technical report A

biodiversity and habitats.



Environment Effects Statement | May 2021

western outer ring main

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APA VTS (Operations) Pty Ltd

Western Outer Ring Main (WORM) Environment Effects Statement - Biodiversity and Habitats Report

May 2021

This Biodiversity and Habitats Impact Assessment Report (Report):

1. Has been prepared by GHD Pty Ltd ("GHD") for APA VTS (Operations) Pty Ltd (APA);
2. May only be used for the purpose of informing the Environment Effects Statement and Pipeline Licence Application for the Western Outer Ring Main Project (and must not be used for any other purpose); and
3. May be provided to the Department of Environment, Land, Water and Planning for the purpose of public exhibition as part of the Environment Effects Statement and Pipeline Licence Application for the Western Outer Ring Main Project.

The services undertaken by GHD in connection with preparing this Report were limited to those specifically detailed in section 6 of this Report. The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD when undertaking services and preparing the Report (Assumptions), as specified in section 1.4 and throughout this Report. GHD excludes liability for errors in, or omissions from, this Report arising from or in connection with any of the assumptions being incorrect. Subject to the paragraphs in this section of the Report, the opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the time of preparation. GHD has not, and accepts no responsibility or obligation to update this Report to account for events or changes occurring subsequent to the date that the Report was signed.

Executive summary

This technical report is an attachment to the Western Outer Ring Main (WORM) Project Environment Effects Statement (EES). It provides a biodiversity and habitat assessment for the Project and defines the environmental management measures necessary to meet the EES evaluation objectives.

Overview

The Western Outer Ring Main Project (the Project) is a 51 kilometre buried 600 millimetre nominal diameter high pressure gas transmission pipeline between APA's existing Plumpton Regulating Station (approximately 38 kilometres north-west of Melbourne's CBD) and Wollert Compressor Station (approximately 26 kilometres north-east of Melbourne's CBD), providing a high pressure connection between the eastern and western pipeline networks of the Victorian Transmission System (VTS).

The Project includes a new buried pipeline, three above-ground mainline valves along the pipeline alignment, and an additional compressor unit and regulating station at the existing APA Wollert Compressor Station.

APA VTS (Operations) Pty Ltd (APA) is the proponent for the Project.

On 22 December 2019, the Minister for Planning determined that the Project would require an EES under the *Environment Effects Act 1978* (EE Act).

The Minister identified key environmental risks that would need to be addressed in the EES. The biodiversity and habitat technical report focuses on the following risks:

- Effects on biodiversity and ecological values within and near the site, associated with adjacent road/rail reserves, conservation and riparian areas, including: native vegetation; ecological communities and species of flora and fauna listed under the *Flora and Fauna Guarantee Act 1988* (FFG Act); and other habitats or protected species.
- Effects on waterways, wetlands and groundwater hydrology, quality and aquatic ecology, including groundwater dependent ecosystems within and near the Project site. This risk is only partially addressed in this report, while risks associated with hydrology and groundwater dependent ecosystems are also addressed in the surface water and groundwater technical reports.

The Project was determined to be a controlled action under Section 75 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 21 February 2020. As a controlled action, the Project requires further assessment and approval under the EPBC Act before it can proceed (referral submission (2019/8569).

The Project is being assessed in accordance with the bilateral agreement between the State of Victoria and the Commonwealth (Environmental Impact Assessment). The EES and subsequent assessment by the State of Victoria will inform a separate approval decision under the EPBC Act.

Acceptance under section 74A of the EPBC Act that the subject of the referral is a component of a larger proposed action was made by the Commonwealth Department of Agriculture, Water and Environment (DAWE). As described in Section 1.3, two geographic sections of the Project Area have been identified with differing assessment and approvals pathways:

- Within the approved Melbourne Strategic Assessment (MSA) areas (KP 0 - KP 3.15, KP 28.16 - KP 28.57 and KP 32.07 – KP 51.04)
- Outside the MSA area (KP 3.15 - KP 28.16 and KP 28.57 – KP 32.07)

The Melbourne Strategic Assessment is an agreement between the Victorian and Commonwealth government made under Part 10 of the EPBC Act whereby impacts on matters of national environmental significance (MNES) that are expected to occur within the Melbourne urban growth boundary are defined and accounted for *a priori* and can be considered early in the development of a plan, policy or program (refer Section 1.3).

No further approvals are required under the EPBC Act for urban development in these areas, provided development follows the Urban Growth Boundary Program Report and the conditions of the approvals. APA has been advised by the DAWE that it can rely on the approval decision made under Part 10 of the EPBC Act for those parts of the Project within the approved MSA areas.

GHD was commissioned to undertake a biodiversity and habitat impact assessment for the purpose of the EES. A summary of the key assets, values or uses potentially affected by the Project, and an associated assessment of ecological impacts, are provided below.

Ecological context

The scoping requirements for the EES issued by the Minister for Planning set out the specific environmental matters to be investigated and documented in the Project's EES, which informs the scope of the EES technical studies. The scoping requirements include a set of evaluation objectives. These objectives identify the desired outcomes to be achieved in managing the potential impacts of constructing and operating the Project.

The biodiversity evaluation objective outlined in the scoping requirements is to "avoid and minimise potential adverse effects on native vegetation, listed threatened and migratory species and ecological communities and habitat for these species, as well as restore and offset residual environmental effects consistent with state and Commonwealth policies" (DELWP, 2020b).

Existing conditions

A risk-based approach was applied to screen and prioritise the key potential issues for assessment and inform measures to avoid, minimise and offset potential effects. Characterisation of the existing ecological conditions within the Project Area was undertaken through:

- A desktop assessment to determine the likelihood of occurrence of threatened flora, fauna and ecological communities within the Project Area
- A general field assessment to collect information on vegetation and habitat characteristics, and to inform the need for targeted surveys
- Field assessments to quantify native vegetation quality and extent
- Targeted surveys at specific locations that were considered likely to support threatened species or communities

Existing conditions - botanical values

The Project Area intersects six endangered Ecological Vegetation Classes (EVCs) across two bioregions: Victorian Volcanic Plain and Central Victorian Uplands. The majority of the Project Area falls within the Victorian Volcanic Plain bioregion.

The quality of native vegetation within the Project Area is generally poor, and the ecological values present largely reflect the long history of agricultural and urban land use in the surrounding landscape. There is continuing pressure from weed infestation, which is extensive and dominates the Study Area in general, and regular broadscale disturbance from urban development. Most native vegetation occurs outside the MSA area.

Despite the highly utilised landscape, the Project Area contains notable ecological values. Key areas of remnant vegetation within the Project Area generally consist of riparian vegetation (Riparian Woodland) associated with Deep, Jacksons and Merri Creeks. Also recorded were patches of good quality Plains Grassland and Plains Grassy Woodland, some of which also meet condition thresholds for EPBC Act-listed threatened ecological communities (TECs), *Natural Temperate Grassland of the Victorian Volcanic Plain* and *Grassy Eucalypt Woodland of the Victorian Volcanic Plain*.

Within the entire Project Area approximately 15.32 ha of patches of native vegetation was mapped in six EVCs. Additionally, 12 large trees within patches, 16 large scattered trees, and 16 small scattered trees were also recorded. Outside the MSA, the extent of native vegetation is 13.39 ha. Within the MSA, 1.93 ha of native vegetation was mapped during field surveys (although 5.94 ha of native vegetation is mapped as time-stamped data).

Two FFG Act-listed threatened communities were mapped within the Project Area. Western (Basalt) Plains Grasslands Community was the more widespread of the two communities, occupying 10.36 ha, the majority of which (8.98 ha) occurred outside the MSA area on private property. In total, 4.62 ha of Western Basalt Plains (River Red Gum) Grassy Woodland was mapped within the Project Area but occurred almost entirely on private property outside the MSA area (4.30 ha).

In total, 4.16 ha of TEC *Natural Temperate Grassland of the Victorian Volcanic Plain* (Critically Endangered) was mapped within the entire Project Area, with the majority (3.43 ha) occurring outside the MSA area. Additionally, 2.26 ha of TEC *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* was mapped within the entire Project Area, almost all of which (2.20 ha) occurred outside the MSA area.

Botanical surveys identified three threatened flora within the Project Area:

- Matted Flax-lily *Dianella amoena* (one individual) listed as Endangered under the EPBC Act and threatened under the FFG Act; recorded on public land outside the MSA area
- Tough Scurf-pea *Cullen tenax* (48 individuals), listed as threatened under the FFG Act were recorded in a single population on private land within the approved MSA area
- Arching Flax-lily *Dianella longifolia* var. *grandis* (one individual) considered vulnerable on the Department of Environment, Land Water and Planning (DELWP) advisory list; recorded on private land outside the MSA area

Eleven noxious weeds listed under the Victorian *Catchment and Land Protection Act 1994* were recorded within the Project Area. Most of these are extremely widespread and abundant both within and outside the construction corridor.

Existing conditions – terrestrial fauna values

The majority of the Project Area has been subject to some level of disturbance as a result of farming (predominantly cropping and grazing) and urban development (Biosis, 2020). Native vegetation (which generally represents higher value fauna habitat) still persists within the Project Area although it is generally degraded and fragmented, reflecting the area's long history of agricultural land use and more recently, urban development. The Project Area is dominated by pasture grasses and in some areas, extensive tracts of noxious weeds. Three main habitat types were identified within the Project Area: grassland, woodland and waterways/wetlands.

Most threatened species identified for the Project Area are considered to have a low likelihood of occurrence. However, targeted surveys documented the occurrence of four threatened terrestrial fauna species within the Project Area:

- Striped Legless Lizard (six individuals) listed as Vulnerable under the EPBC Act, threatened under the FFG Act and endangered on the DELWP Advisory list, were recorded on private land outside the MSA area. The current Project Area intercepts 0.67 ha of confirmed habitat. A conservative approach to the remaining areas identified as Striped Legless Lizard habitat has been adopted and a total of 39.34 ha of known and assumed habitat has been assessed outside the MSA area.
- Golden Sun Moth (90 individuals) listed as Critically Endangered under the EPBC Act, threatened under the FFG Act and endangered on the DELWP Advisory list, were recorded from 14 parcels both within and outside the MSA area. The current Project Area intercepts a combined total of 19.93 ha of known and assumed habitat outside the MSA area.
- Growling Grass Frog listed as Vulnerable under the EPBC Act, threatened under the FFG Act and endangered on the DELWP Advisory list, were heard from three waterways and one dam inside and outside the MSA. Outside the MSA area, the species was heard at Deep Creek and presence has been assumed at Jacksons Creek where it intercepts 0.03 ha of habitat.
- Tussock Skink (93 individuals) listed as vulnerable on the DELWP Advisory list, were recorded from 10 grids both within and outside the MSA area.

Due to fieldwork constraints such as access being unavailable to some private property or unsuitable weather, not all targeted surveys were able to be completed. Habitat in these areas where surveys were not completed as per specific Guidelines are assumed to support relevant threatened species in order to inform impact assessment.

Existing conditions – aquatic values

The Project Area is within the Werribee River, Yarra River and Maribyrnong River catchments although no waterways are crossed by the alignment in the Werribee catchment. In terms of waterway health, Merri Creek, Jacksons Creek and Deep Creek are in poor condition, based on physical form, riparian zone composition and ‘aquatic life’, as indicated by the aquatic macroinvertebrate community. The fish community in the Project Area for each waterway consists of common native species and exotic species. There is a low likelihood of Platypus being present in Deep Creek but there has been a recent sighting (2019) in Jacksons Creek around 200 metres downstream of the Project Area. It is unlikely that Platypus are present in the Merri Creek Project Area.

There were seven threatened aquatic biota listed on the EPBC Act or FFG Act predicted to occur in the Project Area: Dwarf Galaxias, Australian Grayling, Macquarie Perch, Murray Cod, Silver Perch, Australian Mudfish or the Murray River Turtle. However, the desktop assessment and targeted surveys determined that most are considered to have a low likelihood of occurrence with Australian Grayling the only species with a medium likelihood.

In the Yarra catchment, the construction of a fishway at Dights Falls has aided in the recovery of Australian Grayling with increased recolonisation of upstream reaches and tributaries (Backhouse et al., 2008). Dights Falls is on the Yarra River in the vicinity of the confluence with Merri Creek, approximately 35 kilometres south of the Project Area. However, modelled distribution suggests a low probability they would exist in Merri Creek (Walsh et. al, 2013) and it is considered very unlikely they would navigate to upper reaches due to existing fish barriers near Craigieburn (Melbourne Water, 2018a) and a lack of suitable habitat within the Project Area for the species.

In the Maribyrnong catchment, the removal of barriers and upgrading of fishways in 2016 in the Maribyrnong River is likely to have improved fish passage through the Maribyrnong River and into Deep Creek and Jacksons Creek. Consequently, there is the potential that Australian Grayling would be able to navigate to these waterways as they are known to occur in the Maribyrnong River.

In terms of Jacksons Creek there is a low likelihood of Australian Grayling being present on site. Suitable habitat exists in the vicinity of the pipeline crossing. However, the current survey results, lack of previous records in Jacksons Creek and presence of the significant barrier downstream from the site indicate a low likelihood of presence.

With regards to Deep Creek, there is potential that Australian Grayling could pass through the site during its life cycle. Despite not being recorded from the 2020 survey, the habitat present on-site (i.e. a relatively diverse range of substrates, alternating pool-riffle sections, waterway size) and connection to the Maribyrnong River (where Australian Grayling have been recorded) suggest that Australian Grayling have a medium likelihood of occurring within the Project Area.

All other minor drains and waterways intersected by the Project Area were deemed highly unlikely to support EPBC Act or FFG Act-listed species based on desktop assessment.

Existing conditions – conservation areas

The Project area traverses two Biodiversity Conservation Strategy conservation areas (Figure 10):

- Conservation Area 34a - Northern Growth Corridor: Growling Grass Frog Corridor (between KP 42 and KP 44)
- Conservation Area 28b - Summerhill Road (East), Wollert (between KP 48 and KP 50)

A Works in Conservation Area (WICA) approval will be required for any works proposed in a Conservation Area.

Existing conditions – Environment Mitigation Levy areas

The Environment Mitigation Levy is applied within the MSA area to offset the loss or deemed loss of particular listed threatened species habitat and/or native vegetation The liability to pay an MSA levy is triggered when a levy event occurs within the levy area, where habitat compensation obligations have not been previously met. The Project has the potential to trigger two levy events:

- Issue of a Statement of Compliance for a plan of subdivision (i.e. subdivision of land)
- Construction of utility infrastructure on Crown land

The Project Area does not intercept any Crown land subject to the levy.

The Project Area intercepts 0.01 ha of the levy type Golden Sun Moth where land associated with MLV 3 (Gunn’s Gully Road) will be acquired as a subdivision.

Risk and impact assessment

A risk assessment of Project activities was conducted. The initial risk ratings considered a set of Environmental Management Measures (EMMs), which are based on compliance with the relevant legislation and standard requirements that are typically incorporated into the delivery of infrastructure projects of similar type, scale and complexity. Risk ratings were applied to each of the identified risk pathways assuming that these EMMs were in place.

Two species of threatened flora (Matted Flax-lily *Dianella amoena* and Tough Scurf-pea *Cullen tenax*), 10 large River Red Gum trees within a TEC and 6.01 ha of native vegetation will be avoided through pipeline re-alignment and use of horizontal directional drilling (HDD).

Land clearing during construction will impact one individual of threatened plant species, Arching Flax-lily *Dianella longifolia* var. *grandis*; 15.32 ha of native vegetation including 6.41 ha of two EPBC Act TECs, and two FFG Act threatened communities. The majority of the extent of both of these communities occurs outside the MSA.

Land clearing during construction that will impact endangered EVCs and threatened communities is planned to occur. These losses are considered unavoidable since design options have included reducing the construction corridor, using HDD where practicable and maximising use of non-native vegetation as temporary construction areas.

Land clearing may also result in temporary localised fragmentation of some fauna habitats. Some of the habitats that would be affected are known to or may support threatened fauna also. Habitats within the Project Area that support threatened terrestrial fauna are mainly confined to the higher quality grassland areas and waterways. Impacts to threatened fauna are expected to be largely limited to four species: Golden Sun Moth, Striped Legless Lizard, Growling Grass Frog and Tussock Skink.

The Golden Sun Moth, Striped Legless Lizard and Tussock Skink are confined to the grassy and grassy woodland habitats. Disturbance of understorey habitats within the Project Area is expected to be temporary with grasslands reinstated following works. However, Golden Sun Moth and Striped Legless Lizard in particular are very susceptible to ground disturbance and may not successfully recolonise these areas. With a majority of the Project Area comprising grassland habitats, it is the Golden Sun Moth and Striped Legless Lizard that are expected to experience the greatest impacts of land clearance in the Project Area, with respective totals of 19.93 and 39.34 ha of known or assumed habitat expected to be impacted and triggering significant residual impacts under the EPBC Act.

The Growling Grass Frog is known or assumed to be present in two locations outside the MSA area (Jacksons and Deep Creeks). The crossing at Deep Creek (where the species was recorded) is expected to be constructed using HDD methods, therefore impacts on instream habitat will be avoided and impacts on any adjacent terrestrial habitat minimised. Growling Grass Frog has been assumed present at Jacksons Creek, which is expected to be crossed using open trench methods. Here, the Project Area width has been reduced to 20 m wide within the waterway. Whilst individuals (If present) at these locations are expected to incur a small loss in available habitat at the time of construction, the areas of impact will be temporary and will be reinstated following completion of works.

Construction activities introduce risks of sediment, dust, litter or the release of other contaminants to waterways and wetlands that can degrade aquatic fauna habitat. Impacts on aquatic fauna may occur directly or indirectly. For example, an increase in sediment loads can smother aquatic plants and reduce substrate complexity, thereby indirectly reducing available habitat and indirectly influence aquatic fauna. Contaminants can potentially lead to direct toxicity, physical stress and behavioural effects on aquatic fauna. The use of HDD is assessed as a ‘negligible’ risk with a minor consequence while open trench construction is a ‘low’ risk with a minor consequence.

Construction activities introduce risks of impacts on riparian vegetation and in-stream habitats associated with waterways and wetlands leading to a loss or degradation of habitats used by both threatened and non-threatened terrestrial and aquatic fauna. The use of HDD and open trench construction methods are assessed as a ‘low’ risk with a minor consequence.

Project construction may result in the injuring or killing of fauna, mainly through land clearing (habitat removal) or fauna straying into a construction area. However, this is assessed as a low risk with an insignificant consequence as risks to threatened species can be managed and minimised through relevant EMMs (Environmental Management Measures) while risks to common species can also be minimised, but are more likely to impact individuals rather than populations.

The Project is in a rural landscape where the prevailing habitat types are largely contiguous and the proposed area of impact is restricted to a narrow corridor (up to 30 m wide in most places). As such, impacts as a result of noise, vibration and lighting are expected to be minimal as they are expected to be highly localised.

Potential impacts are most likely during the construction phase of the Project with all residual risks assessed as a low or negligible risk during the operation phase, once site rehabilitation is completed.

Matters of national environmental significance

Assessment of MNES under the EPBC Act is relevant to the areas outside the MSA area only.

Of the nine MNES identified in the EPBC Act, three were considered here in more detail: wetlands of international importance, listed threatened species and ecological communities, and migratory species. None of the other six MNES occur within the Project Area or are expected to be impacted at all by the Project. Listed threatened species and communities were identified by the DAWE as a controlling provision and impacts to this MNES are expected during construction of the Project.

Eight EPBC Act listed species and ecological communities were recorded during field assessments of the Project Area, of which five (*Natural Temperate Grassland of the Victorian Volcanic Plain*, *Grassy Eucalypt Woodland of the Victorian Volcanic Plain*, Golden Sun Moth, Striped Legless Lizard and Growling Grass Frog) are expected to be directly or indirectly impacted. Impacts on most species are expected to be minor, with the project only expected to trigger a significant impact in relation to two species: the Golden Sun Moth, based on the removal of greater than 0.5 ha of habitat; and the Striped Legless Lizard, which may be subject to a reduced area of occupancy and fragmentation of populations. Two threatened ecological communities (*Natural Temperate Grassland of the Victorian Volcanic Plain*, *Grassy Eucalypt Woodland of the Victorian Volcanic Plain*) are also expected to be significantly impacted by construction of the Project, based on three criteria for NTGVVP and five criteria for GEWVVP.

Environmental management measures

Thirty-six risk pathways were identified for the Project, of which 32 relate to the construction phase and four to the operation phase. Of these, two have a residual risk rating of very high, one has medium risk, 21 have low risk and 12 are considered to have negligible residual risk.

Potential impacts on ecological values due to the Project will be managed using the Project's Environmental Management Measures (EMMs). A range of EMMs are proposed to manage and mitigate the identified potential ecological impacts.

Nineteen EMMs relating specifically to expected impacts during construction have been developed to avoid or minimise risks to biodiversity and habitats from construction of the Project. Additionally, three EMMs are recommended to avoid or minimise any further impacts during operation of the Project.

EMMs from other technical reports have also been drawn upon to minimise impacts on biodiversity and habitats. Related technical reports are Technical report B – Surface water, Technical report C – Groundwater, Technical report E - Contamination, Technical report F - Noise and vibration, and Technical report J – Landscape and visual.

Two very high residual risks for this Project are risks that involve direct loss of EPBC Act TECs and FFG Act-listed threatened communities, and endangered EVCs. One medium residual risk for this Project is a risk that involves loss of habitat for fauna.

