefore, the type and amount of offset required depends on the native vegetation being removed and the contribution it makes to Victoria's biodiversity. Offsets must be secured before the removal of native vegetation can occur.

6.2 ENSYM scenario testing

As the pipeline alignment and subsequent corridor has not yet been finalised, ENSYM scenario testing allows for multiple iterations and manipulations. This method is useful in assisting proponents to avoid and minimise impacts to native vegetation.

Native vegetation within the corridor has been mapped in three different ways:

- GHD VQA vegetation - the VQA was confined to areas where the pipeline alignment corridor (8 m wide: comprised of a buffer 4 m either side of the pipeline alignment) overlapped rapid assessment polygons. (See Figure 1)
- Modelled vegetation - used for the DELWP Modelled Wetland Layer, which is required to have native vegetation represented by the weighted average native vegetation condition score
- Not assessed - vegetation that will be impacted by the corridor where GHD did not asses and for the installation of pumps and air-valves. The location of these is yet to be determined and depends on the final pipeline alignment.

The current ENSYM scenario utilises the GHD VQA vegetation and the Modelled vegetation data for the DELWP Current Wetland layer. It is noted that GWMWater will have all impacts assessed on ground before the final impact shape files and dataset are submitted to DELWP, and a final NVR Report is generated by DELWP.

GWMWater have advised that they are able to avoid impacts to all scattered trees and as such, no scattered trees have been included in the ENSYM scenario.

6.3 Measures taken to avoid and minimise impacts to native vegetation

6.3.1 Assessment and prioritisation process

GWMWater has initiated a thorough avoid and minimise processes from the inception of the EGRP. The aim was to identify ecological values within the study area at an early stage and then use this information to avoid and minimise impacts where practicable. As construction of the EGRP constitutes a long narrow impact across a vast area, a staged approach to the assessment of ecological impacts was required. Steps to avoid and minimise were able to be carried out at each stage. The process is detailed below and the associated vegetation impacts at each stage are identified in Table 18:

1. An initial desktop assessment was completed in July 2018, during which high-level potential ecological constraints for the proposed project were identified. The potential need for a referral under the EE Act was identified at this stage based on the potential presence of large amounts of Endangered EVCs (GHD 2018).
2. The rapid assessment is a risk based approach where the pipeline alignment is mapped into traffic light categories which determine the level of further survey required; depending on the category of traffic light mapped in any given area some locations were not surveyed further. After this was completed, GWMWater defined a corridor that attempted to avoid/minimise native vegetation polygons as much as possible.
3. A pipeline alignment and corridor were determined following consideration of the rapid assessment. VQA and targeted surveys were conducted in this corridor. At this stage it was assumed the pipeline would be constructed by trenching for its entire length within the corridor.
4. Following VQA, an ENSYM scenario was run to determine the total impacts of the corridor (70.97 ha of native vegetation). Subsequently, GWMWater was able to make further corridor alterations, including alignment deletion and stipulating the use of HDD to avoid impacts in sensitive areas. The resultant corridor further avoided native vegetation and habitat. A second ENSYM scenario was run to determine the total impacts of the corridor (36.505 ha), 48.56 % less than the initial ENSYM. All scattered trees are expected to be avoided.

Table 18 Reduction in native vegetation being removed during the avoid and minimise process

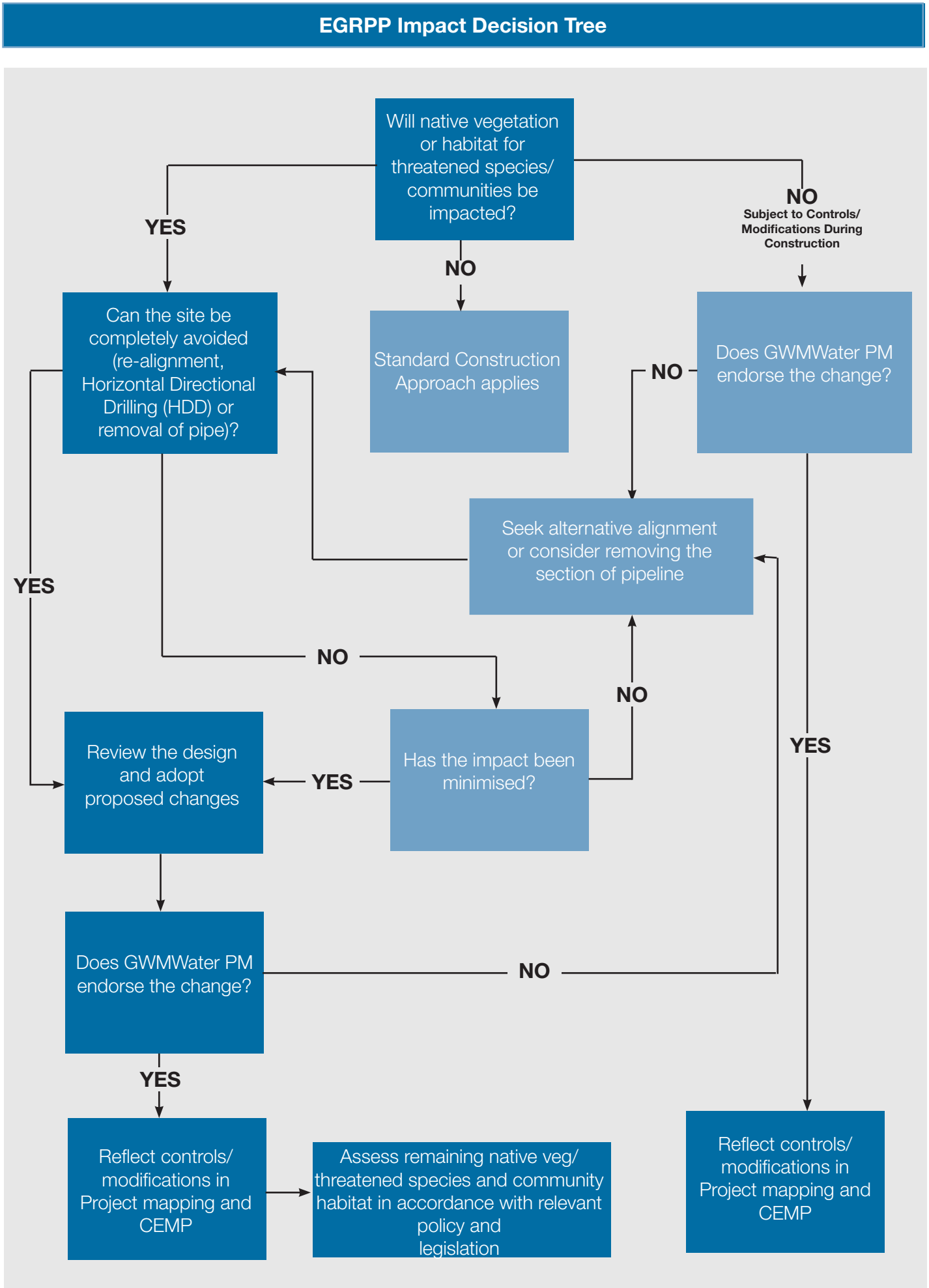
EVC Bioregional Conservation Status	Extent of Modelled Native Vegetation for RSA (Hectares)	Extent of Native Vegetation impacted by the corridor	Extent of Native Vegetation impacted by the corridor utilising HDD and avoidance
Endangered	160.78	39.56 ha	22.56
Vulnerable	34.73	13.61 ha	8.69
Depleted	55.16	16.02 ha	5.25
Least Concern	23.87	1.78 ha	0.00
Total	274.54	70.97 ha	36.5

6.3.2 Native vegetation impact decision tree

Consequential iterations, changes to the corridor, changes to construction techniques and associated infrastructure all have the potential to impact native vegetation. These future changes may result in impacts outside of the corridor assessed by GHD; therefore, a process to form a decision on the next steps for potential vegetation to be removed is important.