None of these impacts can be further avoided, since the likelihood of these events happening is certain, precluding any further reduction of the residual risk rating. Residual impacts will be offset in accordance with an ecological offset strategy.

Offset strategy

The construction of the Project will require the removal of surface vegetation including EPBC Act-listed TECs, FFG Act-listed threatened communities of flora, Victorian endangered EVCs, threatened flora and fauna habitat, large trees and scattered trees.

Unavoidable loss of TECs and threatened fauna habitat will be managed through Commonwealth offsetting as required under the EPBC Act, while the removal of endangered EVCs and large trees will be managed through an offsetting arrangement in accordance with the Victorian *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a). Offsets for the loss of FFG Act-listed threatened vegetation communities will be addressed through offsets for endangered EVCs Plains Grassland and Plains Grassy Woodland. The offset strategy will also detail the Environmental Levy requirements for impacts within the MSA area. The Ecological Offsets Strategy (GHD 2021) indicates that the risk of not being able to secure the required offsets is low.

Based on the current native vegetation removal report for the Project (Appendix BB), 14.789 ha of native vegetation is planned to be removed. Removal considers the area occupied by tree canopies and excludes areas of native vegetation that will be removed in the approved MSA area. Offsets are required for native vegetation and 19 large trees but these losses do not currently trigger species offsets. An avoidance and minimisation strategy has aimed to reduce offsets for large trees. Where greater than 10% of the tree protection zone falls within the construction corridor, an arborist's assessment will be conducted prior to construction to determine the actual expected losses for trees, and during construction to further reduce impacts to trees where these are deemed avoidable once works have commenced. These trees will be excluded from offsetting.

Summary of Vegetation Calculations for impacts and offsets

Community	Bioregion	Inside MSA (Timestamped Data)	Inside MSA (Field mapped Data)	Outside MSA Field Mapped Data	Total Field Mapped Data
EVCs impacted (ha)					
Plains grassland (EVC 132)	VVP	1.89	1.38	8.73	**10.11 ha**
Plains grassland (EVC 132)	CVU	0.00	0.00	0.25	**0.25 ha**
Plains Grassy Woodland (EVC 55)	VVP	2.47	0.32	4.30	**4.62 ha**
Aquatic Herbland (EVC 653)	VVP	0.00	0.00	0.06	**0.06 ha**
Riparian Woodland (EVC 641)	VVP	0.01	0.08	0.05	**0.13 ha**

Community	Bioregion	Inside MSA (Timestamped Data)	Inside MSA (Field mapped Data)	Outside MSA Field Mapped Data	Total Field Mapped Data
Stony Knoll Shrubland (EVC 649)	VVP	1.37	0.14	0.00	**0.14 ha**
Creekline Tussock Grassland (EVC 654)	VVP	0.03	0.00	0.00	**0.00 ha**
Plains Grassy Wetland (EVC 125)	VVP	0.17	0.00	0.00	**0.00 ha**
Total EVC's		**5.94**	**1.93**	**13.39**	**15.32 ha**
FFG community impacted (ha)					
Western (Basalt) Plains Grasslands Community	VVP	1.89	1.38	8.98	**10.36 ha**
Western Basalt Plains (River Red Gum) Grassy Woodland	VVP	2.47	0.32	4.30	**4.62 ha**
Total		**4.36**	**1.71**	**13.12**	**14.98 ha**
EPBC Community Impacted (ha)					
NTGVVP			0.73	3.43	**4.16 ha**
GEWVVP			0.06	2.20	**2.26 ha**
NTGVVP Fragmented patches			0.02	0.28	**0.30 ha**
GEWVVP Fragmented patches			0.00	0.04	**0.04 ha**
Total EPBC community (removal)			**0.78**	**5.63**	**6.41 ha**
Total fragmented patches			**0.02**	**0.32**	**0.34 ha**
Total EPBC Community accounted for			**0.80**	**5.95**	**6.75 ha**
Native Trees impacted (trees)					
Small scattered trees			6	10	**16 trees**
Large Scattered trees			6	10	**16 trees**
Large Canopy trees			3	9	**12 trees**
NVR report - offsets					
Extent of proposed removal			0.013 ha	14.775 ha	**14.789 ha**
Large trees to be removed			-	19 trees	**19 trees**
Offset amount			0.006 GHU	5.521 GHU	**5.527 GHU**

Abbreviations

Abbreviation	Definition
AEMO	Australian Energy Market Operator
ALA	Atlas of Living Australia
APA	APA VTS Australia (Operations) Pty Ltd (APA) (trading as APA)
BioCS	Bioregional Conservation Significance
BCS	Biodiversity Conservation Strategy
Biosis	Biosis Pty Ltd
BSA	Biosis Survey Area
CaLP Act	*Catchment and Land Protection Act 1994*
CAM	Common Assessment Method
CEMP	Construction Environment Management Plan
CMA	Catchment Management Authority
CVU	Central Victorian Uplands
DAWE	Department of Agriculture, Water and the Environment
DBH	Diameter at breast height
DCPO	Development Contributions Plan Overlays
DoEE	Department of Environment and Energy (now DAWE)
DELWP	Department of Environment, Land, Water and Planning
DEPI	Department of Environment and Primary Industries (now DELWP)
DSE	Department of Sustainability and Environment (now DELWP)
DSEWPAC	Department of Sustainability, Environment, Water, Population and Communities (now DAWE)
eDNA	Environmental DNA
EES	Environment Effects Statement
EMM	Environmental Mitigation Measure
EnSym	Environmental Systems Modelling Platform
ESO	Environmental Significance Overlay
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EVC	Ecological Vegetation Class
FFG Act	*Flora and Fauna Guarantee Act 1988*
FFGA Act	*Flora and Fauna Guarantee Amendment Act 2019*
FZ	Farming Zone
GAA	Growth Area Authority
GDE	Groundwater dependent ecosystem

Abbreviation	Definition
GEWVVP	Grassy Eucalypt Woodland of the Victorian Volcanic Plain
GHD	GHD Pty Ltd
GHU	General Habitat Units
GWZ	Green Wedge Zone
HCO	Habitat Compensation Obligation
HDD	Horizontal Directional Drilling
Hha	Habitat ha
HO	Heritage overlay
HWS	Healthy Waterway Strategy
HZ	Habitat zone
IPO	Incorporated Plan Overlay
IUCN	International Union for the Conservation of Nature
KP	Kilometre Point
LGA	Local Government Authority
MCMC	Merri Creek Management Committee
MEL	National Herbarium of Victoria
MNES	Matters of National Environmental Significance
MSA	Melbourne Strategic Assessment
NTGVVP	Natural Temperate Grassland of the Victorian Volcanic Plain
NVIM	Native Vegetation Information Management
NVPP	Native Vegetation Precinct Plans
NVR report	Native Vegetation Removal report
OEMP	Operations Environmental Management Plan
OMP	Offset Management Plan
OMR	Outer Metropolitan Ring
PE Act	*Planning and Environment Act 1987*
PMST	Protected Matters Search Tool
PPRZ	Public Park and Recreation Zone
PSP	Precinct Structure Plan
RCZ	Rural Conservation Zone
ROW	Right of Way
SAC	FFG Act Scientific Advisory Committee
SEPP	State Environment Protection Policy (Waters)
SHWTLP	Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains
SLO	Significant Landscape Overlay
SRZ	Structural Root Zone
TEC	Threatened Ecological Community
TPZ	Tree Protection Zone

Abbreviation	Definition
UGB	Urban Growth Boundary
UGZ	Urban Growth Zone
VPO	Vegetation Protection Overlay
VROTS	Victorian rare or threatened species
VBA	The Victorian Biodiversity Atlas
VNIE	Victorian Northern Internet Expansion
VQA	Vegetation Quality Assessment
VVP	Victorian Volcanic Plain
WICA	Works in Conservation Area
WoNS	Weeds of National Significance
WORM	Western Outer Ring Main (the Project)
WVTN	Western Victoria Transmission Network

Glossary

Term	Definition
Biodiversity	The variety of all life forms, the different plants, animals and micro- organisms, the genes they contain, and the ecosystems of which they form a part.
APA	APA VTS (Operations) Pty Ltd, a subsidiary of APA Group, the proponent for the Project
ASI	Areas of Strategic Importance
Bioregion	A landscape based approach to classifying the land surface using a range of environmental attributes such as climate, geomorphology, lithology and vegetation.
Bioregional conservation status (BioCS)	An assessment of the conservation status of the native vegetation type (EVC) in the context of a particular bioregion, taking account of how commonly it originally occurred, the current level of depletion and the level of degradation of condition typical of remaining stands.
e-bird	A database of bird records (at www.ebird.org), administered by Audubon and Cornell Lab of Ornithology, USA
Ecological Vegetation Class (EVC)	A type of indigenous vegetation classification specific to Victoria that is described through a combination of floristics, lifeforms and ecological characteristics and through an inferred fidelity to particular environmental attributes. Each EVC includes a collection of floristic communities that occurs across a biogeographic range, and although differing in species, have similar habitat and ecological processes operating.
Environmental management measure	Approaches, requirements or actions to avoid, mitigate or manage potential adverse impacts
Exotic fauna (= non-native fauna)	Any fauna that is not native to Australia or its states and territories.
Exotic vegetation	Any vegetation that is not native to Australia or its states and territories.
Drip line	The drip line is the outermost boundary of a tree canopy (leaves and/or branches) where the water drips on to the ground.
Graminoid	A herbaceous plant with a grass-like morphology
Habitat hectare (Hha)	A site-based measure of quality and quantity of native vegetation that is assessed by conducting a Vegetation Quality Assessment in the context of the relevant native vegetation type.
Habitat zone (HZ)	A discrete area of native vegetation consisting of a single vegetation type (EVC) with an assumed similar averaged quality. This is the base spatial unit for conducting a Vegetation Quality Assessment.
HDD	Horizontal directional drilling

Term	Definition
Indigenous vegetation	Indigenous vegetation includes vegetation that is native to Australia as well as being native to a specific geographic region. In the case of the Project, this includes vegetation that is native to the Port Phillip and Westernport Catchment Management Region.
MSA Area	An agreement between the Victorian and Australian governments made under Part 10 of the EPBC Act whereby impacts on MNES that are expected to occur within the Melbourne urban growth boundary are defined and accounted for *a priori* and can be considered early in the development of a plan, policy or program
Native canopy tree	A native canopy tree is a mature tree (that is, it is able to flower) that is greater than three metres in height and is normally found in the upper layer of the relevant vegetation type.
Native trees	Native trees include all trees that are native to Australia, and its states and territories.
Patch	A patch of native vegetation is either: a) an area of vegetation where at least 25% of the total perennial understorey plant cover is native, or b) any area with three or more native canopy trees where the drip line of each tree touches the drip line of at least one other tree, forming a continuous canopy, or c) any mapped wetland included in the *Current wetlands map*, available in DELWP systems and tools (DELWP, 2017a).
Plant cover	Plant cover is the proportion of the ground that is shaded by vegetation foliage when lit from directly above. Areas that include non-vascular vegetation (such as mosses and lichens) but otherwise support no vascular vegetation are not considered to be a patch for the purposes of the Guidelines (DELWP, 2017a). However, when non-vascular vegetation is present with vascular vegetation, it does contribute to cover when determining the percentage of perennial understorey plant cover.
Project area	The full extent of both the Project construction and operation corridors
Scattered tree	A scattered tree is a native canopy tree that does not form part of a patch (DELWP, 2017a).
Scoping requirements	The EES Scoping requirements for the Project issued by the Minister for Planning in August 2020 (DELWP, 2020b).
Threatened species	For the purposes of this report, threatened species refers to species considered threatened in Victoria or Australia. This includes species that are rare, vulnerable, endangered or critically endangered in Victoria as defined by DEPI (2014), DSE (2009) or DEPI (2013b); listed under the Victorian *Flora and Fauna Guarantee (FFG) Act 1988*, or listed as vulnerable, endangered or critically endangered under the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*. Species listed as near-threatened, poorly known or data deficient on DEPI (2014), DSE (2009) or DEPI (2013b) are not considered threatened for the purpose of the biodiversity assessment.

Term	Definition
Victorian Biodiversity Atlas (VBA)	The VBA is administered by the Victorian Department of Environment, Land, Water and Planning and replaces several legacy systems, including the Flora Information System, the Atlas of Victorian Wildlife, and the Aquatic Fauna Database. The VBA encompasses vertebrate and invertebrate animals, fungi, vascular and non-vascular plants from terrestrial and aquatic environments, including marine waters to the three nautical mile statutory limit. It includes both native and naturalised exotic species (including weeds and pests) but is not intended to hold data on cultivated or domesticated species.

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1. Introduction

1.1 Purpose of this report

The Western Outer Ring Main (WORM) gas pipeline project (the Project) is a proposed 51.0 kilometre long 600 millimetre nominal diameter high pressure gas transmission pipeline that will provide a high pressure connection between the eastern and western pipeline networks of the Victorian Transmission System (VTS).

APA is the proponent for the Project. APA is Australia's largest natural gas infrastructure business. In Victoria, the VTS is owned and maintained by APA and consists of some 2,267 kilometres of gas pipelines. The VTS serves a total consumption base of approximately two million residential consumers and approximately 60,000 industrial and commercial users throughout Victoria.

The Project has been designed to provide critical infrastructure for Victoria's gas supply, distribution, and consequent security, efficiency and affordability. The key objectives of the Project are to:

- Improve system resilience and security of gas supply
- Increase the amount of natural gas that can be stored for times of peak demand
- Improve network performance and reliability
- Address potential gas shortages as forecasted by the Australian Energy Market Operator (AEMO) in the March 2020 Victorian Gas Planning Report update

The Minister for Planning determined on 22 December 2019 that APA and the Western Outer Ring Main (WORM) gas pipeline project (the Project) would require an Environment Effects Statement (EES) under the Victorian *Environment Effects Act 1978* (EE Act). The EES will inform assessment of approvals required for the Project including under the Victorian *Pipelines Act 2005* (Pipelines Act), *Aboriginal Heritage Act 2006* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Under the Victorian *Environment Effects Act 1978* (EE Act), Projects that could have a 'significant effect' on Victoria's environment may require preparation of an EES for assessment by the Minister for Planning. The EE Act applies to any works 'reasonably considered to have or be capable of having a significant effect on the environment'.

The EES referral criteria for impacts on ecological values were considered as part of the preliminary assessments for the Project. The Project was referred to the Minister for Planning, who determined that an EES was required for the Project. The Minister's reasons were:

- The Project has the potential for significant environmental effects, in particular on native vegetation, habitat of terrestrial and aquatic species listed under the *Flora and Fauna Guarantee Act 1988*, ecologically sensitive waterways and wetlands, and on Aboriginal cultural heritage.
- An environment effects statement is warranted to provide an integrated, robust and transparent process to assess the proposal's effects and associated uncertainties, and to evaluate effectiveness of the proposed avoidance, mitigation, management and offsetting measures, prior to any statutory approval decisions.

In regards to matters of national significance (MNES) under the federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the Project is considered to be a controlled action and as such requires assessment and a decision under the EPBC Act. The Project will be assessed under a bilateral agreement under the Victorian EE Act.

The Pipeline Licence Application is exhibited with the EES, and the Minister for Planning's assessment of the EES will be considered before granting a licence. Under the *Pipelines Act*, assessment of the Pipeline Licence Application will consider the Act's objectives (including "*to ensure that pipelines are constructed and operated in a way that minimises adverse environmental impacts and has regard for the need for sustainable development*") and principles of sustainable development (including "*biological diversity should be protected and ecological integrity maintained*").

The purpose of this report is to assess the potential biodiversity and habitat impacts associated with the Project. The report describes the existing vegetation, species and terrestrial and aquatic habitats; current threats and potential impacts on biodiversity values from the Project and the environmental management measures necessary to mitigate these impacts and potential impacts. It also assesses the Project's likely direct, indirect and cumulative effects, risks and impacts with respect to flora, fauna and areas of conservation value, and evaluates what alternatives to Project design might exist to reduce or remove these effects. The scope of the report is described in more detail in Section 2.

1.2 Why understanding ecology is important

The study of ecology in the context of this EES technical report is focused on identifying the biodiversity values of areas that may be impacted by the Project. These values are recognised by the Commonwealth and Victorian governments in legislation, frameworks and policies designed to facilitate their conservation and include native vegetation, migratory species, threatened species or communities, and habitat for migratory and/or threatened species.

Impacts on significant ecological values and the application of the legislation, frameworks and policies that relate to their protection are a key consideration of the EES process. Accordingly, an understanding of existing ecological values within the Project study area is critical to determine the likelihood and extent of Project related impacts on significant ecological values.

This report is based on EES criteria and scoping requirements, which prioritise species and communities of conservation significance, particularly threatened and migratory species and threatened communities. Consideration of threatened species and communities and their habitats provides consideration for common (i.e. non-threatened) species and communities that also occur in the Project area.

1.3 Existing assessments and approvals

Biosis (2020, pp. 12-13) summarised existing assessments and approvals that apply to the Project Area with respect to biodiversity in the Melbourne Strategic Assessment (MSA) area and outside the MSA area:

"*Land within the construction footprint* [sic]*has been subject to a number of assessment and approval processes under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC) and the Planning and Environment Act 1987 (PE Act). Specifically, the following processes have been completed:*

- *An assessment was conducted under Part 10 of the EPBC Act for all land within the MSA area in 2009. This assessment involved targeted surveys and detailed assessments of the potential impacts of urban development and associated infrastructure on matters of national environmental significance (MNES). While the MSA assessment was initiated under the EPBC Act an integrated assessment process was conducted, whereby matters of State ecological significance were assessed concurrently, including State significant species and native vegetation (as defined under State based assessment methods). Surveys were undertaken in accordance with the Department of Environment, Land, Water and Planning (DELWP) Biodiversity Precinct Structure Planning Kit (DSE 2010) and EPBC Act guidelines and listing advice for MNES. Significant species recorded during the MSA surveys were submitted to State biodiversity databases.*
- *The MSA surveys and assessments resulted in development of the Native Vegetation Time Stamping Dataset (the timestamped dataset), a definitive view of native vegetation extent and condition across Melbourne's VC68 urban growth areas and incomplete Precinct planning areas within the Melbourne UGB (Urban Growth Boundary), timestamped as at 13 December 2012. The timestamped dataset is based on an assessment of native vegetation using the Victorian habitat ha method (Version 1.3), the current DELWP method for assessing native vegetation extent and condition for regulatory purposes. The dataset was based on a combination of extensive on-ground site surveys and estimated data using the best available information (desktop assessments, modelling, expert opinion, and over the fence assessment) for those properties where access was not obtained.*
- *The area covered by the timestamped dataset aligns with the extent of the Biodiversity Conservation Strategy (BCS) for Melbourne's Growth Corridors (DSE 2013a). The BCS sets out the detailed conservation measures required for Victoria to satisfy the commitments made to the Commonwealth Government under the MSA and meet State requirements for biodiversity under the Victorian planning scheme.*
- *A Part 10 EPBC Act approval was granted on 5 September 2013 allowing Actions resulting from urban development and infrastructure in parts of the MSA area. The areas covered under this approval are referred to as the 'approved MSA areas' and include the sections between approximately* KP 0 - KP 3.15, KP 28.16 - KP 28.57 and KP 32.07 – KP 51.
- *The BCS and timestamped dataset have been used as the basis for assessing decisions under the PE Act within the approved MSA areas. Where Precinct Structure Plans (PSPs) have been approved in the MSA area there has been an amendment to clause 52.17 (Native vegetation) of relevant planning schemes so that proponents can rely on approval conditions under the Part 10 EPBC approval.*

- *The timestamped dataset has been combined with significant species habitat data collected as part of the MSA program to produce the Environment Mitigation Dataset, used to determine habitat compensation obligations (HCOs)[1] for Projects assessed under the MSA area. The Time Stamping Dataset and Environment Mitigation Dataset are currently used to determine impacts and mitigation requirements for Projects within the approved MSA area under the EPBC Act and PE Act. The Victorian Northern Interconnect Expansion (VNIE) pipeline Project constructed in the eastern part of the construction footprint [sic] is one such Project that was within the definition of Actions resulting from urban development and infrastructure under the Part 10 approval and which relied on that approval.*
- *APA has been advised by the Department of Agriculture, Water and Environment (DAWE) that it can rely on the approval decision made under Part 10 of the EPBC Act for those parts of the WORM Project* [sic] *within the approved MSA areas* KP 0 - KP 3.15, KP 28.16 - KP 28.57 and KP 32.07 – KP 51.04.*"*

For consistency with Biosis (2020), this report also refers to the sections requiring approval under Part 9 of the EPBC Act (i.e. not covered by the Part 10 EPBC Act approval for the MSA) as 'areas outside the MSA area'. This includes the section from approximately KP 3.2 to KP 32.1.

Areas within the approved Melbourne Strategic Assessment (MSA) area occur between approximately KP 0 - KP 3.15, KP 28.16 - KP 28.57 and KP 32.07 – KP 51.04. Areas outside of the MSA occur approximately between KP 3.15 - KP 28.16 and KP 28.57 – KP 32.07.

Approved MSA areas and areas outside the MSA area are shown in Figure 2 and Figure 12.

1.4 Limitations, uncertainties and assumptions

This report has been prepared by GHD for APA VTS (Operations) Pty Ltd (subsidiary of APA Group) and may only be used and relied on by APA VTS (Operations) Pty Ltd for the purpose agreed between GHD and APA VTS (Operations) Pty Ltd as set out in section 1.1.