GWMWater has previously used a Native Vegetation impact decision tree in the South West Loddon Pipeline (SWLP) project (Prepared by CNC Project Management Pty Ltd). The SWLP Native vegetation impact decision tree has been manipulated to be relevant to the EGRP. The decision tree allows for a process to follow when native vegetation will potentially be impacted by changes in the corridor or construction technique. This process allows for avoid and minimise steps to be considered at each point when native vegetation will potentially be impacted. The Native Vegetation Impact Decision Tree below (Figure 6) describes the decision making process for the project.

Figure 6 Native Vegetation Impact Decision Tree



6.4 Assessment pathway

Both planning scheme amendments and planning permit applications must be prepared in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017). Applications to remove native vegetation are categorised into one of three assessment pathways with corresponding application requirements and decision guidelines. The assessment pathway for an application to remove native vegetation reflects its potential impact on biodiversity and is determined from the location and extent of the native vegetation to be removed (DELWP 2017).

The three assessment pathways recognised by DELWP are:

- *Basic:* limited impacts on biodiversity
- *Intermediate:* could impact on large trees, endangered EVCs, and sensitive wetlands and coastal areas
- *Detailed:* could impact on large trees, endangered EVCs, sensitive wetlands and coastal areas, and could significantly impact on habitat for rare or threatened species

The assessment pathway determines the information that is required to accompany an application to remove, lop or destroy native vegetation. There are three location categories that indicate the potential risk to biodiversity from removing a small amount of native vegetation: Location 1, 2 and 3 play a role in determining the assessment pathway. The higher category is used if native vegetation proposed to be removed includes more than one location category. The process for determining the assessment pathway is demonstrated in Table 19.

An ENSYM scenario testing *Native Vegetation Removal Report* (NVRR) was generated on 12 March 2019 (Appendix N).

Table 19 Risk matrix for determining the assessment pathway that an application to remove native vegetation will take

Extent of native vegetation	Location Category		
	Location 1	Location 2	Location 3
• < 0.5 hectares (ha) and not including any Large Old Trees	• Basic	• Intermediate	• Detailed
• < 0.5 hectares (ha) and including one or more Large Old Trees	• Intermediate	• Intermediate	• Detailed
• 0.5 hectares (ha) or more	• Detailed	• Detailed	• Detailed

Note: the assessment pathway that this project would follow is highlighted in **bold**

6.5 Unavoidable losses of native vegetation

6.5.1 Patches of native vegetation

Based on GHD vegetation mapping and condition assessments, a total of 36.505 ha of native vegetation is proposed to be impacted by the proposed corridor (Appendix N). This figure comprises the following components:

- A total of 25 Habitat Zones intersected with the corridor
- Total of 7.93 ha mapped DELWP Current Wetland extent layer
- 71 Large trees within patches of native vegetation

6.5.2 Scattered trees

In total 556 scattered trees were mapped within the corridor with 411 being large and 145 small. GWMWater have advised that all scattered trees will be avoided for the project.

6.6 Offset requirements

The ENSYM Scenario test report (Appendix N) states that the following general offsets are required for the Project. No specific offsets are required at this time, however once the footprint has been finalised and all the vegetation has been assessed these maybe required. Note: offsets must be secured before the removal of native vegetation can occur.

General offsets

- 15.792 general habitat units to be sourced from within the Glenelg Hopkins, Wimmera Catchment Management Authority (CMA) or Ararat Rural City, Northern Grampians Shire, Pyrenees Shire Council.
- Minimum strategic biodiversity 0.453
- 71 Large Trees

6.6.1 Identifying suitable offsets

GWMWater do not currently have a final corridor, the offsets determined by the ENSYM (Section 6.6) are only of a subset of the corridor (only what has been assessed by GHD). At this stage of the project the vegetation removal triggers the need for four different species offsets, however the project is also very close to the threshold of triggering four more species offsets. Therefor increasing the vegetation removal may significantly increase the offset obligations for the project. There are two risks to be aware of with large offset obligations firstly, the offsets may not be available for purchase and secondly, the cost of the purchase of offsets may be prohibitive to the project.

GWMWater wish to construct approximately 2500 small impact sites (1m^2 each) to install valves within the road reserves. They are currently seeking confirmation from DELWP as to whether they can estimate their impact for these and then amend the offset requirements following a determination of the exact locations at the completion of construction

Once a corridor has been finalised and assessed on the ground a NVRR generated by DELWP will determine the final offset obligations. As per the *Guidelines* (DELWP 2017), demonstration that offset obligations can be met via first or third party trading must be included within a planning permit application or to satisfy the requirements of an Incorporated Document (Planning Scheme Amendment). Offset obligations must be met prior to the removal of any native vegetation.

7. Potential impacts

This section identifies the potential direct and indirect impacts on flora and fauna as a result of the proposed project. A description of the potential impacts has been limited to areas assessed in detail, i.e. areas subject to VQA or targeted survey, and has not taken into account facilities built to enable operation, such as pump stations that lie outside the area of the detailed assessments. Some of these impacts are likely, e.g. removal of vegetation and habitat, while others are possible, e.g. displacement of waterbirds as a result of noise. The following impacts are based on the current corridor though the extent of impacts will be refined following detailed design.

Construction has the potential to impact on flora and fauna through:

- Clearing native vegetation and the associated loss of habitat for threated species and threatened community
- Clearing native vegetation and the associated direct loss of breeding, roosting, and/or foraging habitat, and potential killing of individual fauna
- Displacement of fauna (especially diurnal, mobile fauna such as birds) from noise
- Introduction and spread of environmental weeds or restricted/controlled weeds listed under the CaLP Act
- Introduction and/or spread of pathogens or diseases
- Light emissions
- Fragmentation of habitat

Operation of the pipeline would include maintenance and inspection of the pipeline throughout its life. Operation has the potential to impact on flora and fauna through:

- The introduction of new exotic flora or fauna species and/or spread of existing exotic flora, vegetation and fauna
- Contamination of wetlands
- Noise and/or light emissions

The potential for each of these impacts in the absence of mitigation is discussed in Section 7.1 to 7.7 . Mitigation and management measures for each potential impacts is discussed in Chapter 8.

7.1 Clearing

7.1.1 Clearing of flora and vegetation

Based on GHD vegetation mapping and condition assessments, a total of 36.505 ha of native vegetation is currently proposed to be impacted by construction within the proposed corridor for the area assessed. This figure comprises the following components:

- Native Vegetation mapped (Appendix G) – 36.505 ha
- Area within modelled DELWP Wetland Layer, where DELWP modelled condition score has been used – 7.93 ha
- 71 Large Trees

Note: final design aims to further avoid and minimise native vegetation to be removed (e.g. large trees are expected to be avoided through detailed design)

No listed flora communities or ecological communities listed under the EPBC or the FFG are proposed to be impacted within the assessed corridor.

No listed flora species (EPBC Act or FFG Act) are proposed to be impacted within the assessed corridor, there is the potential for listed flora species to be present within the study area (not-assessed corridor).

7.1.2 Clearing of breeding, roosting and/or foraging habitat

GWMWater has made a concerted effort to avoid potential habitat for threatened species. Some native vegetation and habitat for threatened species is unavoidable and this is considered a relatively minor impact on breeding, roosting and/or foraging habitat for fauna. Most, if not all, large trees are expected to be avoided during detailed design. As such the impact to any hollow-bearing trees is also expected to be largely avoided.

Only the potential construction corridors adjacent to made roads have been assessed in detail (i.e. VQA or targeted survey). The detailed design may identify alternative corridors that will be subject to the same detailed survey prior to construction. All alternative corridors beyond that outlined within this report will be assessed and documented prior to construction.