GHD otherwise disclaims responsibility to any person other than APA VTS (Operations) Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

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 set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. 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.

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

GHD has prepared this report on the basis of information provided by APA VTS (Operations) Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked 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.

[1] The environmental mitigation levies set out in the MSA Levy Act replace the earlier Biodiversity Conservation Strategy Habitat Compensation Obligations

The opinions, conclusions and any recommendations in this report are based on information obtained from specific sites and conditions at other sites may be different. Investigations undertaken in respect of this report are constrained by the particular site conditions and not all relevant site features and conditions may have been identified in this report. Site conditions may change after the date of this report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

Ecological limitations and assumptions of this assessment are outlined below:

- This assessment is based on the Project Area as described in Section 4.2. Should the Project Area change, this assessment may need to be updated.
- The need for targeted survey for listed threatened species was considered for those species identified by the investigation as having moderate or greater likelihood of occurrence in the Project area.
- For fauna, targeted surveys were not undertaken for some threatened species that are known or likely to occur in the Project Area, because the result was unlikely to alter the conclusion drawn (such as Grey-headed Flying-fox *Pteropus poliocephalus*, and Swift Parrot *Lathamus discolor*; as explained in Section 8.4.1).
- Where targeted fauna (terrestrial or aquatic) surveys are not undertaken in strict accordance with specific Guidelines and they do not detect the subject species they cannot provide conclusive evidence that threatened species do or will not occur, just that they haven't been detected. The assessment of likelihood of occurrence is based on survey effort, background information and previous records compiled.

2. EES scoping requirements

2.1 EES evaluation objectives

The scoping requirements for the EES released by the Minister for Planning set out the specific environmental matters to be investigated and documented in the Project's EES and inform the scope of the EES technical studies. The scoping requirements include a set of evaluation objectives. These objectives identify the desired outcomes to be achieved in managing the potential impacts of construction and operating the Project.

The following evaluation objective is relevant to the ecological assessment:

- Avoid and minimise potential adverse effects on vegetation, listed threatened and migratory species and ecological communities, and habitat for these as well as restore and offset residual environmental effects consistent with relevant State policies and Federal legislation.

3. EES scoping requirements

The scoping requirements relevant to the ecological evaluation objective are shown in Table 1, as well as the location where these items have been addressed in this report.

Table 1 Scoping requirements relevant to biodiversity

Scoping requirement	Section addressed
Existing environment	
Identify and describe any protected areas and other areas of biodiversity conservation value within or close to the Project.	Sections 5.3.4, 8.6.1, 8.7
Characterise the type, distribution and condition of native vegetation (including large trees), terrestrial and aquatic habitat and habitat corridors or linkages that could be impacted by the Project, including offsite infrastructure. This must include the quality and type of habitat impacted and quantification of the total impact area and areas indirectly impacted from the proposed action and must be informed as appropriate by targeted surveys undertaken in accordance with the appropriate Commonwealth or DELWP survey guidelines. Native vegetation and ecological communities characterised need to include those listed under the EPBC Act and FFG Act including but not limited to: • Natural Temperate Grassland of the Victorian Volcanic Plain • Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland • Grassy Eucalypt Woodland of the Victorian Volcanic Plain	Sections 8.3, 8.4, 8.5, 8.6
Identify the existing or likely presence of any protected species, and especially species listed under the EPBC Act, FFG Act and DELWP advisory lists, as well as environmental weeds, pathogens and pest animals. Among other species, this needs to include the potential use of the site and its environs by the: • Growling Grass Frog (*Litoria raniformis*) • Golden Sun Moth (*Synemon plana*) • Spiny Rice-flower (*Pimelea spinescens* subsp. *spinescens*) • Matted Flax-lily (*Dianella amoena*)	Sections 8.3.2, 8.3.3.3, 8.3.3.4, 8.4.3, 8.5.2, 8.5.3, 12.2, 12.2.2
Characterise the listed threatened and migratory species, other protected species, ecological communities, and potentially threatening processes that are likely to be present. This characterisation is to be supported by seasonal or targeted surveys where necessary. Details of the scope, timing and method for studies or surveys used to provide information on the ecological values of the Project Area (and in other areas that may be impacted by the Project) needs to be outlined. Records and other data from local sources should also be gathered and considered as appropriate	Sections 6.2.2, 6.2.6 and Appendix AA
As appropriate, identify the different uses which significant species may make of different habitat areas that could be affected by the Project at different times or life-cycle stages	Sections 8.4.3, 8.5.2, 8.5.3
Identify and characterise any groundwater dependent ecosystems that may be affected by the Project works. This characterisation is to be informed by data, literature and appropriate surveys	Section 8.3.2.7
Identify flora and fauna that could be affected by the Project's potential effects on air quality, noise or vibration, or could be disoriented or otherwise impacted by Project lighting	Section 10.1.2, 10.1.4, 10.1.9, 10.2.3

Scoping requirement	Section addressed
The characterisation of the existing environment for biodiversity should consider the timestamped dataset collected as part of the Melbourne Strategic Assessment (MSA) program	Section 6.2.2.2, 8.3.3.1
Describe the existing threats present to biodiversity values, including: • Removal of individuals or destruction of habitat • Historic or ongoing disturbance or alteration of habitat conditions (e.g. habitat fragmentation, severance of wildlife corridors or habitat linkages, changes to water quantity or quality, fire hazards, erosion and sedimentation, etc.) • Threats of mortality of listed threatened fauna • Presence of or risk of introduction of any declared weeds, pathogens and pest animals within and near the Project area • Initiating or exacerbating potentially threatening processes listed under the EPBC Act and/or FFG Act	Section 10 and Appendix AA
Mitigation measures	
Identify potential and proposed design options and measures that could avoid, minimise, mitigate or manage significant direct and indirect effects on native vegetation (including large trees) and any listed ecological communities or flora and fauna species and their habitat within or adjacent to the pipeline alignment. Include description and assessment of the expected or predicted effectiveness of the mitigation measures, including cost and any statutory or policy basis for the mitigation measures	Section 13
Justify and describe the assumptions and level of uncertainty associated with the proposed measures achieving their desired outcomes.	Section 6.2.2.4 and 14.2.4
Likely effects	
Assess likely direct and indirect effects of the Project and feasible alternatives on flora and fauna including native vegetation (including large trees), ecological communities and habitats for protected fauna and flora species, in particular any species listed under the EPBC Act, FFG Act or DELWP advisory lists. Where appropriate, effects should be described in relation to existing hazards and risks and with regard to conservation or listing advices, action statements, recovery plans and threat abatement plans.	Sections 9, 10 and 12
Assess likely direct and indirect effects of the Project and alternatives on protected fauna and their habitat, including threatened or migratory species listed under the EPBC Act, FFG Act or DELWP advisory lists, relative to existing hazards and risks and with regard to conservation or listing advices, action statements, recovery plans and threat abatement plans. Where surveys do not identify a listed species but past records and/or habitat analysis suggest that it may occur locally, justification will need to be provided if further investigations or further mitigation measures are not proposed	Sections 9, 10 and 12
Assess potential impacts on protected areas and other areas of biodiversity conservation value, including conservation areas identified in the Biodiversity Conservation Strategy for Melbourne's Growth Corridors (2013) or updates	Section 8.7

Scoping requirement	Section addressed
Assess likely cumulative effects on biodiversity-related values that might result from the Project in combination with other projects or actions taking place or proposed nearby	Section 10.3
Performance criteria	
Describe and evaluate proposed measures to manage the residual effects of the Project on biodiversity values and MNES, including an offset strategy and offset management plan (OMP) that sets out and includes evidence of the offsets that can be secured or are proposed to satisfy Commonwealth and Victorian offset policy or guideline requirements	Sections 13 and 14.2
Describe how the offset/s will be secured, managed and monitored, including management actions, responsibility, timing, performance measures and the specific environmental outcomes to be achieved.	Ecological Offsetting Strategy
Proposed EPBC Act offsets must meet the requirements of the EPBC Act Environmental Offsets Policy (October 2012).	Ecological Offsetting Strategy
Describe and evaluate the approach to monitoring and the proposed contingency measures to be implemented in the event of adverse residual effects on flora, fauna and ecological community values requiring further management.	Sections 10.1.1.5,10.2.1, 14, Table 57

3.1 Linkages to other reports

This report relies on or informs the technical assessments as indicated in Table 2.

Table 2 Linkages to other technical reports

Specialist report	Relevance to this impact assessment
Technical report B – Surface water	Provides an assessment of the Project's effects on creeks and rivers, which is used in the assessment of threats to aquatic ecology.
Technical report C – Groundwater	Provides an assessment of changes to groundwater that inputs to the assessment of threats to groundwater dependent ecosystems.
Technical report D – Ground movement and land stability	Provides an assessment of potential ground level changes, which may impact hydrology of aquatic ecosystems and terrestrial vegetation.
Technical report E - Contamination	Provides an assessment of potential soil and waterway contamination risks.
Technical report F - Noise and vibration	Provides an assessment of potential noise and vibration risks.
Technical report J – Landscape and visual	Provides an assessment of existing landscape conditions and visual features that may be impacted by native vegetation removal
Technical report L – Social	Provides an assessment of matters of impacts to social values and socio-economic characteristics and affected communities that may be linked to vegetation removal.
Technical report K – Land use	Provides an assessment of the relevant strategic land use planning legislation, policies, strategies and provisions for the alignment.
Ecological Offsetting Strategy (GHD 2021)	Quantifies the offsets required by the Commonwealth and Victorian governments, and details how these offsets will be secured

Specialist report	Relevance to this impact assessment
Community and Stakeholder Consultation Report (GHD 2021)	Attachment to the EES that summarises the consultation undertaken during the EES process
EES Chapter 3 − Project Development	Describes the development of the Project and explains how the current form of the Project was selected
EES Chapter 20 – Environmental Management Framework	Provides a framework to manage the environmental effects identified in the EES

4. Project description

4.1 Overview

The Project provides a new link between APA's existing Plumpton Regulating Station (approximately 38 kilometres north west of Melbourne's CBD) and Wollert Compressor Station (approximately 26 kilometres north east of Melbourne's CBD). The Project includes the following key components:

- **A new pipeline**: The pipeline would be approximately 51 kilometres in length. The pipeline would be within a 15 metre wide permanent easement and be buried for its entire length to a minimum depth of cover of 750 millimetres.
- **Mainline valves**: Three mainline valves (MLV) would be located along the pipeline alignment. The area required for mainline valves would be subdivided and acquired by APA to provide ongoing access for any maintenance or inspection activities from the existing roads. The mainline valves would be spaced at intervals of approximately 15 kilometres, and located at approximately KP 6, KP 22 and KP 35.
- **The Wollert Compressor Station upgrade**: The installation of a new Solar Centaur 50 compressor, an end of line scraper station and a pressure regulating station within the existing APA facility at Wollert.

A schematic illustration of the Project context is shown Figure 1.

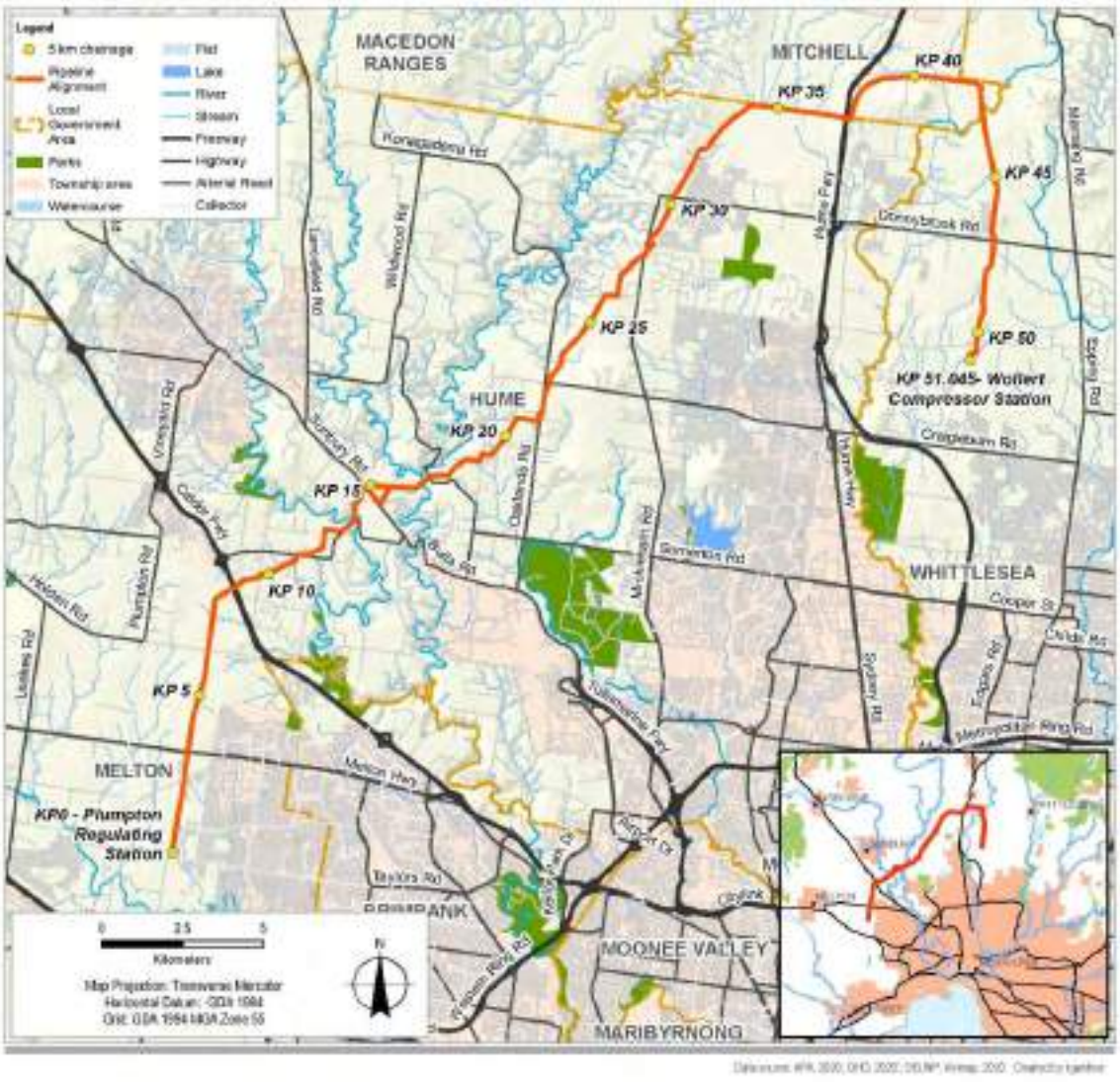


Figure 1 Western Outer Ring Main overview

4.2 Project location definitions

4.2.1 Project Area

The **Project Area** includes the full extent of both the construction and operation corridors. These consist of a permanent easement corridor where the pipeline will be contained during operation, within the construction corridor. Any tracks and turn around bays required during construction are included as part of the construction footprint. Refer to Section 4.3.2 and Section 4.4 for details.

4.2.2 Study Area – terrestrial flora and fauna

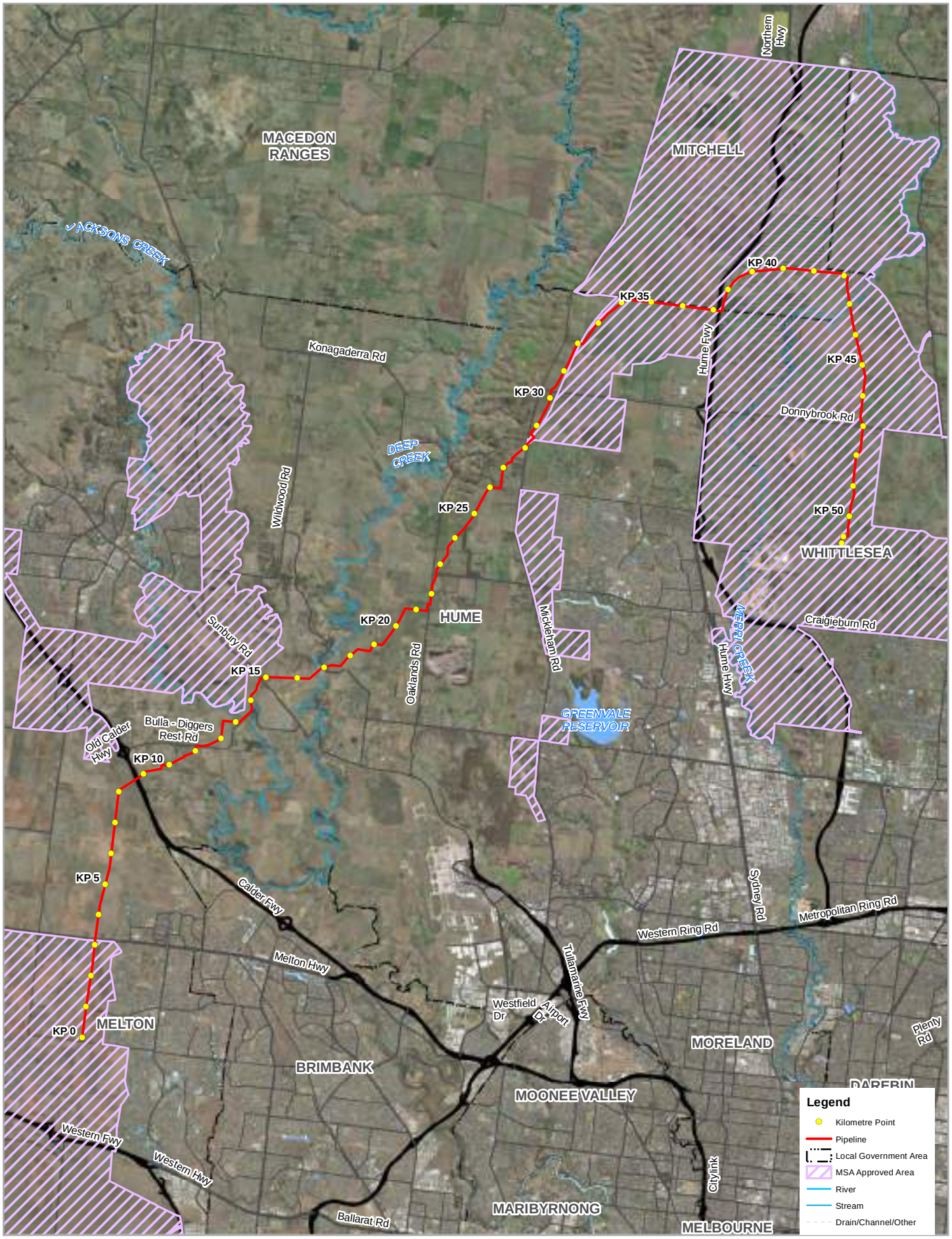
The term **Study Area** refers to a broader region surrounding the Project Area (i.e. includes areas that are outside the proposed impact areas). The Study Area for this assessment includes all land within five kilometres of the Project Area. This description covers a much broader area than the expected zone of impact and the additional information captured has been used to provide context to determine the significance of ecological features identified within the Project Area (for example, whether they are part of a larger area, or whether there are potential impacts on ecological features outside the Project Area).

4.2.3 Study Area – aquatic fauna

For aquatic fauna the Study Area included the entire lengths of Deep Creek, Jacksons Creek and Merri Creek to the confluence of the Yarra River with a one-kilometre buffer from streams (this incorporates the Maribyrnong River for Deep Creek and Jacksons Creek). This approach considers the requirement for diadromous fish species to migrate between freshwater and estuarine or marine habitats for breeding (see Section 6.2.6). The Study Area was only assessed at a desktop level.

Two sections have been identified for discussion purposes:

- Within the Melbourne Strategic Assessment approved areas (KP 0 - KP 3.15, KP 28.16 - KP 28.57 and KP 32.07 – KP 51.04)
- Outside the Melbourne Strategic Assessment approved areas (KP 3.15 - KP 28.16 and KP 28.57 – KP 32.07)
- Refer to Figure 2 below for an overview of the Project Area and relevant sections



Paper Size ISO A4

0 1 2 3 4

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Project No. 31-12529997
Revision No. D
Date 14/12/2020

Project Area Overview

Figure 2

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Print date: 14 Dec 2020 - 10:54

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020,Vicmap basemap imagery Created by: kgardner

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4.3 Construction

Subject to the staging of the works, construction for the entire Project is expected to take approximately nine months. Key construction activities for the Project include:

- Establishing offsite construction sites and construction/laydown areas
- Constructing the pipeline
- Constructing three mainline valves
- Construction of upgrades associated with the Wollert compressor station
- Rehabilitation

4.3.1 Construction sites

Two temporary sites would be established for construction. One offsite compound for pipeline works, nominally 200 metres x 200 metres, including laydown and storage areas and located on a site where the activity is permitted under the relevant Planning Scheme, most likely within an existing industrial area.

The second temporary laydown area and construction offices will be established for the Wollert Compressor Station construction works. The construction offices and site laydown area for the compressor station equipment will be located within the existing compressor site area at Wollert.