The entire worksite or activity area for the project is in the order of 1,300 ha. At this early stage in the planning cycle, 36.5 ha of native vegetation is estimated to be impacted. The vast majority of the corridor is considered non-native vegetation or contains no native vegetation as a result of previous disturbances on site including grazing and cropping. Some areas of non-native vegetation have been avoided as they contain potential threatened species habitat the remaining areas of non-native vegetation provide very little value for fauna.

Disturbance of areas of habitat could result in a range of potential impacts including:

- Killing/injuring fauna
- Displacement of fauna
- Disruption to nesting/roosting/foraging habitat and/or behaviour
- Broader landscape-scale impacts through incremental loss of habitat locally
- Erosion and sedimentation resulting from vegetation clearance
- Degradation of remaining habitats through edge effects

These impacts are considered further through sections 7 and 8; and the residual risk with mitigation employed is expected to be low.

7.2 Introduction and spread of introduced plants, animals and disease

With the application of appropriate mitigation measures (Section 8.3), the residual risk associated with the introduction of weeds and feral animals is expected to be low.

Transport of material, vehicle movements and inappropriate waste management can promote the introduction of new weeds and spread of existing weeds during construction and operation. These have the potential to cause:

- Local decline in habitat quality, including potential degradation of threatened species habitat
- Displacement of fauna from habitats as habitat quality deteriorates
- Habitat deterioration through vehicle movement and soil disturbance, which can increase the suitability of habitat for, allow introduction or spread of, pest animal species. This can cause increased competition (particularly on threatened species) by natural areas becoming invaded by aggressive and dominating native pest species

It should be noted that the vast majority of the project impact area is within areas mapped as non-native vegetation, which are already dominated by weeds, including Weeds of National Significance and declared noxious weeds under the CaLP Act.

7.3 Decline in quality of water sources and habitat

There are several potential risks associated with the construction and operation of the project that could lead to contamination of surface and/or groundwater and consequent potential impacts on fauna. The residual risk to the environment is expected to be low in regards to the following potential impacts:

- Contamination of wetlands and waterways or the groundwater caused by inappropriate storage and handling of hazardous substances, e.g. fuel
- Contamination via sediment runoff from areas stripped of vegetation or from soil stockpiles during rain or high flow events

Given the proximity of wetland and waterway habitat to parts of the corridor (including within the corridor) there is the potential for these sensitive receptors to be impacted. A number of mitigation and management measures have been included in Section 8.4 to minimise the potential for the release of contaminants and sediment into the environment.

7.4 Noise

Noise impacts associated with construction are expected to be temporary and short term and with mitigation measures in place, the risk of impact associated with noise is considered low.

Disturbance to fauna associated with the generation of unexpected and/or excessive noise during construction has the potential to result in the displacement of fauna and disruption to nesting/roosting/foraging behaviour. Displacement of fauna into sub-optimal habitat could increase their susceptibility to predation and competition.

It is assumed construction will be limited to day time hours. As such noise impacts are most likely to affect diurnal species, in particular birds and nocturnal fauna sleeping during the day.

Any impacts associated with displacement from noise are expected to be temporary especially given pipeline construction is expected to be highly mobile (moving approximately 1.5 to 3 kms per day).

Noise is not expected to significantly impact fauna during operation with appropriate mitigation (e.g. insulation of pump stations).

7.5 Artificial light

The residual risk of artificial light during construction is considered low. As lighting is not expected to be a factor during the construction phase which is intended to be limited to daylight hours. However lighting should be considered for any operational infrastructure such as pump stations, which have not been assessed at this stage. Prolonged lighting could impact on 'normal' nocturnal behaviours.

Light plays a critical role in ecology. It determines activity levels of diurnal and nocturnal fauna, it assists predators in their hunting success, and some light sources attract invertebrate fauna that attract and are then preyed on by other fauna. Localised disturbance to nocturnal fauna associated with generation of light has the potential to cause the following impacts on fauna:

- Local displacement of fauna (i.e. nocturnal fauna move away from brightly lit areas)
- Increased susceptibility of fauna to predation (e.g. prey species find it harder to remain concealed in brightly lit areas, attraction of and enhanced predation of amphibians)
- Disruption to nesting/roosting behaviour (e.g. bright lights may awaken diurnal species)
- Disorientation of migrating birds
- Attraction and disorientation of amphibians
- Disorientation of bats
- Disruption to small mammal activity rhythms

7.6 Injury, illness and death from proximity of hazards

Vehicle movement through fauna habitats can lead to increased likelihood of collisions with fauna. There is potential for some species that occur within the subject site to be occasionally struck and killed by vehicles moving in the area (especially kangaroos and wallabies). However, the majority of threatened fauna are highly mobile and are not expected to be at high risk. It is possible to reduce the risk of collision to 'low', through mitigation such as speed limits.

7.7 Fragmentation of habitats

The pipeline will be installed underground and once constructed, the pipeline would not create a physical barrier to movement. The bulk of the development is confined to private properties and within the first 20 m within the property from the fence line. Typically these areas are already disturbed as a result of the erection of fences and used as vehicle access across properties or around crops. Where possible, the pipeline alignment has been designed to occur within non-native vegetation, typically in areas subject to grazing or cropping. Within native vegetation, the corridor is limited to 8 m wide and is expected to be rehabilitated following construction.

8. Mitigation and management measures

It is acknowledged the EGRP has not yet undergone detailed design and therefore the extent of impacts and consequent mitigation measures may change. Mitigation and management measures are required to control, reduce or eliminate impacts of project activities on flora and fauna and their habitat. This section provides guidance on the types of mitigation that will need to be considered for the construction and operations phase of the project. Mitigation and management measures along the lines of those outlined below would need to be incorporated into a project specific Construction Environment Management Plan (CEMP).

8.1 Avoidance and minimisation of impacts

A thorough iterative process has been undertaken to avoid and minimise impacts to native vegetation wherever possible. This process is outlined in Section 6.3.

8.2 Clearing

The amount of land disturbance and native vegetation clearing has been minimised such that only 36.505 ha of native vegetation will be impacted. Where appropriate, construction personnel would be briefed during inductions regarding the ecological value of areas of native vegetation and habitat including the surrounding areas and their responsibilities with regard to protecting these areas during construction.

Additional control measures will include:

- Appropriate procedures for demarcating the limits of clearing and no-go zones, using high visibility para-webbing
- Appropriate location of hardstand, laydown and soil stockpile areas in areas of non-native vegetation
- Limiting construction to daylight hours
- Pre-clearance of hollows by an ecologist prior to the removal of any hollow-bearing limbs or trees
- Implementation of standard erosion and sediment control measures
- Development of a revegetation and landscaping strategy that incorporates the use of locally indigenous species

As there is no final construction footprint there is still native vegetation that will be required to be mapped at future stages of the design. Once the final design is complete and all the vegetation to be impacted has been mapped, residual impacts associated with the project will be offset in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017).

8.3 Introduction and spread of exotic plants and animals

Develop and implement weed, pest and pathogen management protocols for inclusion in a CEMP. In particular, high-threat noxious weeds and Weeds of National Significance (all species listed in Section 3.5) would need to be controlled prior, during and post construction. Works would be undertaken by an appropriately qualified contractor with the ability to accurately distinguish the relevant weed species from indigenous flora, in order to avoid impacting native species during control works.

The presence of aquatic fauna species would be considered for weed control works near aquatic habitat, or areas of poor drainage. In these areas, manual removal of weeds is preferable, otherwise low-toxicity, non-residual herbicides registered as suitable in watercourses (e.g. Roundup Biactive®) may be appropriate for use in a targeted manner such as spot spraying.

Construction vehicles would be thoroughly cleaned and dried before entering and exiting the site and between properties to minimise spread and/or introduction of weeds and diseases (Amphibian Chytrid Fungus, *Phytophthora cinnamomi* (Cinnamon fungus), *Dichelobacter nodosus* (Footrot)). Complete drying (e.g., of soil, vehicles or equipment) kills the chytrid fungus and would be an easy measure to significantly reduce the potential of introducing the pathogen (including novel strains) to the corridor. Disinfectants will destroy Cinnamon fungus and Footrot and is an easy measure to significantly reduce the potential of spreading these diseases through the corridor.