4.3.2 Pipeline construction area

The Project will require a construction area for the pipeline, which would typically comprise a 30 metre wide corridor along the pipeline alignment. Most construction activity will be located within this construction area. The activities and facilities within the construction corridor will include access tracks and additional work areas (such as vehicle turn around points and additional work spaces for crossings), and areas for stockpiling of materials and storage of pipe. Additional work areas around 50 metres x 50 metres or 50 metres x 100 metres (such as for vehicle turn-around points and areas to accommodate HDD) would be required in some locations. An access road running adjacent to the railway line in Beveridge is a possible access option for use by the Project. The access road is an existing access track recently constructed by Yarra Valley Water (YVW) and no physical construction works is proposed by the Project. As such this access track has not been considered further with regards to the assessment for biodiversity. APA and YVW had ongoing discussions on utilising the existing access track in 2020 however, APA's utilisation of the access track would require a separate agreement with each affected landowner and present significant cost due to lease payments and reinstatement costs. Due to the additional cost and risk that the affected landowners may not support the continued use of the track by APA, this option was not progressed. The track has been developed to allow YVW to complete their works currently progressing, these works shall be complete by October 2021 with the track reinstated by end of 2021.

A second informal access track option may be used by machinery and equipment to access the construction footprint from the north. This track follows the existing APA VNIE easement. Minimal works are required to establish the access track (e.g. stripping topsoil laying geofabric and rock) to create a durable surface for construction traffic. This access track has not been considered further with regards to the assessment for biodiversity, as the preferred option is to utilise a temporary access track over Merri Creek for approximately three months, which has been assessed in the report.

4.3.3 Pipeline construction method

The techniques used to construct the underground pipeline will include open trenching, and horizontal directional drilling (HDD) or horizontal boring at certain locations.

Where crossing watercourses, major roads, rail line reserves or other constraints, the pipeline may be constructed using trenchless construction techniques such as HDD or shallow horizontal boring to avoid construction disturbance within the sensitive area. Other factors, such as terrain and cost will also inform the extent to which these alternative techniques can be used. When trenching through waterways (including Jacksons Creek and Merri Creek), diversion dams would be constructed of appropriate materials to minimise watercourse sedimentation, such as steel plates, sand bags or inflatable dams. Where necessary trench breakers (either side of creek) would be used to reduce sediment transport into the drain caused by water flowing along the excavated trench. To prepare sites for construction a number of activities would be undertaken including installation of a vehicle crossing point across each creek.

The pipeline construction sequence starts with survey works and continues with site establishment (including laydown area), clearing and grading, pipe stringing, pipe bending, welding and coating, trenching, lowering pipe into trench and backfilling, hydrostatic testing, commissioning, and finally rehabilitation.

There will be dedicated access points into the construction corridor and vehicular movements along the Project alignment will be kept within the construction corridor.

4.3.4 Construction of other facilities

The construction sequence for the Wollert Compressor Station works starts with survey works and continues with site establishment (including laydown area), bulk earthworks, civil works (concrete slab and footings), mechanical works, electrical and instrumentation works, hydrostatic testing, commissioning, and site completion.

Various components of the compressor are assembled offsite. When delivered to site these components are assembled *in situ*. Cranes are used to lift the compressor into place with all connecting pipework fitted.

4.4 Operation

Following reinstatement after pipeline construction, the land will be generally returned to its previous use. Additional detail regarding reinstatement is provided in Section 13.3. When commissioned, the pipeline will be owned and maintained by APA. The pipeline will be contained within a 15 metre wide permanent easement corridor (within the area that formed the 30 metre construction corridor). Routine corridor inspections will be undertaken in accordance with APA procedures and AS 2885 to monitor the pipeline easement for any operational or maintenance issues.

Excavating or erecting buildings, large trees or shrubs over the underground pipeline is prohibited in accordance with the Pipelines Act and any additional works are pursuant to easement agreements with landowners.

Maintenance and inspections of the MLVs and the Wollert Compressor Station will also be conducted periodically in accordance with APA procedures. The activities usually include vegetation management, valve and compressor operation and corrective maintenance.

The key operation and maintenance phase activities include:

- Easement maintenance (vegetation control, weed management, erosion and subsidence monitoring)
- Pipeline, MLVs and compressor station maintenance
- Specialist pigging operations
- Cathodic protection surveys for mechanical and electrical preventative and corrective maintenance

- Monitoring and routine inspections and surveillance

4.5 Design, construction and operation considerations relevant to ecology

The method of construction has the potential to influence the level of impact to terrestrial and aquatic flora and fauna. In general, pipeline construction involves trenching or trenchless approaches. Trenchless construction is desirable where minimum surface disruption is to be achieved and to avoid the need for excavation. This may include under or through major transport corridors, some major watercourses, environmentally sensitive areas or where access may be restricted due to existing vegetation or infrastructure. Additional detail regarding method of construction is provided in Section 12.1.

There are three methods to construct the pipeline:

- Horizontal Directional Drilling (HDD)
- Horizontal boring
- Open trench

4.5.1 Horizontal directional drilling (HDD)

HDD is a trenchless method to install underground pipes, conduits and cables from the surface. The drilling process begins at surface level from a prepared launch site. The drill is directed at a relatively steep angle into the ground to drive it rapidly away from the surface.

HDD requires an entry and exit pit to be constructed that are typically approximately three metres wide, three metres in length and two metres deep. The drilling fluid or “mud” is used to assist with driving the drilling head and primarily consists of Bentonite and water. The mud is pumped under high pressure through the drill string to power the drill motor and mixes with the drill cuttings, also known as drill spoil. The mixture is then returned to the drill site. The drill cuttings are processed at the HDD rig and the drilling mud is recycled. The purpose of the drilling fluid is to keep the transmitter cool, stabilise the walls of the tunnel and remove spoil.

4.5.2 Horizontal boring

Horizontal boring, also referred to as thrust boring or micro-tunnelling, involves excavation of a horizontal bore hole for installation of a pipeline beneath sensitive surface features, roads and underground services. This method requires a large rectangular entry and exit pit to be excavated at each end of the crossing to accommodate the machinery and piping. Excavated pits are approximately at least four metres wide by eight metres long and up to five metres deep. The drilling commences at the entry pit and finishes at the exit pit. Once the boring is completed, the casing and pipes are installed and the pits are refilled.

4.5.3 Open trench

Open trenching involves excavating a trench to the required depth using specialised trenching machines and excavators to install pipelines before backfilling the surface. The trench is typically excavated to a depth of approximately two metres and approximate width of one metre. The trench spoil is stockpiled away from the streambed and stockpiled separately from vegetation and topsoil stockpiled earlier in the construction program. Prefabricated pipes are lowered into the trench and backfilled immediately. Rock breaking processes such as the use of rock saws/hammers and/or blasting are expected to be required to excavate the trench in areas of rock.

5. Legislation, policy and guidelines

5.1 Overview

The EES is prepared under the EE Act and will inform assessment of approvals required for the Project. The legislation relevant to the principal approvals required for the Project is:

- Commonwealth approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). For the component of the Project that is located outside of the MSA, the Project requires assessment and approval under the EPBC Act, under the assessment bilateral agreement with Victoria made under section 45 of the EPBC Act.
- Pipeline Licence approval is required under the *Pipelines Act 2005* (Vic) (Pipelines Act) for the Project. The Pipeline Licence application is exhibited with the EES.
- Cultural Heritage Management Plan (CHMP) under the *Aboriginal Heritage Act 2006* (Vic) (AH Act). Two CHMPs are currently in progress for the Project (CHMP 16593 and CHMP 16594).

A number of legislative, policy, guidance and standard documents are relevant to the Project and are discussed further in this report. The key legislation, policy and guidelines that apply to the biodiversity impact assessment for the Project are summarised in Table 3. Further detail is provided below in Sections 5.2 and 5.3.

Table 3 Key legislation and policy applicable to the Project

Legislation/policy	Relevance to this impact assessment
Commonwealth	
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Provides for the conservation of biodiversity and the protection of the environment, particularly MNES. Significant Impact Guidelines 1.1: Matters of National Environmental Significance (Department of Environment, 2013).
State of Victoria	
Environment Effects Act 1978 (EE Act)	Under the EE Act, Projects that could have a 'significant effect' on Victoria's environment may require an Environment Effects Statement (EES). An assessment of the EES referral criteria (DSE 2006) was made and the Project was subsequently referred to the Minister for Planning who determined that an EES was required for the Project.
Pipelines Act 2005	Construction and operation of 'high transmission' pipelines in Victoria. Sets a framework for consideration of the Pipeline Licence application including the principle that 'biological diversity should be protected and ecological integrity maintained' (Section 4(c)).
Melbourne Strategic Assessment (Environment Mitigation Levy) Act 2020	Establishes a Victorian legislative framework for the existing Melbourne Strategic Assessment program that has operated since 2010 under Part 10 of the EPBC Act approvals.
Flora and Fauna Guarantee Act 1988 (FFG Act)	Provides a process for listing threatened species and communities, protected flora and fauna, and potentially threatening processes with respect to Victorian native flora and fauna. Sets out protected flora controls.

Legislation/policy	Relevance to this impact assessment
Flora and Fauna Guarantee Amendment Act 2019 (FFGA Act)	Introduces principles to guide the implementation of the FFG Act, including consideration of the rights and interests of Traditional Owners and the impacts of climate change. • Requires consideration of biodiversity across government to ensure decisions and policies are made with proper consideration of the potential impacts on biodiversity. • Clarifies existing powers to determine critical habitat and improves their protection by encouraging cooperative management. • Gives effect to a consistent national approach to assessing and listing threatened species to reduce duplication of effort between jurisdictions and facilitate the monitoring and reporting of species' conservation status. • Modernises the FFG Act's enforcement framework including stronger penalties.
Environment Protection Act 1970 (EP Act)	Sets a framework for protection and improvement of surface water environments, including protected beneficial uses and environmental quality objectives. The EP Act allowed for the establishment of the State Environmental Protection Policy (Waters) (SEPP Waters), which applies to all surface waters, estuarine and marine waters and groundwater across the State. As the Project has the potential to impact waterways, the SEPP (Waters) clauses relevant to Management of Instream works (Clause 40); Management of the storage and handling of chemicals and hazardous substances (Clause 41), and Management of Construction Activities (Clause 42) must be adhered to. It is noted that the amended *Environment Protection Act 2017* will come into force in July 2021.
Water Act 1989	A works on waterways permit is required to construct works on a waterway identified under section 67 of the Water Act. The Project must apply to Melbourne Water for a works on waterways permit.
Wildlife Act 1975	Under the Act it is an offence to take or destroy (including removal or relocation) protected or threatened wildlife without authorisation. Under the Wildlife Act Regulations it is an offence to damage, disturb or destroy any wildlife habitat unless authorised to do so under any Act.
Catchment and Land Protection Act 1994 (CaLP Act)	Establishes a framework for management and protection of catchments, and sets out land owner responsibilities in relation to the management of pest plants and animals in Victoria.
Fisheries Act 1995	Creates a framework for regulation, management, development and conservation of Victorian fisheries, aquatic habitats and ecosystems, aquaculture industries and associated aquatic biological resources. FFG Act-listed aquatic biota are also protected under the *Fisheries Act 1995* and may not be taken, injured, damaged or destroyed (Section 71) or have their passage obstructed (Section 119) without authorisation.
Planning and Environment Act 1987 (P & E Act)	Establishes the framework for the use, development and protection of land in Victoria. The P&E Act provides for planning schemes which are typically administered by local government but can also be administered by the State in certain circumstances.
DELWP threatened species advisory lists (DSE 2009, 2013b; DEPI 2014) (non-statutory)	Provides a list of species that are recognised as rare or threatened in Victoria. There are no direct legal requirements or consequences that flow from inclusion of a species in the advisory lists, although they are afforded some protection through *the Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a). Species included in the list may also be listed as threatened under the EPBC Act or FFG Act.

Legislation/policy	Relevance to this impact assessment
SEPP (Waters) (2018)	Subordinate to the EP Act, the State Environment Protection Policy (SEPP) for Waters provides a framework for the protection and management of water resources in Victoria, covering surface waters, estuarine and marine waters and groundwater across the State. SEPP (Waters) aims to protect the beneficial uses of water resources, set water quality indicators and objectives, and establish rules and obligations to achieve these objectives.
Victorian Waterway Management Strategy (2013)	Detailed policy for managing Victoria's waterways over an eight-year period. The strategy aims to maintain and improve the condition of wetlands, rivers and estuaries so they can continue to provide environmental, social, cultural and economic value for all Victorians.
Melbourne Water's Healthy Waterways Strategy (2018b)	Provides a framework for addressing community expectations and the obligations for waterway management as expressed in the Victorian *Water Act 1989*, *Catchment and Land Protection Act 1994*, the State Environment Protection Policy (Waters), other relevant State and national legislation and policies, and international agreements. It builds on a long-term regional vision for waterway health.

5.2 Commonwealth legislation

This section provides an outline of Commonwealth environmental legislation and/or policies relevant to the Project.

5.2.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Commonwealth Government's key piece of legislation for environmental protection. One of the main objectives of the EPBC Act is to protect MNES, defined as:

- World heritage properties
- National heritage places
- Wetlands of international importance (listed under the Ramsar Convention)
- Listed threatened species and ecological communities
- Migratory species protected under international agreements
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mines)
- A water resource, in relation to coal seam gas development and large coal mining development

Of the MNES listed above, three are relevant to the Project: wetlands of international importance, listed threatened species and ecological communities and migratory species protected under international agreements.

Existing approvals

Approvals in regards to MNES within the approved MSA area (see Sections 1.3, above and 5.3.3 and 5.3.4, below) were addressed under a Part 10 EPBC Act approval in September 2013 that allows actions resulting from urban development and infrastructure in approved MSA areas. Approved MSA areas in the Project Area are sections KP 0 - KP 3.15, KP 28.16 - KP 28.57 and KP 32.07 – KP 51.04. No further approvals are required under the EPBC Act for urban development in these areas, provided development follows the Urban Growth Boundary Program Report and the conditions of the approvals. APA has been advised by the Department of Agriculture, Water and Environment (DAWE) that it can rely on the approval decision made under Part 10 of the EPBC Act for those parts of the Project within the approved MSA areas between KP 0 - KP 3.15, KP 28.16 - KP 28.57 and KP 32.07 – KP 51.04.

Otherwise, outside the MSA area all other considerations with regard to MNES are addressed according to EPBC Act requirements.

Because a bilateral agreement between the Commonwealth and State governments is in place and is applicable to the Project, the EES provides the required assessment under the EPBC Act. The bilateral agreement sets out the matters that the Minister for Planning will consider in relation to the EPBC Act.

Other matters protected by the EPBC Act

Approval under the EPBC Act may also be required for a proposed action that significantly affects the environment on Commonwealth land, or if an action is likely to significantly impact on the environment anywhere if the action is proposed by the Commonwealth Government or its agencies. These ‘other matters’ are: listed marine species, whales and other cetaceans, critical habitats, Commonwealth reserves (terrestrial or marine), and Commonwealth heritage places or Commonwealth land.

The Project is not located adjacent to or within Commonwealth land and would therefore not result in a significant impact on the environment of Commonwealth land.

Listed key threatening processes

The EPBC Act also provides for the identification and listing of key threatening processes. A key threatening process is defined as such if it could:

- Cause a native species or ecological community to become eligible for inclusion in a threatened list (other than the conservation dependent category).
- Cause an already listed threatened species or threatened ecological community to become more endangered.
- Adversely affect two or more listed threatened species or threatened ecological communities.

Key threatening processes do not trigger the EPBC Act as they are not MNES and they also do not regulate or prevent actions undertaken by the states, territories or individual property managers (DoEE, 2017a). Threat abatement plans may be prepared for key threatening processes.

Biodiversity Offsets requirements

Offsets may be required under the Commonwealth Government’s EPBC Act to compensate for any residual impacts to Matters of National Environmental Significance (MNES) once avoidance and mitigation measures have been considered (DSEWPAC, 2012). Where residual impacts are considered to be significant, an offset is likely to be required.

An offset must deliver an overall conservation outcome that improves or maintains the viability of the MNES and should be tailored specifically to the attribute of the MNES that is to be affected. An offsets package is defined in the EPBC Offsets Policy (DSEWPAC, 2012) as a suite of actions that a proponent undertakes to compensate for the residual significant impact of a project. An offsets package can comprise a combination of direct offsets and other compensatory measures.

Offsetting Fragmented Patches

Offsets for losses to EPBC Act-listed TECs as a result of this Project have considered both direct impacts and impacts on the extent/size of patches. In situations where larger patches have been dissected by the alignment and the remaining non-impacted parts of the patch no longer meet the area criteria to qualify as the listed community (and consequently losing their protection under the EPBC Act), then the whole patch has been considered as a loss and offsets have been applied to account for this. There are 17 fragmented patches that meet this criterion resulting in an additional 0.34 ha loss of TECs.

5.3 Victorian legislation, policy and guidelines

This section provides an outline of Victorian environmental legislation and/or policies relevant to the Project.

5.3.1 Environment Effects Act 1978

On 22 December 2019, the Minister for Planning determined that the Project would require an Environment Effects Statement (EES) under the *Environment Effects Act 1978* (EE Act).

Under the EE Act Projects that could have a 'significant effect' on Victoria's environment may require an EES to be prepared for assessment by the Minister for Planning. The EE Act applies to any works 'reasonably considered to have or be capable of having a significant effect on the environment'.

The EES referral criteria for impacts to ecological values were considered as part of the preliminary assessments for the Project. These criteria are summarised in Table 4.

Table 4 EES referral criteria for ecological matters (from DSE, 2006)

Criteria type	Criteria
Individual mandatory referral criteria for ecological matters	Potential clearing of 10 ha or more of native vegetation from an area that: • Is of an EVC identified as endangered by Victorian Department of Environment, Land, Water and Planning (DELWP), or • Is, or is likely to be, of very high conservation significance • Is not authorised under an approved Forest Management Plan or Fire Protection Plan
	Potential long-term loss of a significant proportion (e.g. 1 to 5% depending on the conservation status of the species) of known remaining habitat or population of a threatened species within Victoria.
	Potential extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems over the long-term.
	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' (Environment Australia, 2001).
Combination referral criteria for ecological matters	Potential clearing of 10 ha or more of native vegetation, unless authorised under an approved Forest Management Plan
	Matters listed under the *Flora and Fauna Guarantee Act 1988*: • Potential loss of a significant area of a listed ecological community, or

Criteria type	Criteria
	• Potential loss of a genetically important population of an endangered or threatened species (listed or nominated for listing), including as a result of loss of fragmentation of habitats, or • Potential loss of critical habitat, or • Potential significant effects on habitat values of a wetland supporting migratory bird species.
	Potential extensive or major effects on landscape values of regional importance, especially where recognised by a planning scheme overlay or within or adjoining land reserved under the *National Parks Act 1975*

5.3.2 Pipelines Act 2005 – Section 85 Application of planning laws

The *Pipelines Act 2005* is the primary Act governing the construction and operation of pipelines in Victoria and applies to the Project. The Act covers 'high transmission' pipelines that have a maximum design pressure exceeding 1050 kPa for gaseous hydrocarbons and 345 kPa for liquids, and is administered by DELWP.

Section 49 of the Pipelines Act requires that the following are some of the matters that are considered before granting a licence:

> (*a) the potential environmental, social, economic and safety impacts of the proposed pipeline;*
>
> *(f) the assessment of the Environment Effects Minister in relation to the proposed pipeline, if an assessment has been made;*
>
> *(g) any written comments received from the Planning Minister or the relevant responsible authority on the effect of the proposed pipeline on the planning of the area through which it is to pass;*
>
> *(h) any written comments received from the Water Minister and from the relevant Crown Land Minister on the impact of the proposed pipeline.*

Section 3 of the Pipelines Act sets out the objectives of the Act including:

> (*a) to facilitate the development of pipelines for the benefit of Victoria;*
>
> *(e) to protect the public from environmental, health and safety risks resulting from the construction and operation of pipelines;*
>
> *(f) to ensure that pipelines are constructed and operated in a way that minimises adverse environmental impacts and has regard for the need for sustainable development.*

Section 4 of the Pipelines Act sets out the principles of sustainable development to be given regard in implementing the Act including:

> *(c) biological diversity should be protected and ecological integrity maintained;*
>
> *(h) decision-making should be guided by—*
>
> (*i) a careful evaluation to avoid serious or irreversible damage to the environment wherever practicable; and*
>
> (*ii) an assessment of the risk-weighted consequences of various options.*

Section 54(c) of the Pipelines Act states that conditions on a licence may include conditions concerning the protection of the environment.

As set out above, s49 of the Pipelines Act requires that matters related to the planning framework and assessment of impacts through the EES be considered before granting a licence:

> Any native vegetation removed for construction of the Project would be considered with reference to the 'avoid, minimise and offset' requirements for native vegetation removal in Victoria, in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a), which are part of the planning framework considered under s49.

5.3.3 Melbourne Strategic Assessment

Overview

The Melbourne Strategic Assessment is an agreement between the Victorian and Commonwealth governments made under Part 10 of the EPBC Act whereby impacts on MNES that are expected to occur within the Melbourne urban growth boundary are defined and accounted for *a priori* and can be considered early in the development of a plan, policy or program (refer Section 1.3).

No further approvals are required under the EPBC Act for urban development in these areas, provided development follows the Urban Growth Boundary Program Report and the conditions of the approvals.

Biodiversity Conservation Strategy

The Biodiversity Conservation Strategy (BCS) is the overarching strategy that sets out conservation measures required for matters of national and state environmental significance, to satisfy commitments to the Commonwealth government under the MSA and to meet State requirements with respect to vegetation removal (refer Section 1.3). The BCS applies to all areas of the Project within the approved MSA area (KP 0 - KP 3.15, KP 28.16 - KP 28.57 and KP 32.07 – KP 51.04).

5.3.4 Environment Mitigation Levy Act 2020

The *Melbourne Strategic Assessment (Environment Mitigation Levy) Act 2020* (MSA Levy Act) establishes a Victorian legislative framework for the existing MSA program. The Act came into effect on 1 July 2020. The environmental mitigation levies set out in the MSA Levy Act replace the earlier Biodiversity Conservation Strategy Habitat Compensation Obligations fee system (refer Section 1.3), with the purpose of imposing a levy to fund measures to mitigate impacts on biodiversity caused by the development of land in Melbourne's growth corridors.

The MSA Levy Act applies to areas declared by the Secretary of the DELWP as a levy area. The levy area covers the four growth corridors within the expanded 2010 Urban Growth Boundary, including some of the location of the Project Area. Within those areas, the levy to offset the loss or deemed loss of particular listed threatened species habitat and/or native vegetation also covers State-based offset obligations. The levy does not apply to conservation areas in the MSA area, which are subject to alternative offsetting arrangements as required by DELWP.

Conservation Areas

The Project Area traverses two BCS conservation areas (Figure 10):

- Conservation Area 34a - Northern Growth Corridor: Growling Grass Frog Corridor (between KP 42 and KP 44)
- Conservation Area 28b - Summerhill Road (East), Wollert (between KP 48 and KP 50)

A Works in Conservation Area (WICA) approval will be required for any works proposed in a Conservation Area.

Levy Triggers

The liability to pay an MSA levy is triggered when a levy event occurs within the levy area, where habitat compensation obligations have not been previously met. The only levy events are the:

- Issue of a Statement of Compliance for a plan of subdivision (i.e. Subdivision of land)
- Application for a building permit
- Approval of a work plan or variation of a work plan under the Mineral Resources (Sustainable Development) Act 1990
- Construction of utility infrastructure on Crown land
- Construction of a road on Crown land

For this Project, two of these levy events are most likely to be triggered; construction of utility infrastructure on Crown land (within the BCS area) and where land will be acquired as a subdivision.

Removal of native vegetation for urban development within the area covered by the BCS may also be subject to:

- Further survey requirements within conservation areas
- Salvage and/or translocation requirements

5.3.5 Flora and Fauna Guarantee Act 1988

The *Flora and Fauna Guarantee Act 1988* (FFG Act) was established to provide a legal framework for enabling and promoting the conservation of all Victoria's native flora and fauna, and to enable management of potentially threatening processes. One of the main features of the FFG Act is the listing process, whereby native species and communities of flora and fauna, and the processes that threaten native flora and fauna, are listed in the schedules of the Act. The Act includes the following lists:

- Threatened species list (DELWP, 2017c), which includes taxa and communities of flora and fauna that have been listed as threatened in accordance with Section 10 of the FFG Act
- Protected flora list (DELWP, 2017d) which includes:
  - Plant taxa listed as threatened under the FFG Act
  - Plant taxa belonging to communities listed as threatened under the FFG Act
  - Plant taxa which are not threatened but require protection for other reasons
- Processes list (DELWP, 2016) which includes processes that have been listed as potentially threatening processes in accordance with Section 10 of the FFG Act

The FFG Act also enables habitat critical to the survival of native flora and fauna to be declared and requires permits for activities that could harm threatened plants, fish and communities.

It is an offence to take, trade in, keep, move or possess protected or threatened flora without a permit. 'Take' is defined as to kill, injure, disturb or collect, as set out in the FFG Act flora controls. Flora controls do not apply on private land, unless the land is identified as critical habitat for the species.

It is also an offence under the FFG Act to take, trade in or keep listed fish species.

5.3.6 Flora and Fauna Guarantee Amendment Act 2019

The *Flora and Fauna Guarantee Amendment Act 2019* (FFGA Act) came into effect in June 2020. The intent of the FFGA Act is to provide a modern and strengthened framework for the protection of Victoria's biodiversity.

The FFGA Act:

- Introduces principles to guide the implementation of the FFG Act, including consideration of the rights and interests of Traditional Owners and the impacts of climate change
- Requires consideration of biodiversity across government to ensure decisions and policies are made with proper consideration of the potential impacts on biodiversity
- Clarifies existing powers to determine critical habitat and improves their protection by encouraging cooperative management
- Gives effect to a consistent national approach to assessing and listing threatened species, the Common Assessment Method (CAM), which will reduce duplication of effort between jurisdictions and facilitate the monitoring and reporting of species' conservation status
- Modernises the FFG Act's enforcement framework including stronger penalties

Currently, the FFGA Act guidelines are still being developed. The following provides more information on expected updates.

Threatened Species Listing

Species will be considered for listing as threatened under the FFGA Act in accordance with the intergovernmental CAM. The CAM adopts the categories and criteria of the International Union for the Conservation of Nature (IUCN) Red List of threatened species. The categories are extinct, extinct in the wild, critically endangered, endangered, vulnerable and conservation dependent. Species will be listed under the FFG Act in these categories of threat. This new listing is currently being developed. Key elements of the previous listing process are retained, such as public nomination and assessment by the FFG Act Scientific Advisory Committee (SAC).

Critical Habitat and Habitat Conservation Orders

New guidelines expand the concept of critical habitat in the FFG Act. The amendments provide a greater role for the SAC, including making recommendations to the Secretary and assisting to draft eligibility guidelines. The FFG Act will now also require the Secretary to seek to manage critical habitat by agreement with affected landholders or managers. Habitat Conservation Orders are replacing Interim Conservation Orders. Habitat Conservation Orders have a maximum operation time of ten years. Any persons affected by a Habitat Conservation Order will be notified and can provide submissions. In some cases, there may be compensation for those affected by a Habitat Conservation Order.

Public Authority Duty

The amended FFG Act requires Ministers and public authorities to consider the FFG Act when performing functions that might impact biodiversity. The Act requires that in performing any of their functions that may reasonably be expected to impact on biodiversity, including a function under any Act, ministers and public authorities must give proper consideration to the Act's objectives, so far as is consistent with the proper exercising of their functions. The Act establishes tools to provide guidance to public authorities in considering biodiversity, and these include:

- Ministerial guidelines to clarify the duty and to support public authorities with further information
- Public authority management agreements made with the Secretary to DELWP, which can provide certainty that biodiversity impacts are being sufficiently considered and being managed and can streamline approval requirements

Protected Flora

A new category of protected flora is being introduced: "restricted use protected flora". There are changes to offences related to the take, trade, movement or possessing of all protected flora, including revised exemptions. There have also been changes to the penalties for not complying with controls. At present, all current protected flora will remain as 'generally protected flora' until this review is complete.

5.3.7 Environment Protection Act 1970

The *Environment Protection Act 1970* (EP Act) provides the legislative foundation for the prevention of pollution and environmental damage by setting environmental quality objectives and establishing programs to meet them. The conservation of biological diversity and ecological integrity is one of the Principles in the Act, along with the precautionary principle and shared responsibility.

State Environment Protection Policies (SEPPs) provide more detailed requirements and guidance. Of particular relevance to the assessment of ecology is SEPP (Waters) which outlines specific beneficial uses (environmental values and human activities) to be protected. The SEPP also includes specific environmental quality objectives for waterways and aquatic ecosystem condition. Guidelines are published by Environment Protection Authority (EPA) Victoria that include biological, nutrient and water quality assessment methods.

A review of the *Environment Protection Act 1970* has resulted in the passage of the *Environment Protection Act 2017* (EP Act 2017) which was scheduled to come into effect in July 2020, however this has been delayed until July 2021.

The EP Act 2017 includes a new approach to environmental issues, focusing on preventing waste and pollution impacts rather than managing those impacts after they have occurred. The Act also includes the concept of general environmental duty (GED) which requires people to undertake reasonably practicable steps to eliminate, or otherwise reduce risks of harm to human health and the environment from pollution and waste. Unlike similar laws in other states and territories, a breach of the GED could lead to criminal or civil penalties, similar to those currently outlined in the *Occupational Health and Safety Act 2004*.

Under the new Act, the beneficial uses of water, as outlined in the SEPP (Waters) will be known as environmental values.

5.3.8 Water Act 1989

The *Water Act 1989* provides the legal framework for managing Victoria's water resources, including in Catchment Management Authority areas. This includes management and planning of waterways, land and works protection. Melbourne Water is responsible for ensuring that waterways in the Port Phillip and Westernport Catchment Management Authority (CMA) region are protected and improved, and is the lead agency for the delivery of the Healthy Waterway Strategy (HWS). The HWS identifies a vision for the region, and sets priority areas for investment and management actions. The HWS identifies seven key challenges for waterways in the region that are managed by Melbourne Water.

5.3.9 Catchment and Land Protection Act 1994

The *Catchment and Land Protection Act 1994* ('CaLP Act') establishes a framework for management and protection of catchments through the management of land and water resources. The CaLP Act is the principal legislation relating to the management of pest plants and animals in Victoria. Under the Act, landholders have a responsibility to avoid causing or contributing to land degradation, including taking all reasonable steps to conserve soil, protect water resources, eradicate regionally prohibited weeds, prevent the growth and spread of regionally controlled weeds and where possible, eradicate established declared pest animals.

Weed categories and their respective management requirements under the CaLP Act are summarised in Table 5.

Table 5 CaLP Act declared noxious weed management requirements

Weed category	Enforceable management requirement
State prohibited weeds	These include weeds that either do not occur in Victoria but are a significant threat if they do invade, or are weeds that are present and pose a serious threat but are expected to be eradicated as infestations are generally small. The Victorian Government is responsible for the eradication of these weeds and may direct land owners to prevent growth and spread.
Regionally prohibited weeds	Regionally prohibited weeds are not widely distributed in a region but are capable of spreading further. It is reasonable to expect they can be eradicated from a region and they must be managed with that goal. Land owners, including public authorities responsible for crown land management, must take all reasonable steps to eradicate regionally prohibited weeds on their land.
Regionally controlled weeds	These invasive plants are usually widespread in a region. To prevent their spread, ongoing control measures are required. Land owners have the responsibility to take all reasonable steps to prevent the growth and spread of regionally controlled weeds on their land.
Restricted weeds	This category includes plants that pose an unacceptable risk of spreading in Victoria and are a serious threat to another state or territory of Australia. Trade in these weeds and their propagules, either as plants, seeds or contaminants in other materials, is prohibited.

5.3.10 Wildlife Act 1975

In Victoria, the legislation for protecting and managing wildlife is the *Wildlife Act 1975.* The *Wildlife Act 1975* forms the procedural, administrative and operational basis for the protection and conservation of native wildlife in Victoria. The purposes of the Wildlife Act are to establish procedures in order to promote:

- The protection and conservation of wildlife
- The prevention of taxa of wildlife from becoming extinct
- The sustainable use of and access to wildlife

The Wildlife Act often sits as the default reference for other associated policies regarding wildlife. For example, the operation of the FFG Act often needs to be considered in conjunction with the provisions and procedures of the Wildlife Act as some wildlife would be protected under both the Wildlife Act and as a listed threatened species under the FFG Act.

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*.

With the exception of pest animals declared under the CaLP Act or wildlife declared to be unprotected wildlife, the Wildlife Act makes it an offence to hunt, take or destroy protected or threatened wildlife without authorisation. All native wildlife in Victoria is 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 Act may be required if native fauna need to be captured and/or relocated during proposed works, e.g. pre-clearance of habitat. This must be held prior to construction in the name of the ecologist undertaking the fauna handling.

5.3.11 Fisheries Act 1995

The *Fisheries Act 1995* forms the framework for regulation, management, development and conservation of Victorian fisheries, aquatic habitats and ecosystems, aquaculture industries and associated aquatic biological resources including aquatic ecological processes. One objective of the Fisheries Act is to promote sustainable fisheries, including recreational fishing. The Act also includes the list of declared noxious species of fish.

FFG Act-listed aquatic biota are also protected under the *Fisheries Act 1995* and may not be taken, injured, damaged or destroyed (Section 71) or have their passage obstructed (Section 119) without authorisation. If salvage of fish is required during construction of the Project, a General Permit issued by the Victorian Fisheries Authority under Section 49 of the Fisheries Act may be required to catch and release and includes requirements for animal ethics approval.

5.3.12 Planning and Environment Act 1987

Planning zones and overlays

The implications of the following zones and overlays were assessed for the purposes of informing this report:

- Development Contributions Plan Overlays (DCPO): The intent of this overlay is to identify areas which require the preparation of a development contributions plan for the purpose of levying contributions for the provision of works, services and facilities before development can commence.
- Environmental Significance Overlays (ESO): The broad intent of an ESO is to identify areas where the development of land may be affected by environmental constraints, and to ensure that if development does happen, it is compatible with the values that are highlighted in any schedule to the identified ESO.
- Farming Zone (FZ): The FZ provides for the use of land for agriculture, to encourage the retention of productive agricultural land and to ensure that non-agricultural uses do not adversely affect the use of land for agriculture.
- Green Wedge Zone (GWZ): A GWZ recognizes, protects and conserves green wedge land for its agricultural, environmental, historic, landscape, recreation and tourism opportunities, and mineral and stone resources. This overlay also protects biodiversity of the area that may be within the Project.
- Incorporated Plan Overlay (IPO): An IPO details the form and conditions that must be met by future land use and development to be shown on an incorporated plan before a permit can be granted. It also requires a planning scheme amendment before the incorporated plan can be changed.
- Rural Conservation Zone (RCZ): This zone protects and enhances the natural environment and natural processes for their historic, archaeological and scientific interest, landscape, faunal habitat and cultural values.
- Urban Growth Zone (UGZ): The UGZ manages the transition of non-urban land into urban land. It encourages the development of well-planned and well-serviced new urban communities and reduces the number of development approvals needed in areas where an agreed plan is in place. It also safeguards non-urban land from use and development that could prejudice its future urban development.
- Vegetation Protection Overlays (VPO): A VPO is specific to the removal of vegetation that has been deemed to be significant and protects this vegetation against inappropriate development.

A schedule to an ESO and VPO would contain a statement of the significance of the environmental, vegetation or landscape value that is protected by the overlay, and the objective to be achieved. Approval (via permit) is typically required to remove most vegetation within any of the overlays, and the application for an approval for vegetation removal must show the proponent has been cognisant of the intent of each overlay.

In considering any application for vegetation removal, the decision guidelines of ESOs and VPOs must be considered. Decision guidelines include but are not limited to:

- The State Planning Policy Framework and the Local Planning Policy Framework, including the Municipal Strategic Statement and local planning policies
- The statement of environmental, vegetation and/or landscape significance and the environmental objective contained in a schedule to the relevant overlay

- The need to remove, destroy or lop vegetation to create defendable space to reduce the risk of bushfire to life and property
- Any other matters specified in a schedule to the relevant ESO and VPO

Table 6 outlines all Local Government Authorities (LGAs) with applicable planning schemes, including key environmental planning zones and overlays for the Project Area.

Table 6 Applicable local planning schemes

Administrative boundary	Code	Description
Hume City Council	DCPO4	Development Contributions Plan Overlay, Schedule 4 'Merrifield West Precinct Structure Plan Development Contribution Plan'
	ESO1	Environmental Significance Overlay, Schedule 1 'Rural Waterways and Environs'
	ESO10	Environmental Significance Overlay, Schedule 10 'Rural Conservation Area'
	ESO11	Environmental Significance Overlay, Schedule 11 'River Red-gum and Grassy Woodlands'
	GWAZ	Green Wedge A Zone
	IPO3	Incorporated Plan Overlay, Schedule 3 'Sunbury South Precinct Structure Plan and Lancefield Road Precinct Structure Plan'
	UGZ4	Urban Growth Zone, Schedule 4 'Merrifield West Precinct Structure Plan'
Melton City Council	ESO1	Environmental Significance Overlay, Schedule 1 'Remnant Woodlands, Open Forests and Grasslands'
	GWZ	Green Wedge Zone
	UGZ11	Urban Growth Zone, Schedule 11 'Plumpton Precinct Structure Plan'
Mitchell Shire Council	DCPO4	Development Contributions Plan Overlay, Schedule 4 'Merrifield West Precinct Structure Plan Development Contribution Plan'
	UGZ1	Urban Growth Zone, Schedule 1 'Lockerbie Precinct Structure Plan'
	VPO2	Vegetation Protection Overlay, Schedule 2 'Freeway Environs Protection'
Whittlesea City Council	ESO4	Environmental Significance Overlay, Schedule 4 'Rural Conservation Area'
	ESO6	Environmental Significance Overlay, Schedule 6 'Urban Conservation Area'
	FZ	Farming Zone
	IPO6	Incorporated Plan Overlay, Schedule 6 'Donny-brook Woodstock Precinct Structure Plan - Biodiversity Conservation Strategy Areas'
	RCZ	Rural Conservation Zone
	UGZ6	Urban Growth Zone, Schedule 6 'Donnybrook-Woodstock Precinct Structure Plan'

Precinct Structure Plans and Native Vegetation Precinct Plans

For areas within the approved MSA areas that are included in a Precinct Structure Plan (PSP), Native Vegetation Precinct Plans (NVPP) regulate the protection and offset of vegetation communities listed for protection under the EPBC Act and State significant native vegetation.

NVPPs are prepared based on the time-stamped mapping, which covers all native vegetation patches within the precinct, and can be supplemented by surveys of individual scattered trees where required. Removal of native vegetation in these areas may trigger native vegetation offsets based on the PSP offset targets.

Three native vegetation precinct plans (NVPPs) apply across the Project Area:

- Lindum Vale PSP – No vegetation to be retained will be impacted by the Project
- Merrifield West PSP – Vegetation to be retained will not be impacted if the Project is constructed outside the Outer Metropolitan Ring Transport Corridor Project (OMR) road easement. There would be no impacts to vegetation identified to be retained for the OMR
- Lockerbie PSP – No vegetation to be retained will be impacted by the Project

Guidelines for the removal, destruction or lopping of native vegetation

The *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a) ('the Guidelines') are incorporated into the Victoria Planning Provisions and all planning schemes in Victoria. The Guidelines provide instruction on how an application for a permit to remove native vegetation is to be assessed under the P&E Act, including requirements to undertake a site assessment, the required site-assessment method, and any specific conditions that may form part of a granted permit, such as offsetting. The guidelines are also used to assess native vegetation removal proposed as part of major infrastructure Projects in Victoria.

Under the Guidelines, there are three pathways under which an application to remove native vegetation can be assessed – basic, intermediate and detailed. The assessment pathway determines the types of offsets that are required to be implemented for the proposed vegetation removal. This is determined via an assessment of location, whether any large trees are to be removed and the extent of risk to biodiversity of the particular Project:

- Location risk is determined by assessing the likelihood that the removal of a small amount of native vegetation may impact the persistence of a rare or threatened species. Location risk has been determined for all of Victoria with areas being categorised as Location 1, Location 2 or Location 3. The location risk of a particular site is determined using the native vegetation location risk map available from the Native Vegetation Information Management (NVIM) system tool found on the DELWP website[2].
- Extent risk is determined by the extent of the native vegetation, including the presence or absence of large trees, proposed to be removed.

Together, these two types of risk are used to determine the assessment pathway for a permit application to remove native vegetation (DELWP, 2017a).

[2]<https://www.environment.vic.gov.au/native-vegetation/native-vegetation-information-management>

Table 7 explains the assessment pathways for native vegetation removal.

Table 7 Assessment pathways for native vegetation removal

	Location category		
Extent of native vegetation to be removed	**Location 1**	**Location 2**	**Location 3**
Less than 0.5 ha and not including any large trees	Basic	Intermediate	Detailed
Less than 0.5 ha and including one or more large trees	Intermediate	Intermediate	Detailed
0.5 ha or more	Detailed	Detailed	Detailed

The assessment pathway determines the assessment process to be followed when applying to remove native vegetation. For this Project:

- Native vegetation removal will be greater than 0.5 ha and therefore the 'Detailed' assessment pathway will be followed for assessment of the Project. Noting that the Project will be considered under the Pipelines Act (see section 5.3.2) rather than the P&E Act, and the principles outlined in the Guidelines will be relevant to that consideration.

Offset requirements

The biodiversity loss from the removal of native vegetation is required to be offset in accordance with the Guidelines (DELWP, 2017a). Offsets are designed to compensate for the loss of biodiversity value. Offsets will still be provided even though the Project is governed by the Pipelines Act, and apply to areas of the Project Area outside the MSA approved areas. Within the approved MSA areas, environmental mitigation levies are incurred under the MSA Levy Act (refer section 5.3.4 above).

A combination of site-based and landscape-scale information is used to calculate the biodiversity value of the vegetation to be removed. This information is used to determine the loss in biodiversity value that needs to be compensated for with an offset that provides equivalent gain in biodiversity value. Biodiversity value is represented by a general or species habitat score.

Either a species offset or a general offset is required to compensate for any removals:

- A species offset is required when the removal of native vegetation has a significant impact on habitat for a rare or threatened species. Species offsets must compensate for the removal of that particular species' habitat.
- A general offset is required when the removal of native vegetation does not have a significant impact on any habitat for rare or threatened species

Unless an arborist report indicates otherwise, a tree or trees will be deemed lost if works encroach into 10 per cent or more of the Tree Protection Zone (an area around the trunk of the tree which has a radius of 12 x the diameter at breast height to a maximum of 15 metres but no less than 2 metres), or if works are inside the Structural Root Zone.

Offsets are determined in a Native Vegetation Removal (NVR) report, which is generated by DELWP following the submission of a Vegetation Quality Assessment (VQA) and spatial data.