8.4 Decline in quality of water sources and habitat

Standard construction measures to avoid and minimise impacts on water sources and surrounding habitat would be incorporated into the CEMP, and include but not be limited to:

- Installation of erosion and sediment control measures prior to construction
- Regular inspection of erosion and sediment control measures, particularly following heavy rain, to maintain ongoing functionality
- Siting of stockpiles/laydown areas as far away as feasible from the waterways and wetlands
- Construct adequate bunds for fuel/hazardous chemicals

8.5 Noise

Noise impacts associated with construction are expected to be temporary and short term and with standard construction noise mitigation measures in place, the risk of impact associated with noise is considered low.

Minimising noise during construction will be difficult, but noise should be limited to daylight hours to reduce the impact on nocturnal fauna. Standard construction noise mitigation should be incorporated into the CEMP.

As the location is currently of operational infrastructure e.g. pump stations, impacts associated with noise at night of operational infrastructure has not been considered.

8.6 Artificial light

Lighting is not expected to be a factor during construction, which would be during daylight hours only. The residual risk of artificial light impacting fauna is considered low for the construction phase.

However, the potential impacts of lighting should be considered for any operational infrastructure such as pump stations, which have not been assessed at this stage. General mitigation measures to reduce the impacts of prolonged lighting include:

- Limiting artificial light to areas where it is essential
- Turning off lights when not required
- Limiting the escape of light into surrounding areas of fauna habitat (especially the wetland areas) using shields/deflectors
- Use of lower rather than higher lighting installations

- Directing lighting towards the ground rather than upwards or laterally
- Use of lower wavelengths of light wherever possible, i.e. red/yellow lights
- Implementing external light curfews or motion sensors
- Use of light intensities that are as low as possible without reducing safety or efficiency

8.7 Injury, Illness and death from proximity of hazards

To minimise and mitigate the effects of increased road traffic during construction, the following actions are recommended:

- Reduce speed limits where necessary (i.e., in areas where roadkill is particularly prevalent)
- Have an injured wildlife protocol in place

8.8 Fragmentation of habitats

The bulk of the project area is within private properties and within the first 20 m within the property from the fence line. Where possible the pipeline alignment has been designed to occur within non-native vegetation, to avoid loss and fragmentation of native vegetation and habitat. Within native vegetation, the corridor is limited to 8 m wide and is expected to be rehabilitated following construction. The pipeline will be installed underground and once constructed is not expected to create a physical barrier to fauna movement. The following actions are recommended for the rehabilitation of cleared native vegetation:

- Revegetation should include locally indigenous species appropriate for the EVC
- Management of rehabilitation areas should include weed control and monitoring

9. Policy and legislative implications

This section provides information with respect to ecological and planning policy and legislation, and its relevance to the project. This information is not intended to provide an exhaustive list, but rather a summary of the key requirements.

The information below is based upon GHD's understanding of the legislation and policy, and our experience with their implementation. There is a possibility that regulatory authorities may interpret and/or implement the legislation and policy differently.

As the pipeline alignment and construction corridor for the proposed works has not yet been confirmed, the legislative advice provided in this section provides a high-level overview of the potential for different environmental permits and approvals to be triggered by the project, based on the information gathered to date. Once a pipeline alignment and construction corridor has been finalised for the project, it is recommended that updated advice is sought regarding the environmental permits and approvals required for the project.

9.1 Overview

A summary of the likely legislative requirements, with respect to the corridor assessed under State and Commonwealth legislation is provided in Table 20 Further detailed explanation of each legislative requirement is provided in the following sections (9.2 and 9.3).

Table 20 Likely legislative requirements for this project

Legislation/ Policy	Relevance to project
Commonwealth	
Environment Protection and Biodiversity Conservation Act 1999	Matters of NES relevant to the project: wetlands of international importance, listed threatened species and ecological communities and Migratory species. • Wetlands of international importance (Ramsar): A significant impact to a Ramsar site as a result of this project is not expected • Listed threatened species and ecological communities: Habitat for EPBC Act listed flora, fauna and ecological communities were identified during the rapid assessment. Potential and actual habitat for threatened flora, fauna and communities has been avoided through an iterative process of avoid and minimisation. • Migratory species: No species is expected to make substantial use of wetlands or other habitats proposed to be impacted. Works are highly unlikely to result in impacts on important habitat or on a significant proportion of any population of Migratory species. The need for a referral to the Commonwealth Minister for the Environment (for a determination as to whether the proposed action constitutes a significant impact and consequently, a controlled action, under the EPBC Act) is considered unlikely based on the assessed corridor. The need for an EPBC Act referral should be taken into consideration when assessing the remainder of the corridor and associated infrastructure.

Legislation/ Policy	Relevance to project
State	
Environment Effects (EE) Act 1978	With its current alignment, the project would trigger the need for a referral under the EE Act based on the individual criterion: Potential clearing of 10 ha or more of native vegetation from an area that is of an Endangered EVC (22.56 ha of Endangered EVC intercepted by the assessed corridor). The project may also trigger the need for a referral based on combined criteria, particularly: Potential clearing of 10 ha or more of native vegetation (36.51 ha of native vegetation intercepted by the assessed corridor). There may also be other non-ecological triggers. GWMWater is proposing to undertake significant avoidance and minimisation measures as part of the detailed design phase of the project and are committed to keeping vegetation to the lowest extent feasible.
Planning and Environment Act 1987 (P&E Act)	The current corridor results in an impact to 36.51 ha of native vegetation. Approval under the *Planning and Environment Act* will be required for the removal of native vegetation, either as a permit/s under the *Planning and Environment Act* or as a Planning Scheme Amendment following the process outlined in the *Planning or Environment Act.* An Offset Availability Statement demonstrating that offsets have been identified and can be secured for the project needs to be obtained prior to the submission of an approvals application. Additional planning scheme overlays or triggers may also be present for native/any vegetation removal. GWMWater is considering obtaining approvals through a planning scheme amendment (PSA) for the project. If a PSA is adopted for the project then a permit for the removal of native vegetation under the P&E Act would not be required. Permits under other planning overlays may also not be required under a PSA. Following the adoption of a PSA certain conditions will be set out in an Incorporated Document (e.g. purchase of suitable offsets).
Guidelines for the removal, destruction or lopping of native vegetation.(DELWP 2017)	Based on GHD vegetation mapping and condition assessments, a total of 36.51 ha of native vegetation is proposed to be impacted by the current corridor (Appendix L). Based on the extent of vegetation being removed, the assessment process would follow the Detailed pathway, and would be lodged with the relevant LGAs then referred to DELWP. GWMWater do not currently know whether they intend to apply for a planning permit or a planning scheme amendment. Irrespective of which process is followed, an application to remove native vegetation must follow the Guidelines and will be required to be referred to DELWP. The ENSYM Scenario test report (Appendix L) states that the following general offsets are required for the current corridor: • General Offsets – 15.792 general habitat units to be sourced from within the Glenelg Hopkins, Wimmera Catchment Management Authority (CMA) or Ararat Rural City, Northern Grampians Shire, Pyrenees Shire Council. – Minimum strategic biodiversity 0.453 – 71 Large Trees NB. Not all vegetation has been mapped within the corridor. Once the corridor has been finalised, further mapping and condition assessments will be required and a NVR Report obtained from DELWP to determine total offset obligations.