5.3.13 **Protecting Victoria's Environment** – Biodiversity 2037

Protecting Victoria's Environment – Biodiversity 2037 (DELWP, 2017e), is the Victorian Government's commitment to ensuring consistency with national and international biodiversity programs and agreements. The Biodiversity Plan represents the Victorian Government's long-term vision for Victoria's biodiversity, setting the vision, priorities for action and policy agenda towards safeguarding Victoria's natural environment.

6. Methods

6.1 Overview of method

This section describes the method that was used to assess the potential impacts of the Project. A risk based approach was applied to prioritise the key issues for assessment and inform measures to avoid, minimise and offset potential effects. Figure 3 shows an overview of the assessment method.

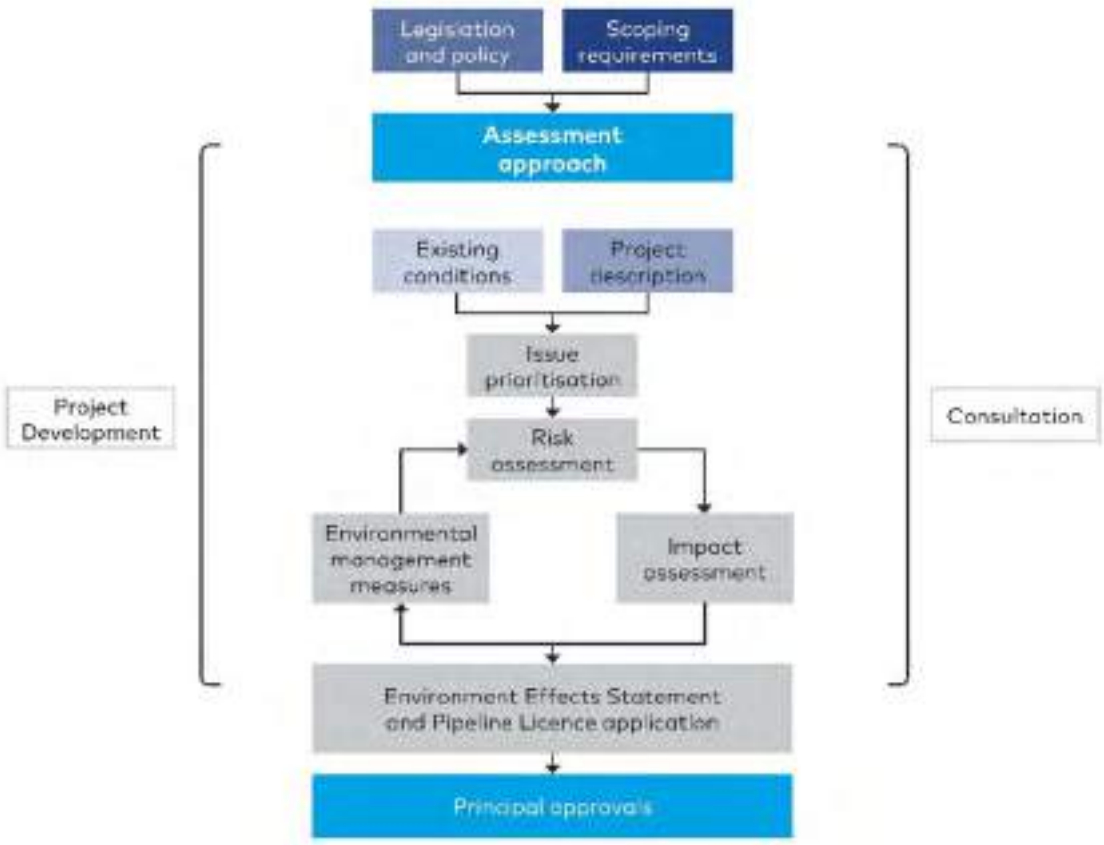


Figure 3 Overview of assessment method

6.2 Existing conditions

6.2.1 Overview

This section describes methods used to understand existing conditions identified from the most recent (2019, 2020 and 2021) desktop and field assessments to provide an understanding of terrestrial and aquatic biodiversity within the Project Area. These sources have drawn on a wide range of literature, databases, strategies and recent reports, and include field assessments conducted specifically for the Project by Biosis (2019; 2020) and GHD (2020, 2021).

The following sources were reviewed as part of these assessments and the current assessment:

- Biodiversity databases curated by the Commonwealth and Victorian governments
- The legislative context applicable to the Project
- Field assessments for flora and fauna

The most comprehensive description and quantification of native vegetation and terrestrial fauna for the Project is by Biosis (2020), who conducted a desktop assessment and field surveys prior to 2020. Additional botanical surveys, and targeted surveys for EPBC Act threatened terrestrial (Golden Sun Moth and Growling Grass Frog) and fish species (Australian Grayling), were conducted by GHD in 2020 and 2021 to address gaps in the earlier survey effort that had arisen from later alignment changes (to understand the extent of EPBC Act-listed TECs at specific locations and to inform the presence or likelihood of the targeted species occurring within the Project Area. The majority of the information provided below is drawn from these pieces of work.

Biosis (2020) conducted a comprehensive flora and fauna field assessment to understand and describe the existing conditions of the Project Area to inform the environmental impact assessment for the Project. This assessment incorporated:

- A review of the recent desktop and field assessments (Biosis 2019, 2020) that included:
  - A synthesis of biodiversity datasets curated by the Commonwealth and Victorian governments
  - Determination of the likelihood of occurrence of threatened species and threatened species' habitat
  - A review of literature relevant to the Project area
- Vegetation Quality Assessments
- Seasonal/targeted flora and fauna field surveys
- Additional botanical and aquatic biota surveys conducted by GHD in 2020 and 2021, where gaps in survey effort existed, including:
  - Targeted field survey for Australian Grayling, *Prototroctes maraena*
  - Targeted survey for threatened flora
  - Targeted survey for Golden Sun Moth
  - Targeted survey for Growling Grass Frog
  - Threatened species habitat assessments
  - Vegetation Quality Assessments

6.2.1.1 Defining threatened species, migratory species and ecological communities

For the purposes of this report, 'threatened species' refers to those species that are listed as threatened under the EPBC Act, FFG Act, and/or recognised as vulnerable, endangered or critically endangered in Victoria by DSE (2009, 2013) or DEPI (2014), referred to as 'DELWP Advisory Lists'.

Rare species are those listed solely on the DELWP Advisory List for plants (DEPI 2014). Rare species are not considered threatened and none were identified during the desktop or field surveys (Biosis 2019, 2020). Rare species were excluded from the scoping requirements and consequently, are also excluded for the purpose of this assessment.

‘Threatened communities’ refers to communities of flora and fauna that are listed as threatened under the EPBC Act or FFG Act. Flora or fauna communities known or potentially occurring within the Study Area are only considered if they are listed under one or more of these Acts. ‘Migratory species’ refers to species listed as Migratory under the EPBC Act. Categories are identified in Table 8.

Table 8 Threatened species, threatened communities and migratory species listing categories by legislation

Legislation	Categories
EPBC Act	Vulnerable (VU)
	Endangered (EN)
	Critically Endangered (CR)
	Migratory (Mi)
FFG Act	Listed (L)
DELWP Advisory List	Vulnerable (v)
	Endangered (e)
	Critically Endangered (cr)

The Marine status of fauna (as defined under the EPBC Act) was not considered because the Project Area is not within or near a Commonwealth Marine Area; thus, impacts on a Commonwealth Marine Area are highly unlikely.

A number of species records from the Victorian Biodiversity Atlas (VBA) list were eliminated based on their listing status, a review of relevant literature and an understanding of their preferred habitats. Records of species not considered further in this report include:

- Flora that has been nominated for listing or was rejected for listing under the FFG Act
- Flora considered ‘poorly known’ in Victoria in the DELWP Advisory list, as the current knowledge of their distribution and abundance is not sufficient to determine whether these species should be considered as rare or threatened in Victoria
- Flora considered ‘rare’ in Victoria in the DELWP Advisory list (DEPI 2014) since none were identified in the study area (Biosis 2020). Rare species are addressed under the Guidelines, where modelled vegetation mapping is considered suitable habitat for rare or threatened species.
- Threatened flora that are outside their natural range but are commonly used for landscaping and amenity, including Spotted Gum *Corymbia maculata*, Red Bloodwood *Corymbia gummifera* and Giant Honey-myrtle *Melaleuca armillaris*
- Fauna considered ‘near threatened’, ‘conservation dependent’ or ‘data deficient’ in the DELWP Advisory list (these species are not considered threatened species), unless they are also listed under the EPBC Act and/or FFG Act
- Fauna reliant on marine environments, including albatross, petrels, cetaceans and marine turtles (that are in the database search results based on the proximity of the Project Area to the Port Phillip Bay marine environment), since no habitat for these species is present in the Project Area or likely to be impacted by the Project
- Non-migratory aquatic biota that were greater than five kilometres outside the Project Area (i.e. outside the Study Area)

6.2.1.2 Nomenclature

Common names for flora follow the VBA (Version 3.2.6) and scientific names for flora follow the Flora of Victoria[3], unless otherwise stated. Common names and scientific names for fauna follow the VBA (Version 3.2.6) unless otherwise stated.

For flora, many species do not have a single well-recognised common name (they may have multiple names in common use or none at all). In this report, the species naming convention is provided as by common name followed by scientific name. For fauna, species tend to have a single well-recognised common name, so the species naming convention is typically provided as common name followed by scientific name.

In general, both names (scientific and common) are provided for all species where first introduced, then one name is provided thereafter in that section. This convention is overlooked in some sections to make it clear which species are being referred to.

6.2.2 Desktop reviews

6.2.2.1 Literature review

In addition to Biosis (2019), this report includes an extensive literature review of previous environmental studies by public or private entities that were publicly available, to inform targeted surveys (see Section 6.2.3) and for the purposes of this report, to extend an understanding of the Project Area. These included public authority management plans, recovery plans and action statements, and council and other administrative bodies' environmental investigations and environmental feature descriptions. The aim of the literature review was to compile the findings of information relevant to the Project.

This section includes accounts of some areas that are outside the Project Area and are not expected to be directly impacted. However, for fauna in particular, these areas were considered to help build a picture of the broader ecology of the area and identify any values that may need to be protected from any indirect impacts. Table 9 summarises the documents reviewed.

Table 9 Reports reviewed for the literature review (this report)

Report name	Reference
Western Outer Ring Main – Surface Water and Groundwater	Alluvium Consulting Australia (2019)
Whole of Water Cycle Assessment: PSP 1067 Donnybrook and PSP 1096 Woodstock	Arup (2014)
National Recovery Plan for the Australian Grayling *Prototroctes maraena*	Backhouse *et al*. (2008)
Use of underpass culverts by the Growling Grass Frog *Litoria raniformis* (PowerPoint Presentation)	Biosis (2014)
Lindum Vale PSP 1202: Updated Biodiversity Assessment	Biosis (2018)
Western Outer Ring Main (WORM): Desktop biodiversity assessment. Project no. 29802	Biosis (2019)
Western Outer Ring Main (WORM) Biodiversity Assessment. Project no. 31496	Biosis (2020)
Melbourne Airport Link to Outer Metropolitan Ring and Bulla Bypass Planning Study - Flora, Fauna and Net Gain Assessment	BL&A (2013)
National Recovery Plan for the Swamp Everlasting *Xerochrysum palustre*. Department of Sustainability and Environment, Melbourne	Carter and Walsh (2011)
Growling Grass Frog Masterplan for Melbourne's Growth Corridor	DELWP (2017g)

[3] https://vicflora.rbg.vic.gov.au/ [accessed August 2020]

Report name	Reference
Index of Stream Condition - The Third Benchmark of Victorian River Condition	DEPI (2010)
Biodiversity Conservation Strategy for Melbourne's Growth Corridors	DEPI (2013a)
National Recovery Plan for the Maroon Leek Orchid *Prasophyllum frenchii*. Department of Sustainability and Environment, Melbourne	Duncan (2010)
Growling Grass Frog Habitat Assessment and Mapping: PSP 1067 Donnybrook and PSP 1096 Woodstock	Ecology Australia (2014)
Biodiversity Assessment for Precinct Areas 1062 and 1098, Beveridge, Victoria	EHP (2012)
Mitchell and Whittlesea Planning Scheme Amendment GC28 - Donnybrook/Woodstock Precinct Structure Plan	EHP (2016)
Lindum Vale Precinct Structure Plan (PSP 1202): Amendment C205	EHP (2018)
Lockerbie Precinct Structure Plan Background Report	GAA (2012)
Hume City Council, Rural Areas Hume Integrated Growth Area Plan (HIGAP), Chapter 5.6 – Issues and Options Analysis, Environment section	Hume City Council (n.d.)
Aitken Boulevard Non Drinking Water and Drinking Water Mains – Ecology Report	Jacobs (2017)
Results and Review from three *Synemon plana* survey activities for volunteers at Craigieburn Grassland Reserve Epping/Wollert	Merri Creek Management Committee (2007)
Merri Creek and Environs Strategy 2009 – 2014	Merri Creek Management Committee (2009)
Operational Management Plan for Kalkallo Common Grassland	Merri Creek Management Committee (2010)
Beveridge Golden Sun Moth Targeted Survey	MWH (2009)
National Recovery Plan for the Dwarf Galaxias *Galaxiella pusilla*	Saddlier et al. (2010)
National Recovery Plan for the Hoary Sunray *Leucochrysum albicans* var. *tricolor*. Department of Sustainability and Environment, Melbourne.	Sinclair (2010)
Biodiversity Assessment Report (Native Vegetation) - PSP 23: Greenvale South	SMEC Australia (2010)

In addition to the documents listed in Table 9, the following reports and planning documents were reviewed by Biosis (2019):

Table 10 Reports reviewed by Biosis 2019 (referenced within)

Report name	Reference
Wollert to Wandong Transmission Pipeline Net Gain Assessment VNIE-RP-A-004	Monarc Environmental (2014)
Wollert to Wandong Pipeline Project - Flora and Fauna Assessment VNIE-RP-A-003	Monarc Environmental (2013a)
Wollert to Wandong Transmission Pipeline – Merri Creek Crossing	Monarc Environmental (2013b)
Construction Environment Management Plan (VNIE-PL-A-004) Victorian Northern Interconnect expansion Wollert to Wandong gas pipeline (PL101)	Monarc Environmental (2014b)
Offset Management Plan – Wollert Compressor Station	Monarc Environmental (2011)
Lindum Vale PSP 1202: Biodiversity Assessment	Biosis (2015)
Scattered tree assessment, PSP 1067 Donnybrook	Biosis (2013a)
Scattered tree assessment, PSP 1069 Woodstock	Biosis (2013b)
Native vegetation assessment of land east of Melton, Victoria	Biosis (2009)
Sub-regional species strategy for the Golden Sun Moth	DEPI (2013c)
Sub-Regional Species Strategy for the Growling Grass Frog	DEPI (2013d)
Merrifield West Native Vegetation Precinct Plan	Growth Areas Authority (2012)
Donnybrook-Woodstock Precinct Structure Plan	VPA (2017a)
PSP 1078 Plumpton Precinct Structure Plan	VPA (2017b)

6.2.2.2 Database review

A database assessment was conducted by Biosis (2019), based on the existing Project Area, to provide an account of the ecological values previously recorded or modelled to occur within five-kilometres of the Project Area, and an indicative map of significant ecological features and constraints. The study assumed a 100 metre wide corridor, which although wider than the expected Project Area, was selected to capture potential changes to the alignment. A preliminary pipeline alignment was used as a 'reference Project' for the desktop assessment and included all construction components of the Project, ancillary components of the pipeline, operational and decommissioning components, and the Wollert Compressor Station upgrade area. As part of their assessment, Biosis (2019, pp. 11-12) reported an examination of curated records and spatial data in the following Victorian and Commonwealth government databases:

- *"Department of Agriculture, Water and the Environment (DAWE) EPBC Act Protected Matters Search Tool (PMST) to identify the potential occurrence of MNES* (see Appendix Appendix FF)
- *Commonwealth Atlas of Living Australia (ALA) to capture any records not contained by the Victorian Biodiversity Atlas*
- *Victorian Biodiversity Atlas administered by the Department of Environment, Land, Water and Planning*
- *DELWP's Biodiversity Conservation Strategy Extent dataset*
- *DELWP's Native Vegetation Time Stamping Dataset - Melbourne Growth Areas (VC68)*
- *DELWP's Conservation Areas in the Biodiversity Conservation Strategy dataset*
- *DELWP's Environment Mitigation point dataset*

- *DELWP's Environment Mitigation polygon dataset*
- *DELWP's Areas of Strategic Importance for Growling Grass Frog habitat dataset*
- *DELWP's Strategic Biodiversity Value (NATUREPRINT_4_0_SBV) dataset*
- *DELWP's Native Vegetation Regulation Extent (2017) dataset*
- *DELWP's Native Vegetation Regulation Location (2017) (NVR2013_LOCRISK_V2) dataset*
- *DELWP's Native Vegetation Regulation Condition (2017) – 75 metre resolution dataset*
- *DELWP's Modelled FFG Act Community (NV2005_FFG_COMM) dataset*
- *DELWP's pre 1750 Ecological Vegetation Classes (EVCs, NV1750_EVC) dataset*
- *DELWP's Current Wetland layer*
- *DELWP's Victorian Bioregion (VBIOREG100) dataset*
- *DELWP's Bioregional Conservation Status datasets*
- *DELWP's Terrestrial Groundwater Dependent Ecosystem (GDE) Density dataset*
- *Australian Government Bureau of Meteorology Groundwater Dependent Ecosystem Atlas datasets*
- *DELWP's Seasonal Herbaceous Wetland likelihood model V1 output (mean and standard deviation) datasets*
- *DELWP's Habitat Importance maps*
- *Aerial photo interpretation:*
  - ESRI imagery dated 2015-2017
  - Nearmap imagery dated 19 April and 18 May 2019
  - Real-time Nearmap imagery accessed on the 10-11 June 2019
- *DoEE SPRAT documents*
- *Victorian Government Threatened Species and Community listing advice*

6.2.2.3 Aerial photo interpretation and rapid field assessment

Aerial imagery was examined and interpreted to identify areas of potential native vegetation and habitat by evaluating any existing gaps in available datasets, the likely accuracy of existing modelled vegetation mapping, limitations of remote imagery for interpretation of grassy vegetation types and changes that may have occurred in vegetation type and extent since any previous field surveys were conducted (Biosis 2020). Imagery reviewed was:

- ESRI imagery dated 2015-2017
- Nearmap imagery dated 19 April and 18 May 2019
- Real-time Nearmap imagery accessed on the 10-11 June 2019

The review included reference to DELWP native vegetation modelled spatial datasets.

Using the results from this review, areas within the preliminary pipeline corridor were assigned to two categories: 'uncultivated' and 'previously cultivated'. These were used to guide identification of habitat for significant species, based on a presumed correlation between degree of ground disturbance and habitat loss.

To further refine aerial photo interpretation, areas of potential native vegetation and/or habitat for significant species were mapped during rapid field assessments. The results of these preliminary assessments were then used to further assign areas of potential native vegetation and habitat into three classes: 'Cultivated', 'Previously Cultivated' or 'Uncultivated'.

6.2.2.4 Additional assessments to address knowledge gaps

As a result of changes to the Project's proposed alignment in early 2020, three parcels outside the MSA area and 13 parcels within the approved MSA area were identified that were not included in earlier botanical surveys in 2019/2020. Additionally, a small area (<0.1 ha) of the construction corridor was not surveyed for threatened fauna (see below).

As a result of changes to the Project's proposed alignment in late 2020, 13 parcels outside the MSA area were identified that were not included in earlier botanical surveys in 2019/2020.

The removal of fish barriers and reconstruction of fishways in the Study Area also means Australian Grayling and other native species may now be able to travel further upstream. The desktop assessment was therefore updated to include a wider search area to account for mobile fish species (see below).

Botanical values

To address potential botanical knowledge gaps, the additional parcels not previously surveyed were reviewed to determine if sufficient information existed to appropriately assess potential botanical values, develop mitigation measures or prepare an offset strategy.

Using GIS, polygons were identified that fell within the parcels added with the alignment changes and outside the previous surveyed area. Results from the earlier Biosis desktop reviews and field surveys were collated and reviewed to gain an idea of the survey effort and type of information that might be required, potential vegetation quality and extent, and the distribution of scattered trees. These areas were then inspected using aerial imagery and interrogation of time-stamped mapping and EVC mapping to help to confirm recommendations for further surveys.

Three plant species listed as threatened under the EPBC Act were deemed unlikely to occur within the Project Area by Biosis and were not included in Biosis's targeted surveys (Biosis 2019). However, in its referral decision under the EPBC Act, the Commonwealth Government Department of Agriculture, Water and the Environment (DAWE) considered that the Project may have a significant impact on these three species. These species were Hoary Sunray *Leucochrysum albicans* subsp. *tricolor*, Maroon Leek-orchid *Prasophyllum frenchii* and Swamp Everlasting *Xerochrysum palustre*.

To evaluate the Biosis (2020) analysis, the Atlas of Living Australia[4] was searched for descriptions of species' locations and habitat from Australia's Virtual Herbarium (AVH) including herbarium records where available, and the VBA to evaluate the species' ecology and known distributions (GHD 2020). The search areas were within a five-kilometre radius of parcels 5LP92520, 10LP215406 and 1TP829278 (KP 9: southern end of the alignment) and parcels 9LP136262, 6LP136262 and 1LP221466 (KP 37 − KP 38: northern end of the alignment).

[4] https://www.ala.org.au/ [accessed April 2020]

To further determine whether the three species identified by DAWE were likely to occur in the Project Area and would require targeted surveys, GHD (2020) also reviewed species habitat descriptions from EPBC Act recovery plans (Carter and Walsh, 2010; Duncan, 2010; Sinclair, 2010) and the Flora of Victoria[5].

Terrestrial fauna values

To address knowledge gaps for fauna, a desktop assessment was undertaken of any areas where threatened fauna survey mapping did not cover the Project Area. Consequently, areas were then subject to additional habitat assessment or targeted survey except in a few instances outlined below with regard to Striped Legless Lizard.

- Desktop review of area including review of habitat in adjacent parcels and assessment of habitat via Google Street View at four road reserve locations (Craigieburn Road, Bulla-Diggers Rest Road, Mt Ridley Road and Parkland Crescent). No habitat was present at either Craigieburn Road or Bulla-Diggers Rest Roads, with the impact areas targeting existing access points and therefore having been subject to disturbance to build driveways. However, habitat was assumed to be present at both Mt Ridley Road and Parkland Crescent; these areas have been incorporated into the Striped Legless Lizard habitat category “Habitat present – not surveyed”.

Aquatic ecology

For aquatic species, separate PMST and VBA searches were completed using a five-kilometre buffer from each of the waterway crossings on Deep Creek, Jacksons Creek and Merri Creek.

Additional PMST and VBA database searches were completed along the entire lengths of Deep Creek, Jacksons Creek and Merri Creek to the confluence of the Yarra River with a one-kilometre buffer from streams (this incorporates the Maribyrnong River for Deep Creek and Jacksons Creek). This approach considers the requirement for diadromous (migratory) fish species to migrate between freshwater and estuarine or marine habitats for breeding. This process considers the possibility that records of occurrence may be outside the five-kilometre buffer, but that passage through the Project Area may be a life cycle requirement. Records outside the five-kilometre buffer that are not diadromous species were not considered further. In addition, a search of the ALA was undertaken to identify the occurrence of Platypus and other species that may not have been included in the VBA.

The reports listed in Table 9 which made reference to aquatic ecology or surface water values were reviewed as part of the desktop assessment.

6.2.2.5 Likelihood of occurrence assessments

Biosis (2019) defined likelihood of occurrence as the potential for a threatened species or ecological community to occur within five kilometres of the Project Area. Likelihood is evaluated from interrogation of databases and reports, and from expert opinion and rapid field assessment of the Project Area (including the 100 m buffer). Likelihood of occurrence assessment was completed for each threatened flora, fauna or migratory species and each threatened community identified in the desktop assessment as having the potential to occur within five kilometres of the Project Area, or being known to occur from current records (Appendix B, Appendix K, Appendix L and Appendix R).

[5] https://vicflora.rbg.vic.gov.au/ [accessed April 2020]

Likelihood of occurrence assessments are provided in Appendix B (flora), Appendix K (fauna), Appendix L (migratory fauna) and Appendix R (aquatic fauna). The following likelihood categories were used to rate each species' likelihood of occurrence (Biosis 2019/2020):

- **Negligible** – Planted within the local area, or species regionally extinct, or no suitable habitat
- **Low** – No previous records within five kilometres of the Project Area. In the case of fauna, the species may infrequently visit for foraging but would not reside, roost or breed in, or otherwise depend on habitat in the Project Area for its survival
- **Medium** – Previously recorded within five kilometres of the Project Area. Potential habitat occurs or is likely to occur in the Project Area. In the case of fauna, the species may regularly visit the habitat
- **High** – Species has been recorded in the Project Area (or within very close proximity) and potential habitat persists within the Project Area.

6.2.3 Field assessments

Rapid field assessments were conducted by Biosis (2020) in conjunction with the desktop assessments to determine the presence/absence of native vegetation and habitat, for properties where access was available. These were conducted on foot, by vehicle or from adjacent road reserves (Biosis 2019).

Using the results of the aerial photo review (refer Section 6.2.2.3) and rapid assessment mapping, as well as DELWP's Native Vegetation Time Stamping Dataset − Melbourne Growth Areas (VC68), Biosis (2019) created a 'potential native vegetation map' (PNV) to broadly evaluate the extent of 'Uncultivated', 'Previously Cultivated' or 'Cultivated' land, to inform detailed vegetation field survey locations within the Project Area and assess the possible maximum extent of native vegetation loss.

Detailed field assessments for terrestrial flora and fauna and Australian Grayling were conducted across the length of the 2019 Project Area (where access was available) in winter 2019, spring 2019, summer 2019/2020, autumn 2020 and winter 2020 (Biosis, 2020; GHD, 2020) in accordance with survey guidelines relevant to each species or community (Table 11). Through field assessments, the aim was to collect comprehensive information with respect to biodiversity values present or potentially present within the Project Area. Separate field surveys were undertaken for threatened flora, vegetation communities, terrestrial fauna and aquatic fauna. Surveys were conducted within and outside the MSA area. Total field survey effort is outlined in Table 11.

Table 11 Field survey effort

Survey period by discipline	Total survey effort	Notes
Flora		
Spiny Rice-flower targeted surveys	18 parcels	Conducted in accordance with *Significant Impact Guidelines for the Critically Endangered Spiny Rice-flower* (DEWHA, 2009a), with botanists walking transects 5 m apart on 24/07/2019 (Biosis, 2020)
	24 parcels	Conducted in accordance with *Significant Impact Guidelines for the Critically Endangered Spiny Rice-flower* (DEWHA, 2009a), other than in regard to survey timing since fieldwork was conducted out of season. Transects were spaced 2.5 m apart from 09/09/2019 to 14/02/2020 (Biosis, 2020) to account for potentially reduced visibility.
	15 parcels	Conducted in accordance with *Significant Impact Guidelines* (DEWHA, 2009a), with one botanist walking transects to a maximum of 5 m apart on 28/04/2020, 29/05/2020, 28/07/2020 to 29/07/2020 (GHD, 2020)
	Revision 7 alignment refinements and any areas where alignment revisions were made post any previous surveys.	Conducted in accordance with *Significant Impact Guidelines* (DEWHA, 2009a), with one botanist walking transects to a maximum of 5 m apart on 19, 20, 25/11/2020, 1/12/2020 and 14/12/2020 (GHD 2020
Targeted surveys for four spring-flowering species (inc. three orchids)	65 parcels	Conducted in accordance with DoEE (2013) *Survey guidelines for Australia's threatened orchids* by three botanists walking transects 5 m apart from 01/10/2019 to 18/10/2019 (Biosis, 2020)
	Revision 7 alignment refinements and any areas where alignment revisions were made post any previous surveys.	All surveys were conducted in accordance with DoEE (2013) *Survey guidelines for Australia's threatened orchids* by one or two botanists walking transects 5 m apart on 19, 20, 25/11/2020.
Assessments of habitat and likelihood of absence for four spring-flowering species	5 parcels	Conducted in accordance with DoEE (2013) *Survey guidelines for Australia's threatened orchids* by one or two botanists walking transects 5 m apart on 28/07/2020 and 29/07/2020 (GHD, 2020)
	18 parcels	Conducted by one or two botanists walking transects to a maximum of 5 m apart on 28/04/2020 and 29/05/2020 (GHD, 2020)
Targeted surveys for 21 late spring/summer-flowering species	117 parcels	All surveys were conducted in accordance with DoEE (2013) *Survey guidelines for Australia's threatened orchids* by three botanists walking transects 5 m apart from 18/11/2019 to 14/02/2020 (Biosis, 2020)
	Revision 7 alignment refinements and any areas where alignment revisions were made post any previous surveys.	All surveys were conducted in accordance with DoEE (2013) *Survey guidelines for Australia's threatened orchids* by one or two botanists walking transects 5 m apart on 19, 20, 25/11/2020, 1/12/2020 and 14/12/2020 (GHD 2020)

Survey period by discipline	Total survey effort	Notes
Assessments of habitat and likelihood of absence for 21 late spring/summer-flowering species	8 parcels	All surveys were conducted in accordance with DoEE (2013) *Survey guidelines for Australia's threatened orchids* by one or two botanists walking transects 5 m apart on 28/04/2020 and 29/05/2020 (GHD, 2020)
	22 parcels	All surveys were conducted in accordance with DoEE (2013) *Survey guidelines for Australia's threatened orchids* by one or two botanists walking transects 5 m apart on 28/04/2020 and 29/05/2020 (GHD, 2020)
Opportunistic recording of three non-seasonal dependent species	Throughout the Project Area	Included in all field assessments, primarily VQAs (Biosis, 2020; GHD, 2020)
Vegetation quality assessment	119 parcels	Conducted between 18/09/2019 and 14/02/2020 in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (the Guidelines) (DELWP, 2017a) (Biosis, 2020) – Revision 5 alignment)
	7 parcels	Conducted on 28/04/2020 and 29/05/2020 in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (the Guidelines) (DELWP, 2017a) (GHD, 2020) – Revision 5 alignment
	20 parcels	Conducted 28/07/2020 and 29/07/2020 in accordance with the Guidelines for the *removal, destruction or lopping of native vegetation* (the Guidelines) (DELWP, 2017a) (GHD, 2020). Revision 6 alignment
	Revision 7 alignment refinements and any areas where alignment revisions were made post any previous surveys.	Conducted 19, 20, 25/11/2020 ,1/12/2020 and 14/12/2020 (GHD 2020) in accordance with the Guidelines for the *removal, destruction or lopping of native vegetation* (the Guidelines) (DELWP, 2017a) (GHD, 2020).
Threatened ecological communities	Throughout the Project Area	Conducted concurrently with vegetation quality assessments (Biosis, 2020, GHD 2020) with reference to diagnostic criteria and condition thresholds in Threatened Species Scientific Committee (2008; 2009)

Survey period by discipline	Total survey effort	Notes
Terrestrial fauna		
Rapid field assessment	Throughout the Project Area in areas outside the MSA area	Conducted 8-9/05/2019, 28/06/2019, 22-25/07/2019 (Biosis, 2019).
Habitat assessment of alignment revisions	Revision 7 alignment refinements and any areas where alignment revisions were made post any previous surveys.	Conducted 19, 20, 25/11/2020 and 1/12/2020 (GHD 2020)
Striped Legless Lizard targeted surveys	20 tile arrays of 50 tiles each, over 10 parcels. Each array checked 10-15 times	Tile arrays deployed in August 2019. Tile arrays checked up to once per week between 05/09-29/11 2019 and fortnightly between 05/12-19/12 2019 (Biosis, 2020) Surveys undertaken in accordance with the survey Guidelines methods (DSEWPAC, 2011b) but are not considered sufficient number or extent of grids to confirm absence of the species in identified habitat.
Golden Sun Moth targeted surveys	Of 111 parcels with habitat : 88 parcels x 4 surveys 20 parcels x 1-3 surveys 1 parcel unsurveyed	Walking transects methods conducted in accordance with the survey Guidelines (DEWHA, 2009b): 18/11/2019-23/12/2019 (Biosis, 2020) and 27/11/2020-21/01/2021
Growling Grass Frog targeted surveys	Habitat assessment at 31 waterbodies: 3 waterways, 28 dams. Nocturnal surveys at 19 waterbodies. 2 x nocturnal surveys (unless species detected)	Diurnal habitat assessment to determine habitat suitability 10/12/19 and 6/02/2020 (Biosis 2020), 19&25/11/2020 and 1/12/2020 (GHD 2020) Nocturnal call play back and visual assessment of waterbodies undertaken in accordance with the survey Guidelines (DEWHA, 2009c): 17/12/2019-17/02/2020 (Biosis, 2020) and 9/12/2020 and 15/12/2020 (GHD 2020)
Aquatic fauna		
Fish surveys	3 survey days, overnight netting at each major waterway (Jacksons, Deep and Merri Creek)	Fish and aquatic habitat surveys, including targeted surveys (27/07/2020-29/07/2020) undertaken in accordance with the survey Guidelines (DSEWPAC, 2011a)

6.2.4 Botanical surveys - native vegetation mapping, vegetation quality assessments and targeted surveys

Native vegetation was mapped throughout the Project Area, within and outside the MSA area, according to the Guidelines. Under the Guidelines, native vegetation is considered as either a patch or a scattered tree, where:

- A patch of native vegetation is defined as:

  "an area of vegetation where at least 25 per cent of the total perennial understorey plant cover is native, or 'an area with three or more native canopy trees where the drip line of each tree touches the drip line of at least one other tree, forming a continuous canopy" (DELWP, 2017a pp. 6).

- A scattered tree is defined as "*a native canopy tree that does not form part of a patch*" (DELWP, 2017a pp. 6).

All vegetation quality assessments were conducted by a DELWP-accredited VQA assessor.

To align with DELWP's Native Vegetation Time Stamping dataset, Plains Grassland (EVC 132) was mapped as Heavier-soils Plains Grassland (EVC 132_61). All patches of Plains Grassy Woodland in the Victorian Volcanic Plains (VVP) bioregion were mapped as EVC 55_61. GHD (2020) followed Biosis (2020) methods.

Determination of the diameter at breast height (DBH) threshold for large scattered trees was conducted by overlaying the pre-1750 (pre-European settlement) EVC layer available from DELWP over the locations of scattered trees. The corresponding EVC benchmark was used to allocate DBH thresholds. As per the Guidelines (DELWP, 2017a), circumference should be provided when determining large trees but DBH was used in this instance, since the available EVC benchmarks still list DBH thresholds. These values were later converted to circumference for submission to DELWP for the development of the NVR report. Tree diameter at breast height (DBH) was measured at 130 cm above the ground.

Parcels not surveyed during field assessments

Three parcels outside the MSA area were not surveyed owing to a lack of access.

1. 1LP92520, KP 11
2. 1/TP829278, KP 9
3. 4/LP126752, KP 32

All three parcels were assessed over the fence from adjoining properties with a high degree of certainty as to the extant vegetation. Of the three parcels only one of these parcels (11LP92520, KP 11) contains patches of native vegetation ((<0.2 ha) of Plains Grassland). A visual inspection of the impacted corner of the property from both adjoining properties was conducted by a botanist during November/December 2020 surveys. Assessment concurred with the predicted mapping confirming the presence of Plains Grassland patches in the impacted area in the south east corner of the property. The TEC was assumed present based on the patch being continuous with the adjoining property. Site condition scores and offset obligations have been accounted for this patch based on scores obtained from the continuous grassland patch on the adjoining property 12LP92520.

Within the approved MSA areas, time-stamped data exist for 13 unsurveyed parcels. Nine of these are mapped as non-native vegetation and four parcels are mapped as native vegetation.

Time-stamped data are available and can be used for parcels within the approved MSA areas that have not been assessed to date.

Noxious weeds

Weeds listed as noxious under the CaLP Act and Weeds on National Significance (WoNS) were recorded during the vegetation assessments and the targeted surveys. Due to the extensive presence of these species across the Project Area, locations were not collected (Biosis, 2020).

Protected flora

FFG Act listed protected flora were identified and recorded during the vegetation surveys (Biosis 2020).

Targeted surveys – EPBC Act-listed flora

Following the desktop review and rapid field assessments, Biosis (2020) conducted targeted surveys for EPBC Act-listed threatened flora deemed to have a medium or higher likelihood of occurrence within the Project Area. These included:

- Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens* (Critically Endangered)
- Adamson's Blown-grass *Lachnagrostis adam*sonii (Endangered)
- Basalt Peppercress *Lepidium hyssopifolium (*Endangered*)*
- Button Wrinklewort *Rutidosis leptorhynchoides* (Endangered)
- Matted Flax-lily *Dianella amoena* (Endangered)
- Small Golden Moths *Diuris basaltica* (Endangered)
- Clover Glycine *latrobeana* (Vulnerable)
- Curly Sedge *Carex tasmanica* (Vulnerable)
- Large-headed Fireweed *Senecio macrocarpus* (Vulnerable)
- River Swamp Wallaby-grass *Amphibromus fluitans* (Vulnerable)

Further information on the assessment for each of these species and communities is provided below.

Targeted surveys – FFG Act and DELWP Advisory listed flora

Targeted surveys were conducted for other threatened flora (i.e. FFG Act-listed flora and DELWP Advisory-listed flora with a classification of vulnerable or endangered) that were assessed as having a moderate to high likelihood of occurrence within the Project Area.

A list of these species is provided in Table 12. Some threatened flora were assessed at desktop level as having a moderate to high likelihood of occurrence within the Project Area (Appendix B). However, specific targeted surveys were not conducted for these species, since it was determined that adequate survey effort had previously been conducted and consequently, sufficient data were available to evaluate their likelihood of occurrence in the Project Area.

Targeted surveys – EPBC Act threatened ecological communities and FFG Act threatened communities of flora

Threatened vegetation communities were also mapped where they occurred throughout the Project Area. All surveys were conducted in accordance with relevant State and Commonwealth survey guidelines.

To determine the presence of EPBC Act-listed TECs, native vegetation patches were assessed in the field against key diagnostic criteria and condition thresholds for:

- *Natural Temperate Grassland of the Victorian Volcanic Plain* (Critically Endangered)
- *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* (Critically Endangered)
- *Seasonal Herbaceous Wetlands of the Temperate Lowland Plains* (Critically Endangered)

- *Grey Box Grassy Woodlands and Derived Native Grasslands or South-Eastern Australia* (Endangered)
- *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Critically Endangered)

Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVVP)

Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVVP) was assessed against diagnostic criteria and condition thresholds at sites within the Victorian Volcanic Plain bioregion that contained EVC 55_61 Plains Grassy Woodland (Threatened Species Scientific Committee, 2009).

Natural Temperate Grassland of the Victorian Volcanic Plain

Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) was assessed against diagnostic criteria and condition thresholds at sites within the Victorian Volcanic Plain bioregion in areas of native grassland identified as Plains Grassland (Threatened Species Scientific Committee, (2008).

Seasonal Herbaceous Wetlands of the Temperate Lowland Plains

Field surveys for Seasonal Herbaceous Wetlands were undertaken in accordance with *Approved Conservation Advice for the Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains* (Threatened Species Scientific Committee, 2012), including assessment against key diagnostic criteria and condition thresholds in one parcel that contained EVC 125 Plains Grassy Wetland (2LP130112 − KP 18).

Potential for this community to occur was noted in spring to early summer during vegetation quality assessments. No other wetlands or potential wetlands met the criteria for the community to be considered present or potentially present. Access to the parcel where Plains Grassy Wetland was observed was only available in March 2020; however, further field assessments undertaken concluded that the community was not present, based on a lack of diagnostic species. GHD (2020) found no additional potential occurrences of this community.

Grey Box Grassy Woodlands and Derived Native Grasslands or South-Eastern Australia

In the Central Victorian Uplands bioregion, this community is most closely aligned with EVC 235 Plains Woodland/Herb-rich Gilgai Wetland Mosaic or EVC 803 Plains Woodland in the Central Victorian Uplands and Victorian Volcanic Plain bioregions. One small patch of Plains Woodland was compared against condition thresholds but did not meet the minimum patch size requirement of 0.5 ha (Australian Government, 2012).

Biosis (2020) and GHD (2020) found no occurrences of this community.

White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Around Melbourne, Box-Gum Grassy Woodland may be a component of EVC 55 Plains Grassy Woodland dominated by Yellow Box (*Eucalyptus melliodora*) (Threatened Species Scientific Committee, 2006). Species that may be co-dominant throughout the TEC's range (White Box *Eucalyptus albens* and Blakely's Red Gum (*Eucalyptus blakelyi),* do not occur in the Melbourne region including in the Project Area.

Biosis (2020) and GHD (2020) found no occurrences of this community.

FFG Act threatened communities

To determine the presence of FFG Act-threatened communities, Biosis (2020) and GHD (2020) considered that all patches of Plains Grassland EVC within the Project Area were analogous to the FFG Act listed Western (Basalt) Plains Grasslands Community. Similarly, where they

occurred on the VVP, patches of Plains Grassy Woodland EVC were considered to also be occurrences of Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland.

Seasonal targeted surveys approach − flora

Spiny Rice-flower

Targeted surveys for Spiny Rice-flower followed Significant Impact Guidelines for the Critically Endangered Spiny Rice-flower (*Pimelea spinescens* subsp. *spinescens*) (DEWHA, 2009a). Qualified botanists walked transects spaced up to five metres apart at suitable sites identified during the desktop assessment (Figure 5). Survey guidelines for Spiny Rice-flower state that transect surveys should be undertaken from April to August, when the plant is in flower, in any location containing suitable habitat for the species (DEWHA 2009a). However, the guidelines do not specify transect spacing for Spiny Rice-flower and consequently, the transect spacing applied for the surveys was five metres. This is the minimum spacing recommended in the *Survey guidelines for Australia's threatened* orchids (DoEE 2013) and was adjusted as required based on vegetation density and survey timing. (Biosis, 2020).

The majority of surveys were conducted during the flowering period (April to August). Where access to parcels was not available until later in the year (September 2019 to February 2020), survey effort was adjusted to up to 2.5 m spacing between transects to compensate for lower visibility when plants were not in flower.

Spiny Rice-flower surveys were concentrated in 44 parcels west of Deep Creek in areas of uncultivated grassland. The species has not been recorded east of Jacksons Creek. However, since much of the area between Jacksons Creek and Deep Creek has not been extensively surveyed, Biosis adopted a precautionary approach in setting the eastern survey area limit (Figure 5).

Parcels not surveyed were deemed not to provide suitable habitat for Spiny Rice-flower, such as where previous cultivation or significant ground disturbance (see Section 6.2.2.3). These parcels are shown in Figure 5.