Legislation/ Policy	Relevance to project
Flora and Fauna Guarantee Act 1988	The current extent of the corridor is within private property and therefore there is no obligation to abide by the FFG Act. Although a permit is not required on private land, GWMWater has attempted to avoid and minimise impacts. This has resulted in expected impacts on only 14 FFG Act protected species within private property. The need for a permit for the removal of threatened or protected species or threatened communities on public land should be considered at the time of assessment of these areas.
Wildlife Act 1975	Any persons engaged to remove, salvage, hold or relocate native fauna prior to, or during construction must hold a current Management Authorisation under the *Wildlife Act 1975* (e.g. for fauna salvage during works). A Management Authorisation is considered likely to be required for this project during the construction phase.
Catchment and Land Protection Act 1994 (CaLP)	Eight weeds listed as a Noxious weeds under the Catchment and Land Protection Act (CaLP Act) and three listed as a Weed of National Significance (WONS) were observed within the corridor. Mitigation measures must be developed and incorporated into an Environmental Management Plan to prevent the spread or further introduction of these (and other) weed species in accordance with the CaLP Act.

9.2 Commonwealth legislation

9.2.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* promotes the conservation of biodiversity by providing protection for threatened species, threatened ecological communities, migratory and marine species and other protected matters. The Australian Government Department of the Environment and Energy (DOEE) administers the EPBC Act.

There are nine *Matters of National Environmental Significance* (MNES) identified in the EPBC Act. Not all of these are relevant to every project. Certain actions – in particular, actions that are likely to have a significant impact on any MNES – are subject to a rigorous assessment and approval process (DEWHA 2013), with a referral required where 'significant' impacts on MNES are expected or possible. The referral application generally takes 20 business days to process, after which the Commonwealth Minister makes a determination on the need or otherwise for approval under the EPBC Act. If approval is deemed necessary, a formal assessment and approval process commences.

This assessment identified three MNES that may be relevant to works within the study area: wetlands of international importance, listed threatened species and ecological communities and Migratory species. These are discussed in more detail below.

Wetlands of international importance (Ramsar)

Two Ramsar sites were identified by the PMST as relevant to the study area:

- Glenelg Estuary and Discovery Bay Wetlands (100-150 km downstream)
- Lake Albacutya (150-200 km downstream)

GWMWater intend to directionally drill waterways and as such, impacts to waterways within the study area are not expected. Consequently, impacts downstream as a result of the project are not expected. A significant impact on a Ramsar site as a result of this project is not expected (see section 5.1).

Listed threatened species and ecological communities

Habitat for EPBC Act listed flora, fauna and vegetation communities was identified during the rapid assessment. Subsequently, the pipeline alignment was designed to avoid as much of these areas as possible. Targeted surveys were undertaken to determine presence or absence of listed flora (Appendix B), Golden Sun Moth and vegetation communities (Table 5, Table 7) in areas that were logistically harder to avoid. The alignment was further modified following targeted survey to avoid (through HDD or pipeline alignment deletion) any areas where threatened species or communities were identified. As a result, the assessed pipeline alignment and associated corridor do not intercept habitat for threatened species or communities.

Migratory species

No Migratory species is expected to make substantial use of wetlands or other habitats proposed to be impacted. Works are highly unlikely to result in impacts on important habitat or on a significant proportion of any population of Migratory species (see section 0).

Conclusion

Impacts to areas containing either habitat identified as potentially suitable for EPBC Act species and communities and/or areas where EPBC Act species and/or communities were observed within the assessed corridor have been avoided through HDD or deletion of sections of the pipeline alignment. It should be noted that not all of the proposed project has been assessed at this stage. However, GWMWater has shown a commitment to avoid significant ecological values.

The need for a referral to the Commonwealth Minister for the Environment (for a determination as to whether the proposed action constitutes a significant impact and consequently, a controlled action, under the EPBC Act) is considered unlikely at this stage based on the impacts associated with the assessed areas of the corridor.

GWMWater will need to reconsider EPBC Act referral triggers during assessment of the remainder of the footprint in order to abide by this Act.

9.3 State legislation

9.3.1 Environment Effects Act 1978

The Ministerial guidelines for assessment of environmental effects under the Victorian *Environment Effects Act 1978* (EE Act) provide a range of criteria that can be used to determine whether an Environment Effects Statement (EES) would be required for a project (page 7; DSE 2006).

Many of the listed potential effects that may warrant a referral are related to flora and fauna. There are also other triggers such as social, economic and other environmental triggers that may need to be considered for the project. There are two types of referral criteria: 1) individual potential environmental effects; and 2) a combination of potential environmental effects.

According to DSE (2006), a referral under the *Environment Effects Act 1978* would be warranted if this project were to result in any individual potential environmental effects that might be of regional or state significance (see p.7, DSE 2006). The following individual potential effects relating to terrestrial flora and fauna were considered for this project[19] (Table 21).

[19] Note that there are other potential referral criteria that are not related to flora and fauna.

Table 21 Referral criteria: Individual potential environmental effects

Criterion	Comments
Potential clearing of 10 ha or more of native vegetation from an area that: • Is of an Ecological Vegetation Class identified as endangered by the Department of Sustainability and Environment (in accordance with Appendix 2 of Victoria's Native Vegetation Management Framework), or • Is, or is likely to be, of very high conservation significance (as defined in accordance with Appendix 3 of Victoria's Native Vegetation Management Framework), and • Is not authorised under an approved Forest Management Plan or Fire Protection Plan.	**Possible** The corridor currently intercepts 22.56 ha of Endangered EVCs. This area calculation is based on an 8-m wide construction footprint for the pipeline alignment. Detailed design has not yet been completed and it is expected that the extent of the pipeline alignment will be considerably reduced as multiple paths to the same destination are identified and removed, property owners opt out and/or further areas are designated for HDD. However, it should also be noted that an assessment of the whole project has not yet been undertaken and this figure may change; as areas not yet assessed are accounted for.
Potential long-term loss of a significant proportion (e.g. 1 to 5 percent depending on the conservation status of the species) of known remaining habitat or population of a threatened species within Victoria.	**Unlikely** It is not expected that a "significant portion" of remaining habitat or population of a threatened species occurs within the corridor. GWMWater have already shown a commitment to habitat avoidance by HDD or deleting sections of the pipeline alignment to avoid all potential and actual threatened species habitat identified to date. A long term loss of significant areas of habitat or populations are not expected
Potential long-term change to the ecological character of a wetland listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia'.	**Unlikely** The nearest Ramsar site is in excess of 100 km away. Important Wetlands are present within the study area (Lake Buninjon, Lake Muirhead and Mount William Swamp), however, these wetlands are not expected to be impacted by the project.
Potential extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems, over the long term.	**Unlikely** Waterways are expected to be HDD. Following avoidance measures, the corridor intersects 48 "current wetlands". A majority of these were barely discernible as wetlands, having been cropped or grazed beyond recognition. It is acknowledged that under the right conditions some of these wetlands may re-establish, however in their current state they offer low biodiversity value. Provided appropriate mitigation is employed, the project is not expected to adversely impact on aquatic systems. Impacts are expected to be temporary and rehabilitated following construction.

A referral under the *Environment Effects Act 1978* would be warranted also if this project were to result in the combination of two or more listed types of potential effects on the environment that might be of regional or state significance (see p.7, DSE 2006). The following potential effects relating to terrestrial flora and fauna were addressed for this project[20] (Table 22).

Table 22 Referral criteria: A combination of potential environmental effects

Criterion	Comments
Potential clearing of 10 ha or more of native vegetation, unless authorised under an approved Forest Management Plan or Fire Protection Plan.	**Possible** The corridor currently intercepts 36.51 ha of native vegetation that is not authorised for removal under an approved Plan. This area calculation is based on an 8-m wide construction footprint for the pipeline alignment. Detailed design has not yet been completed and it is expected that the extent of the pipeline alignment will be considerably reduced as multiple paths to the same destination are identified and removed, property owners opt out and/or further areas are designated for HDD. However, it should also be noted that an assessment of the whole project has not yet been undertaken and this figure may change; as areas not yet assessed are accounted for.
Matters listed under the *Flora and Fauna Guarantee Act 1988*: - Potential loss of a significant area of a listed ecological community, or - Potential loss of a genetically important population of an endangered or threatened species (listed or nominated for listing), including as a result of loss or fragmentation of habitats, or - Potential loss of critical habitat, or - Potential significant effects on habitat values of a wetland supporting migratory birds	**Unlikely** Habitat for FFG Act listed communities and species is present within the study area. However, GWMWater have already shown a commitment to habitat avoidance by using HDD or deleting sections of the pipeline alignment to avoid all potential and actual threatened species habitat identified to date. Any impacts on threatened species over the course of the project would not be expected at a population level. There have been no determinations of “critical habitat” under the FFG Act within Victoria. Wetlands are avoided where possible. A majority of the wetlands along the alignment were barely discernible as wetlands at the time of the assessment. Wetlands that had key habitat features such as emergent/fringing vegetation and standing water have been avoided through avoidance of habitat for the Growling Grass Frog. A significant effect on wetland habitat values for migratory birds is not expected.
Potential extensive or major effects on beneficial uses of waterbodies over the long term due to changes in water quality, streamflows or regional groundwater levels.	**Unlikely** Long term changes to the hydrology of the area are not expected. Note that assessment of the water sources for the EGRP is outside of the scope of this assessment.

[20] Note that there are other potential referral criteria that are not related to flora and fauna.

Conclusion

With its current design, the project triggers the need for a referral under the EE Act based on the individual criterion: Potential clearing of 10 ha or more of native vegetation from an area that is of an Endangered EVC (22.56 ha of Endangered EVC intercepted by the assessed corridor).

There are also other triggers such as social, economic and other environmental triggers that may need to be considered for the project and so it should also be noted that there is also the potential need for an EES based on potential clearing of 10 ha or more of native vegetation (36.51 ha of native vegetation intercepted by the assessed corridor) (combined criterion).

Detailed design has not yet been completed and it is expected that the extent of the pipeline alignment will be considerably reduced as multiple paths to the same destination are identified and removed, property owners opt out and/or further areas are designated for HDD.

However, it should also be noted that an assessment of the whole project has not yet been undertaken and the area of vegetation clearing is likely to change; as areas not yet assessed are accounted for.

9.3.2 Planning and Environment Act 1987

The *Planning and Environment Act 1987* is the legislation which gives effect to planning schemes, the instrument of planning control for each municipality.

Approval under the *Planning and Environment Act 1987* is required (as administered under the relevant council planning schemes) for:

- Native vegetation removal under Clause 52.17 – Native Vegetation

Unless particular exemptions apply under Clause 52.17 of the relevant planning scheme, a permit under the Victoria Planning Provisions (made pursuant to the *Planning and Environment Act 1987*) is required to remove, destroy or lop native vegetation. This includes scattered trees and impacts to TPZs. A permit may also be required for impacts on planted native vegetation depending on the policies of the local government authority (LGA), or if vegetation has been planted or maintained using public funds.

The *Planning and Environment Act 1987* also sets out a process for Planning Scheme Amendments (PSA). An amendment may involve a change/s to a planning scheme to achieve a planning outcome or to support a new policy direction. The PSA process involves authorisation by the Minister for Planning and then consultation and public exhibition. If a PSA is adopted, individual planning permits may not be required for certain activities (e.g. removing native vegetation), however conditions set out in the Incorporated Document must be followed.

Under Clause 66.02-2 of the planning scheme, DELWP is the mandatory referral authority for applications where it is proposed:

- To remove, destroy or lop native vegetation in the Detailed Assessment Pathway
- To remove, destroy or lop any native vegetation if a Property Vegetation Plan applies to the site
- To remove, destroy or lop native vegetation on Crown land which is occupied or managed by the responsible authority

Conclusion

The current corridor would result in removal of 36.51 ha of native vegetation. GWMWater have advised that a PSA may be sought instead of separate planning permits for each LGA. Under either process, approval under the Planning and Environment Act will be required for the removal of native vegetation for the project.

An Offset Availability Statement demonstrating that offsets have been identified and can be secured for the project needs to be obtained prior to the submission for approval of a planning permit or PSA.

Additional planning scheme overlays or triggers may also be present for removal of native or other vegetation. These would require additional planning permits or be included into the PSA.

9.3.3 Guidelines for the removal, destruction or lopping of native vegetation

The *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017) (the Guidelines) are incorporated into the Victorian Planning Provisions and all planning schemes in Victoria. The Guidelines replace the previous incorporated document titled *Permitted clearing of native vegetation – Biodiversity Assessment Guidelines* (DEPI 2013).The purpose of the Guidelines is to set out, and describe the application of Victoria's state wide policy in relation to assessing and compensating for the removal of native vegetation. As such, it is an incorporated document at Clause 81.01 of all planning schemes in Victoria. The document's purpose and application includes:

- The assessment of impacts on biodiversity from removing native vegetation
- How offsets are calculated and established to compensate for the loss in biodiversity value from the removal of native vegetation

Further, the incorporated document:

- Must be considered by planning authorities when preparing a planning scheme amendment, as relevant
- Must be considered by responsible authorities when making decisions in relation to development plans, as appropriate
- Must be applied when a permit is required under clauses 52.16 and 52.17 of planning schemes
- Must be applied when developing a Native Vegetation Precinct Plan (NVPP)
- May be considered in other planning decisions to meet state-wide objectives for native vegetation protection and management

Conclusion

Based on GHD vegetation mapping and condition assessments, a total of 36.51 ha of native vegetation is proposed to be impacted by the current corridor (Appendix N). Based on the extent of vegetation being removed, the assessment process would follow the Detailed pathway, and would be lodged with a LGA then referred to DELWP.

GWMWater do not currently know whether they intend to apply for a planning permit or a planning scheme amendment. Irrespective of which process is followed, an application to remove native vegetation must follow the Guidelines and will be required to be referred to DELWP.

The ENSYM Scenario test report (Appendix N) states that the following general offsets are required for the Project:

- General Offsets
  - 15.792 general habitat units to be sourced from within the Glenelg Hopkins, Wimmera Catchment Management Authority (CMA) or Ararat Rural City, Northern Grampians Shire, Pyrenees Shire Council
  - Minimum strategic biodiversity 0.453
  - 71 Large Trees

Once a corridor has been finalised and mapped, a NVRR will be prepared by DELWP to determine the total offset obligations for the project. These will be required to be secured irrespective of the PSA or planning permit pathway for approval. Note: offsets must be secured before the removal of native vegetation can occur.

9.3.4 Flora and Fauna Guarantee Act 1988

The *Flora and Fauna Guarantee Act 1988* (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. The FFG Act seeks to put in place preventative management mechanisms to ensure no biota or ecological communities become extinct within Victoria, and to ensure that the processes that threaten biodiversity are identified and addressed. The FFG Act is far broader than 'endangered species' legislation, covering ecological communities; potentially threatening processes; community involvement in conservation; and a strategic approach to biodiversity conservation and sustainable use.

The FFG Act applies to public land only. On private land there is no obligation to abide by this Act. For areas of public land under the FFG Act, a permit is required from DELWP for impacts to protected flora, listed threatened flora, or listed threatened communities.

Conclusion

The current extent of the corridor is within private property and therefore the FFG Act does not apply.

However, during the VQA and targeted surveys the following FFG Act values were observed within the corridor:

- Four FFG Act threatened flora species
- Two FFG Act threatened fauna species
- 14 FFG Act protected flora species, and
- One FFG Act listed vegetation community

Although a permit is not required on private land, GWMWater has attempted to avoid and minimise impacts. This has resulted in expected impacts to only 14 FFG Act protected species.

Whilst not covered in the scope of this assessment, impacts are also expected within public land (road reserves). Given the species and communities observed in private property, there is a high likelihood that a FFG Act listed threatened and protected species and communities would also occur within public land.

The need for a permit for the removal of threatened or protected species or threatened communities on public land will need to be considered at the time of assessment of these areas.

It is recommended that efforts be made to avoid and minimise impacts to any species or communities listed under the FFG Act during the detailed design phase of the project and any relevant FFG Act Management Plans for relevant species be reviewed and adhered to.

9.3.5 Wildlife Act 1975

In Victoria, the legislation for protecting and managing wildlife is the *Wildlife Act 1975.* Under this Act, 'wildlife' is defined as including indigenous vertebrate species (except declared pest species), invertebrate species listed under the *Flora and Fauna Guarantee Act 1988*, and some introduced game species. This Act does not apply to fish or listed aquatic invertebrates as defined under the *Fisheries Act 1995.* All other native fauna (listed as threatened or not) are protected under the *Wildlife Act 1975*.

Penalties for the *Wildlife Act 1975* are prescribed within the *Wildlife Regulations 2002*. These include penalties for persons who wilfully damage, disturb or destroy wildlife habitat without appropriate authorisation (Part 2, Section 9 of the *Wildlife Regulations 2002*). A Management Authorisation under the Wildlife Act 1975 is required when salvage or handling of fauna is required.

Conclusion

If hollow-bearing trees or limbs are impacted, trench management required or salvage is proposed, then a Management Authorisation will be required. This must be issued prior to construction in the name of the ecologist undertaken the fauna handling.

9.3.6 Catchment and Land Protection Act 1994

There are legislative requirements for weed management that must be adhered to. For example, works must comply with sections 70A and 71 of the *Catchment and Land Protection (CALP) Act 1994*. These provisions prohibit the transportation of noxious weeds and the movement of vehicles containing noxious weeds onto a road.

Of the 51 introduced species observed during the VQA, eight of these are listed as Noxious weeds under the *Catchment and Land Protection Act* (CaLP Act) and three are listed as a Weed of National Significance (WONS). Appendix A shows each noxious weed and its relevant classification in the Catchment Management Authority areas that the study area covers.

Conclusion

For the works to occur, mitigation measures must be developed and incorporated into an EMP to prevent the spread or further introduction of weed species in accordance with the CaLP Act.

10. Recommendations

It is acknowledged the EGRP has not yet undergone detailed design and therefore the extent of impacts, next steps and necessary approvals may change. A recommended approach to follow for the project is outlined below.

10.1 Next steps

10.1.1 Further assessment

The following further assessments are required to fully document the quality and extent of ecological values within the corridor prior to construction:

- Undertake VQA in areas of the corridor and associated infrastructure not yet assessed
- Undertake an assessment of habitat suitability for threatened species in areas of the corridor and associated infrastructure not yet assessed

10.1.2 Obtain necessary approvals

The environmental approval requirements for this project are summarised in Section 8. The key legislative requirements for the project are listed below:

- Based on the current assessment, an EPBC Act referral is not considered necessary, however the need for a referral should be reconsidered when an assessment of the remainder of the corridor and associated infrastructure has been completed
- With its current design, the project triggers the need for a referral under the EE Act based on the individual criterion: Potential clearing of 10 ha or more of an Endangered EVC. Combined criteria are also relevant to the EGRP
- Obtain necessary approval under the P&E Act pending a decision on the assessment pathway (i.e. planning permit or PSA)
- Secure suitable offsets for the project. Liaise with DELWP regarding the acceptability of amending offset requirements following construction to allow for the approximately 2500 small impacts sites
- As the impacts associated with the report consider private land only, an FFG Act permit is not required for those impacts. However, the need for a permit for the removal of threatened or protected species or threatened communities on public land should be considered at the time of assessment of these areas
- A permit under the Wildlife Act 1975 will be required for the handling and removal of fauna from the vegetation to be removed (particularly from hollow bearing trees to be removed or from open trenches during construction)

10.2 Construction Environmental Management Plan

It is recommended that a Construction Environmental Management Plan (CEMP) is developed for the project and implemented in full to further avoid and minimise impacts on ecological values. The CEMP should be prepared once the footprint and construction methods for the proposed works have been finalised.

The CEMP should include provisions relevant to protecting the ecological values identified within the study area. Measures to avoid or minimise impacts on ecological values recommended for inclusion in the CEMP are listed below:

- Implement measures, such as fencing, to protect native vegetation to be retained, so that "No Go" Zones are clearly delineated for construction workers to minimise any accidental damage to native vegetation during construction, beyond an approved project footprint
- Measures should be implemented to limit project works to as small a footprint as possible to minimise ecological impact
- During any hollow bearing tree removal, a qualified ecologist should be present to conduct salvage of any fauna species within hollows
- Any coarse woody debris that is present within the proposed footprint should be shifted to the edge of the construction footprint and retained on site (as opposed to being removed from site)
- Any trees removed should be kept on site to create coarse woody debris
- Standard construction measures to avoid and minimise impacts on water sources and surrounding habitat including installation of erosion and sediment control measures prior to construction
- Incorporate weed, disease and pest control measures to prevent the spread of existing and/or introduction of new weeds, diseases or pests to the site, including:
  - Control of weeds prior, during and post construction where appropriate. Works should be undertaken by an appropriately qualified person with the ability to accurately distinguish the relevant weed species from indigenous flora, in order to avoid impacting native species during control works
  - Consider the presence of frogs and/or other aquatic species for any weed control in or near aquatic habitat, or areas of poor drainage. Manual removal of weeds is preferable, otherwise low-toxicity non-residual herbicides registered as suitable in watercourses (e.g. Roundup Biactive®) may be appropriate for use in a targeted manner such as spot spraying
  - Washdown and inspection of vehicles, machinery and boots before entering/leaving working areas to avoid transporting viable plant materials or large clods of soil

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Appendices

Appendix A – Flora species identified during the assessment

Key to table

EPBC	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FFG	*Flora and Fauna Guarantee Act 1988*
VROTS	DELWP Advisory list of rare or threatened plants in Victoria

Status of species:

CR	Critically Endangered (EPBC)
EN	Endangered (EPBC)
VU	Vulnerable (EPBC)
P	Listed as Protected under the FFG Act
L	Listed as threatened under the FFG Act
en	Endangered in Victoria (VROTS)
vu	Vulnerable in Victoria (VROTS)
r	Rare in Victoria (VROTS)
k	Poorly known in Victoria (VROTS)
C	Regionally Controlled Weeds (CaLP)
R	Restricted Weeds (CaLP)
WONS	Weed of National Significance
GH	Glenelg Hopkins Catchment
W	Wimmera Catchment

Scientific Name	Common Name	Classification
Native		
Acacia dealbata	Silver Wattle	
Acacia hakeoides	Hakea Wattle	P
Acacia implexa	Lightwood	
Acacia mearnsii	Black Wattle	P
Acacia melanoxylon	Blackwood	
Acacia paradoxa	Hedge Wattle	
Acacia pycnantha	Golden Wattle	P
Acaena echinata	Sheep's Burr	
Acaena novae-zelandiae	Bidgee-widgee	
Acrotriche serrulata	Honey-pots	
Allocasuarina verticillata	Drooping Sheoak	
Alternanthera sp. 1	Plains Joyweed	k
Amphibromus neesii	Southern Swamp Wallaby-grass	
Amyema miquelii	Box Mistletoe	
Amyema pendula	Drooping Mistletoe	
Anthosachne scabra	Common Wheat-grass	
Arthropodium strictum	Chocolate Lily	
Asperula conferta	Common Woodruff	
Astroloma humifusum	Cranberry Heath	P
Austrostipa bigeniculata	Kneed Spear-grass	
Austrostipa densiflora	Dense Spear-grass	
Austrostipa mollis	Supple Spear-grass	
Austrostipa oligostachya	Fine-head Spear-grass	
Austrostipa scabra	Rough Spear-grass	
Austrostipa scabra subsp. *falcata*	Rough Spear-grass	
Austrostipa spp.	Spear Grass	
Bossiaea prostrata	Creeping Bossiaea	
Brunonia australis	Blue Pincushion	P
Caesia calliantha	Blue Grass-lily	
Caladenia spp.	Caladenia	P
Calocephalus citreus	Lemon Beauty-heads	P
Calocephalus lacteus	Milky Beauty-heads	P
Carex breviculmis	Common Grass-sedge	
Carex spp.	Sedge	
Chloris truncata	Windmill Grass	
Chrysocephalum apiculatum	Common Everlasting	P
Convolvulus erubescens	Pink Bindweed	
Dianella amoena	Matted Flax-lily	EN en L
Dianella revoluta	Black-anther Flax-lily	
Distichlis distichophylla	Australian Salt-grass	

Dodonaea viscosa subsp. *cuneata*	Wedge-leaf Hop-bush	
Drosera auriculata	Tall Sundew	
Eleocharis acuta	Common Spike-sedge	
Eleocharis spp.	Spike Sedge	
Epilobium billardierianum subsp. *cinereum*	Grey Willow-herb	
Eragrostis infecunda	Southern Cane-grass	
Eryngium ovinum	Blue Devil	
Eucalyptus aromaphloia	Scent Bark	
Eucalyptus baxteri	Brown Stringybark	
Eucalyptus blakelyi	Blakely's Red-gum	
Eucalyptus camaldulensis	River Red-gum	
Eucalyptus dives	Long-leaved Peppermint	
Eucalyptus globulus	Blue Gum	
Eucalyptus goniocalyx	Bundy	
Eucalyptus largiflorens	Black Box	
Eucalyptus leucoxylon subsp. *leucoxylon*	Yellow Gum	
Eucalyptus leucoxylon subsp. *pruinosa*	Waxy Yellow-gum	
Eucalyptus macrorhyncha	Red Stringybark	
Eucalyptus melliodora	Yellow Box	
Eucalyptus microcarpa	Grey Box	
Eucalyptus polyanthemos	Red Box	
Eucalyptus rubida	Candlebark	
Eucalyptus viminalis	Manna Gum	
Eutaxia microphylla	Common Eutaxia	
Geranium retrorsum	Grassland Crane's-bill	
Geranium spp.	Crane's Bill	
Glyceria australis	Australian Sweet-grass	
Gonocarpus tetragynus	Common Raspwort	
Goodenia geniculata	Bent Goodenia	
Hakea decurrens	Bushy Needlewood	
Haloragis aspera	Rough Raspwort	
Hibbertia australis	Upright Guinea-flower	
Hypericum gramineum	Small St John's Wort	
Hypericum japonicum	Matted St John's Wort	
Juncus bufonius	Toad Rush	
Juncus flavidus	Gold Rush	
Juncus procerus	Tall Rush	
Juncus spp.	Rush	
Juncus subsecundus	Finger Rush	
Lachnagrostis adamsonii	Adamson's Blown-grass	EN vu L
Lachnagrostis filiformis	Common Blown-grass	
Lepidosperma spp.	Sword Sedge	

Leptorhynchos orientalis	Lanky Buttons	L
Leptorhynchos squamatus	Scaly Buttons	P
Leptospermum continentale	Prickly Tea-tree	
Leptospermum myrsinoides	Heath Tea-tree	
Lomandra filiformis	Wattle Mat-rush	
Lomandra nana	Dwarf Mat-rush	
Lythrum hyssopifolia	Small Loosestrife	
Marsilea hirsuta	Short-fruit Nardoo	
Melaleuca spp.	Honey-myrtle	
Melicytus dentatus	Tree Violet	
Microlaena stipoides var. *stipoides*	Weeping Grass	
Oxalis perennans	Grassland Wood-sorrel	
Pelargonium rodneyanum	Magenta Stork's-bill	
Phragmites australis	Common Reed	
Pimelea curviflora	Curved Rice-flower	
Pimelea humilis	Common Rice-flower	
Pimelea spinescens subsp. *spinescens*	Spiny Rice-flower	CR en L
Plantago gaudichaudii	Narrow Plantain	
Plantago varia	Variable Plantain	
Poa labillardierei	Common Tussock-grass	
Poa labillardierei var. *(*Volcanic Plains*)*	Basalt Tussock-grass	k
Potamogeton tricarinatus	Floating Pondweed	
Pteridium esculentum subsp. *esculentum*	Austral Bracken	
Rumex brownii	Slender Dock	
Rytidosperma caespitosum	Common Wallaby-grass	
Rytidosperma carphoides	Short Wallaby-grass	
Rytidosperma geniculatum	Kneed Wallaby-grass	
Rytidosperma monticola	Small Flower Wallaby Grass	r
Rytidosperma pallidum	Silvertop Wallaby-grass	
Rytidosperma setaceum	Bristly Wallaby-grass	
Rytidosperma spp.	Wallaby Grass	
Schoenus apogon	Common Bog-sedge	
Senecio quadridentatus	Cotton Fireweed	P
Solenogyne dominii	Smooth Solenogyne	P
Thelymitra spp.	Sun Orchid	P
Themeda triandra	Kangaroo Grass	
Tricoryne elatior	Yellow Rush-lily	
Vittadinia gracilis	Woolly New Holland Daisy	P
Wahlenbergia gracilis	Sprawling Bluebell	
Introduced		
Acetosella vulgaris	Sheep Sorrel	
Agrostis capillaris	Brown-top Bent	

Aira spp.	Hair Grass	
Anthoxanthum odoratum	Sweet Vernal-grass	
Arctotheca calendula	Cape weed	
Avena fatua	Wild Oat	
Avena spp.	Oat	
Brassica spp.	Turnip	
Briza maxima	Large Quaking-grass	
Briza minor	Lesser Quaking-grass	
Bromus hordeaceus	Soft Brome	
Centaurium spp.	Centaury	
Cirsium vulgare	Spear Thistle	R in GH and W
Cynodon dactylon var. *dactylon*	Couch	
Dactylis glomerata	Cocksfoot	
Disa bracteata	South African Orchid	
Ehrharta erecta	Panic Veldt-grass	
Ehrharta longiflora	Annual Veldt-grass	
Erodium cicutarium	Common Heron's-bill	
Gladiolus tristis	Evening-flower Gladiolus	
Genista monspessulana	Montpellier Broom	WONS. C in W. R in GH.
Holcus lanatus	Yorkshire Fog	
Hordeum spp.	Barley Grass	
Hypericum perforatum subsp. *veronense*	St John's Wort	C in GH and W
Hypochaeris glabra	Smooth Cat's-ear	
Hypochaeris radicata	Flatweed	
Juncus acutus subsp. *acutus*	Spiny Rush	C in GH and W
Lactuca serriola	Prickly Lettuce	
Lepidium africanum	Common Peppercress	
Lolium perenne	Perennial Rye-grass	
Lolium spp.	Rye Grass	
Medicago polymorpha	Burr Medic	
Oxalis pes-caprae	Soursob	R in GH and W
Paspalum dilatatum	Paspalum	
Phalaris aquatica	Toowoomba Canary-grass	
Plantago coronopus	Buck's-horn Plantain	
Plantago lanceolata	Ribwort	
Poa annua	Annual Meadow-grass	
Romulea rosea	Onion Grass	
Rosa rubiginosa	Sweet Briar	C in GH and W

Rubus fruticosus spp. agg.	Blackberry	WONS. C in GH and W
Rumex crispus	Curled Dock	
Sonchus spp.	Sow Thistle	
Trifolium arvense var. *arvense*	Hare's-foot Clover	
Trifolium repens var. *repens*	White Clover	
Trifolium spp.	Clover	
Trifolium subterraneum	Subterranean Clover	
Ulex europaeus	Gorse	WONS. C in GH and W
Vulpia bromoides	Squirrel-tail Fescue	
Vulpia spp.	Fescue	