Although failure to detect Spiny rice-flower should not be considered indicative of its absence where it is not possible to adhere to the recommended survey manner, field and desktop surveys are deemed to have:

- Maximised the chance of detecting the subspecies
- Determined the context of the site within the broader landscape (for example amount of habitat on and near site, presence of nearly populations, threats and impacts in surrounding areas)
- Been conducted by a suitably qualified person
- Accounted for uncertainty and error
- Survey methods and effort were adjusted to compensate for the decreased likelihood of detecting the species outside recommended the periods or conditions

Table 12 **Targeted surveys (flora) – species, conservation status and survey timing**

Scientific Name	Common Name	Flowering time	EPBC Act	FFG Act	DELWP Advisory list
Winter-flowering species					
Pimelea spinescens subsp. *spinescens*	Spiny Rice-flower	Apr-Aug	Critically Endangered	L	Endangered
Spring flowering species					
Senecio macrocarpus	Large-headed Fireweed	Sep-Apr	Vulnerable	L	Endangered
Diuris basaltica	Small Golden Moths	Sep-Oct	Endangered	L	Endangered
Diuris palustris	Swamp Diuris	Aug-Oct		L	Vulnerable
Diuris punctata	Purple Diuris	Oct-Nov		L	Vulnerable
Late spring/summer flowering species					
Amphibromus fluitans	River Swamp Wallaby-grass	Nov-Mar	Vulnerable		
Amphibromus pithogastrus	Plump Swamp Wallaby-grass	Nov		L	Endangered
Calotis anthemoides	Cut-leaf Burr-daisy	Sep-Dec		L	
Carex tasmanica	Curly Sedge	Sep-Nov	Vulnerable	L	Vulnerable
Chloris ventricosa	Plump Windmill Grass	Jan, May, Aug			Vulnerable
Comesperma polygaloides	Small Milkwort	Nov-Jan		L	Vulnerable
Coronidium gunnianum	Pale Swamp Everlasting	Nov, Feb-Apr, Jun			Vulnerable
Cullen parvum	Small Scurf-pea	Oct-Jan		L	Endangered
Cullen tenax	Tough Scurf-pea	All year		L	Endangered
Dianella amoena	Matted Flax-lily	Dec-Jan	Endangered	L	Endangered
Dianella longifolia var. *grandis*	Arching Flax-lily	Nov-Dec			Vulnerable
Eleocharis plana	Flat Spike-sedge	Spring-summer			Vulnerable
Geranium solanderi var. *solanderi* s.s.	Austral Crane's bill	Oct-Jan			Vulnerable
Geranium sp. 1	Large-flower Crane's-bill	Apr		L	Endangered

Scientific Name	Common Name	Flowering time	EPBC Act	FFG Act	DELWP Advisory list
Glycine latrobeana	Clover Glycine	Sep-early Oct	Vulnerable	L	Vulnerable
Goodenia macbarronii	Narrow Goodenia	Oct-Mar		L	Vulnerable
Lachnagrostis adamsonii	Adamson's Blown-grass	Nov	Endangered	L	Vulnerable
Lepidium hyssopifolium	Basalt Peppercress	Dec-May		L	Endangered
Microseris scapigera s.s.	Plains Yam-daisy	Sep-Feb			Vulnerable
Podolepis linearifolia	Basalt Podolepis	Sep-Dec			Endangered
Rutidosis leptorhynchoides	Button Wrinklewort	Nov-May	Endangered	L	Endangered
Non-seasonal					
Eucalyptus leucoxylon subsp. *connata*	Melbourne Yellow Gum				Vulnerable
Eucalyptus X *studleyensis*	Studley Park Gum				Endangered
Allocasuarina luehmannii	Buloke	Sep-Nov		L	Endangered

Orchids

Targeted surveys for three spring-flowering orchids considered the *Survey Guidelines for Australia's Threatened Orchids* (DoEE, 2013). Survey was undertaken in suitable habitat (Figure 6), by three botanists (Biosis, 2020) or one botanist (GHD, 2020) walking parallel transects up to 5 m apart as recommended by DoEE (2013). Using this approach, surveys were able to cover the majority of the Project Area width.

Twenty-two spring and summer flowering species

Since there are no species-specific survey guidelines for the 22 remaining spring to summer flowering species, Biosis (2020) and GHD (2020) followed the same survey protocols for orchids (DoEE, 2013) in suitable habitat (Figure 6, Figure 7). These guidelines are considered best practice for threatened flora surveys and enabled three botanists to cover the majority of the Project Area (30 metres wide) in two passes.

Non-seasonal species

Targeted surveys were not undertaken specifically for these species since they are easily observable and could be surveyed as part of general vegetation assessments.

6.2.4.2 Additional autumn and winter targeted surveys and habitat assessments to address knowledge gaps

Additional surveys of 33 parcels of land were conducted in the time available (autumn and winter 2020) to address gaps in the earlier 2019/2020 botanical survey effort (Biosis, 2020) that had arisen due to access constraints.

Furthermore, as a result of revision changes to the Project Area a number of parcels were also identified that were not included in the 2019/2020 botanical surveys. Parcels with alignment changes identified as in these gaps were surveyed to assess the likelihood of occurrence of 26 threatened flora and to advise APA whether any further targeted threatened flora, threatened ecological community surveys or vegetation quality assessments were required, based on fieldwork outcomes.

At all three times when the additional surveys were conducted (April, May and July 2020), it was expected that some species would not be identifiable with 100% confidence owing to a lack of diagnostic characters (e.g. flowers), or were dormant (orchids) in autumn and winter. However, confirmation of habitat suitability or potential suitability, and/or the likely presence or likely absence of species was deemed possible. Criteria to evaluate habitat suitability included whether the site consisted of native vegetation and its type, presence of other indigenous native flora, weediness, disturbance, topographic features and the extent of cultivation or agriculture. A species was considered likely to be absent if no suitable habitat existed at the site and/or no flora with morphological features similar to the targeted species were observed.

Excluded from targeted surveys were the three species listed as threatened under the EPBC Act (Hoary Sunray, Maroon Leek-orchid and Swamp Everlasting), not included in Biosis's targeted surveys (Biosis, 2019) but considered by DAWE as potentially impacted by the Project (refer Section 6.2.2.4 and Section 8.3.2). These species were deemed highly unlikely to occur by both Biosis (2019) and GHD (2020) in two desktop surveys and had not been detected in any of the field surveys.

6.2.5 Fauna field assessments

Following the desktop review and rapid field assessments, Biosis (2020) conducted targeted surveys for species where the outcome of such surveys might contribute to the determination of a species' presence within the Project Area. Consequently, the focus was on determining the presence of cryptic, resident species typically with relatively small and discrete home ranges in areas of suitable habitat. Species that are only seasonally present, wide-ranging and highly mobile are generally unlikely to be significantly impacted by the Project, and targeted surveys for such species were considered unlikely to add any value, as the absence of records does not necessarily mean that these species will not visit habitat within the construction corridor (Biosis, 2020).

Target species surveyed for were (Biosis, 2020):

- Striped Legless Lizard *Delma impar*
- Golden Sun Moth *Synemon plana*
- Growling Grass Frog *Litoria raniformis*

Following revision of the Project Area in 2020 additional habitat assessments were undertaken which identified the need for further survey. Coupled with additional surveys required in order to fill knowledge gaps from the 2019/2020 seasons surveys (Biosis 2020) additional surveys were conducted in 2020 for the Growling Grass Frog and in 2020/21 for the Golden Sun Moth.

Some threatened or migratory species did not require targeted survey because their appropriate habitat may be detected during field assessment for vegetation and habitat. These species included (Biosis, 2020):

Mammals

- Grey-headed Flying-fox *Pteropus poliocephalus*
- Common Bent-wing Bat (eastern ssp.) *Miniopterus schreibersii oceanensis*

Birds

- Swift Parrot *Lathamus discolor*
- Eastern Great Egret *Ardea modesta*
- Little Egret *Egretta garzetta*
- Freckled Duck *Stictonetta naevosa*
- Blue-billed Duck *Oxyura australis*
- Latham's Snipe *Gallinago hardwickii*
- Intermediate Egret *Ardea intermedia*
- Red-chested Button-quail *Turnix pyrrhothorax*
- Lewin's Rail *Lewinia pectoralis*
- Baillon's Crake *Porzana pusilla*
- Black Falcon *Falco subniger*
- Australasian Shoveler *Spatula rhynchotis*
- Hardhead *Aythya australis*
- Musk Duck *Biziura lobata*
- White-throated Needletail *Hirundapus caudacutus*

Reptiles

- Tussock Skink *Pseudemoia pagenstecheri*

Amphibians

- Brown Toadlet *Pseudophryne bibronii*

With the exception of Latham's Snipe, Migratory species listed under the EPBC Act are unlikely to make significant use of or have important habitat within the Project Area (Biosis, 2019). Targeted surveys for Migratory species were not undertaken. Latham's Snipe is discussed further in section 8.4.2.1.

(a) Targeted surveys − Striped Legless Lizard

The Striped Legless Lizard is listed as Vulnerable under the EPBC Act. It is known to inhabit native and exotic grassland dominated by tussock grasses with high biomass, surface rocks or invertebrate burrows (Commonwealth of Australia, 2011; TSSC, 2016).

The Striped Legless Lizard survey employed the artificial shelter (tile surveys) technique, as this is widely recognised as the most effective technique to survey for the species, and is therefore generally expected by DELWP and DAWE (Commonwealth of Australia, 2011) (Biosis, 2020). The method by which the surveys were undertaken and the rationale for the location of surveys is detailed below from Biosis (2020, pp. 20-22 and Biosis pers. comm 2020):

> *Twenty tile arrays were deployed in early August, which allowed the tiles to 'bed down' for a month and for animals to become accustomed to using them for shelter.*
>
> *The linear nature of the Project spanning multiple land parcels precluded the strict application of the Striped Legless Lizard survey guidelines recommended by the Commonwealth of Australia (2011). The guidelines' definition of a 'site' refers to a discrete area of land that has been subject to the same land-use history. The guidelines for Striped Legless Lizard is therefore difficult to apply to large linear infrastructure Projects because they invariably cross numerous landholdings, each supporting habitat of varying quality and extent.*
>
> *The guidelines require 10 tile arrays for 'sites' greater than 30 ha in size, however if the entire Project Area was treated as a 'site', ten tile arrays would be an inadequate survey effort for the approximately 170 hectare impact area. Conversely, if each land parcel supporting potential habitat was treated as a 'site' in accordance with the survey guidelines, an unmanageable (and unjustifiable) number of tile grids would need to be deployed.*
>
> *The Project Area traverses some areas of vegetation (habitat) considered to have a high likelihood of supporting Striped Legless Lizard populations through to areas with a low likelihood of supporting the species.*
>
> *Surveys within the Project Area sampled a range of habitat including native and non-native grassland (Biosis pers. comm. 2021) and aimed to sample sites spanning the longitudinal extent of the construction footprint [sic]. As such, sampling (using tile grids) focused on areas of native grassland and to a lesser extent exotic grassland that contained appropriate habitat structure (tussock grasses, embedded and surface rock). Habitat considered unlikely to support the species included land subject to historic and/or ongoing significant ground disturbance such as cropping and ploughing. No sampling was undertaken in these areas.*

In addition to evaluation of habitat suitability, geographic proximity to other populations of Striped Legless Lizard is a useful indicator of the likely occurrence of the species. Hence, consideration of previous records of the species formed an important component of the assessment. The spatial distribution of Striped Legless Lizard in the Melbourne region is clustered, with records concentrated in Melbourne's west but few records from Melbourne's north. Based on current knowledge of the distribution of Striped Legless Lizard in Melbourne's west and north, the Project Area was divided into three sampling sections. A habitat assessment was undertaken to determine the location and number of tile arrays to be deployed in each of these sections.

We consider that the survey effort and approach were appropriately tailored to the linear nature of the Project based on logic, pre-existing information and ecological survey principles.

The resulting rationale and survey effort in each of these sections was as follows:

- *The western section (west of Calder Freeway; approximately KP0 to KP9) is the section of the Project Area considered most likely to support Striped Legless Lizard, as it is closest to the majority of recent Striped Legless Lizard records. This section of the Project Area was subject to the highest level of survey effort. The majority of apparently suitable habitat patches were sampled within this section. Five tile arrays were placed within this section.*
- *The north-western section (east of Calder Freeway and west of Hume Freeway; approximately KP9 to KP37) is the section of construction footprint [sic] which held the greatest uncertainty in regards to the potential for Striped Legless Lizard to be present. There were no Striped Legless Lizard records through this section, however, only a limited number of surveys have been undertaken in this area. A moderate level of survey effort was undertaken in this section to account for uncertainty, and survey effort was stratified to represent the variety of suitable habitat present (i.e. a range of vegetation patch sizes and grassland types was sampled). Ten tile arrays were placed within this section.*
- *The northern section (east of Hume Freeway; approximately KP37 to KP51) is the section of construction footprint [sic] considered least likely to support Striped Legless Lizard, as a recent review by DELWP concluded that Striped Legless Lizard are unlikely to occur in this area, based on previous survey results. Survey effort was therefore reduced through this section, which focused on the better quality areas of potential habitat based on grassland structure, land use history, proximity to historical Striped Legless Lizard records, patch size and level of fragmentation. Five tile arrays were placed within this section.*

The highest quality habitat patches in which to place the tiles were identified from aerial photo interpretation and verified by on-ground survey by a senior zoologist with extensive experience in Striped Legless Lizard survey. Subsequent detailed flora investigations confirmed that the tile arrays were located within or adjacent to the highest quality Striped Legless Lizard habitat patches occurring within the construction footprint [sic].

Each tile grid consisted of 50 roof tiles spaced approximately five metres apart. Tiles were typically arranged in a rectangular grid of ten tiles by five, however it was also appropriate to adjust this to suit the impact area (e.g. one transect of 50 tiles, or two transects of 25 tiles for linear impact areas). Tile arrays were positioned on a northerly aspect where possible (Commonwealth of Australia 2011).

All tile grids (except grids 16, 17 and 18 on B7PP2258) were checked once per week between September and November (5/6 September 2019 to 27/29 November 2019), and fortnightly in December (5/6 and 19 December 2019) culminating in a total of 15 checks per grid.

Grids 16, 17 & 18 were checked ten times due to land access issues.

In accordance with survey guidelines shelter sites were not checked once ambient temperatures exceeded 28 degrees Celsius (Commonwealth of Australia 2011).

Striped legless lizards were recorded in two of the 20 grids deployed across the construction footprint [sic]. *The two grids were Grids 6 and 7 on 12LP92520.*

The number of Striped Legless Lizard individuals recorded from the survey effort was determined using photo analysis of head- scale pattern, which is unique to each individual lizard. Interpretation of head scales identified six unique individuals across Grids 6 and 7.

Subsequent to the 2019 surveys, alignment revisions and discussion with DELWP and DAWE have led to a more conservative approach being undertaken for this species, and the presumption of presence being applied in all areas of Striped Legless Lizard habitat (including within surveyed and unsurveyed parcels) that occur outside the MSA area.

Seven categories of survey/habitat have been detailed to demonstrate the extent of potential habitat throughout the Project Area (Table 13). Some small sections of the Project Area (e.g. small laydown area within a road reserve) have been assessed via a google drive by and a determination made on the presence or absence of habitat has been made and incorporated into one of the outlined survey and habitat types.

Table 13 Survey and habitat types

Survey/Habitat type	Explanation
10 surveys completed, no SLL detected	Suitable habitat identified and tile grid surveys undertaken within parcel and checked 10 times over the course of the survey. Striped Legless Lizard was not found during surveys.
15 surveys completed, no SLL detected	Suitable habitat identified and tile grid surveys undertaken within parcel and checked 15 times over the course of the survey. Striped Legless Lizard was not found during surveys.
15 surveys complete and SLL detected	Suitable habitat identified and tile grid surveys undertaken within parcel and checked 15 times over the course of the survey. Striped Legless Lizard was found during surveys.
Habitat present – not surveyed	Suitable habitat identified but no tile grids were placed within specific parcel.
No access – presume presence	No access available to parcel to determine suitability of habitat. Parcel is assumed to contain habitat.
No suitable habitat	No habitat suitable to support the species was observed within Project Area e.g. subject to significant ground disturbance (e.g. ploughing, removal of surface and embedded rock) or lacked appropriate vegetative cover (overgrazed). These areas are considered to have a very low likelihood of supporting Striped Legless Lizard.
Not surveyed	Parcel not surveyed as it is not expected to be impacted (e.g. location is expected to be bored or HDD) or occurs within the MSA and surveys are not required.

The parcels containing Striped Legless Lizard grids and the dates of surveys are itemised in Appendix N and mapped in Figure 9.

(b) Targeted Survey − Golden Sun Moth

The Golden Sun Moth (*Synemon plana*) is listed as Critically Endangered under the EPBC Act. It is known to inhabit native grasslands or grassy woodlands containing native wallaby grasses *Rytidosperma* spp., spear grasses *Austrostipa* spp., and Red-leg Grass *Bothriochloa macra*, as well as exotic grasslands dominated by introduced tussock-forming species such as Chilean Needle-grass *Nassella neesiana* (DEWHA, 2009b; Biosis, 2020).

Surveys for Golden Sun Moth must be completed during the flight season for this species and must comply with minimum survey guidelines outlined in DEWHA (2009b).

The method by which the 2019 surveys were undertaken and the rationale for the location of surveys is detailed below from Biosis (2020, pp. 22-23):

> *Surveys were undertaken from 18 November 2019 to 23 December 2019, which was within the typical Golden Sun Moth flight season of November to early January. Surveys did not commence until Golden Sun Moth were confirmed to be flying in the Melbourne area (18 November 2019).*
>
> *Each land parcel that had been identified as supporting potential habitat was surveyed up to four times, and each survey conducted at approximately weekly intervals during the flight season. Access restrictions limited the number of surveys on some sites that contain suitable habitat.*
>
> *Each survey was undertaken by an ecologist walking in a straight line transect through the 30 metre construction footprint [sic]. Where the construction footprint [sic] extended beyond 50 metres in width parallel transects spaced 50 metres apart were walked.*
>
> *Valid survey days met criteria for suitable weather conditions to detect the species. The survey guidelines define suitable conditions as days where temperatures exceed 20 degrees Celsius by 10 am; low wind speed and cloud cover; at least two days since rain; and surveys were undertaken during the warmest part of the day (i.e. 10 am to 3 pm). Sightings of Golden Sun Moth within the Project Area, from nearby Golden Sun Moth surveys and / or reference site checks were used to confirm that the species was flying and therefore readily detectable.*
>
> - *One Golden Sun Moth survey day (14 December 2019) was considered invalid due to no sightings of Golden Sun Moth within the construction footprint [sic] or at a local reference site and unsuitable weather conditions.*
>
> *The location of any Golden Sun Moth observed were recorded using hand-held GPS-enabled tablets and tracks were recorded via a hand-held GPS unit.*

Surveys were not undertaken in parcels considered to have unsuitable habitat as a result of being recently cropped or lacking native and/or exotic tussock-forming grasses.

Additional surveys using similar methods were undertaken during the 2020/2021 flying season to assess locations added to the Project Area since the initial surveys, and to complete the assessment in parcels where surveys were not fully completed during the 2019/2020 season due to land access restrictions, unfavourable weather conditions not suitable to undertake surveys and/or survey windows closing. Surveys during the 2020/2021 flying season did not commence until Golden Sun Moths were confirmed to be flying in the Melbourne area (27 November 2020).

Cumulative survey effort across the 2019/20 and 2020/21 seasons resulted in surveys being conducted across 111 parcels identified as containing suitable habitat for Golden Sun Moth. Four targeted surveys were completed in accordance with the minimum survey guidelines in 88 of these 111 parcels. Twenty parcels received between one and three surveys, and one parcel remained unsurveyed primarily due to access restrictions and weather constraints.

For parcels that are intercepted by the Project Area and outside of the MSA, presence of the species has been assumed if four acceptable rounds of survey were not completed within a single flying season.

The timing and conditions for all Golden Sun Moth surveys are provided in Appendix O and Appendix P, with locations mapped in Figure 10.

(c) Targeted Survey – Growling Grass Frog

The Growling Grass Frog is listed as Vulnerable under the EPBC Act. 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 Frogs may utilise permanent or semi-permanent waterbodies. Typical habitats include open vegetated wetlands, flooded paddocks and drains. The species is also likely to utilise terrestrial habitat adjacent to occupied wetlands for foraging, dispersal and over-wintering (DEWHA, 2009c). The Growling Grass Frog is relatively mobile and able to colonise wetlands/waterbodies from source populations during suitable conditions.

The Project Area contains suitable wetland habitat for Growling Grass Frog in the form of creeks, farm dams and other off-stream waterbodies within and adjacent to the proposed alignment (Pyke & White 1996, in Biosis 2020). The species has been previously recorded from the three major streams (Jacksons, Deep and Merri Creeks) intersected by the Project Area. Biosis (2020) notes that previous studies of Growling Grass Frog in the region have found the probability of occupancy of waterbodies to be positively associated with wetland hydroperiod, aquatic vegetation cover and proximity (connectivity) to other Growling Grass Frog populations (Heard & Scroggie, 2009). This means that permanent waterbodies supporting a high cover of aquatic vegetation and close to existing populations of Growling Grass Frog are more likely to be occupied by the species, while isolated, ephemeral or intermittent waterbodies with little or no aquatic vegetation are much less likely to be occupied (Heard et al., 2010) (Biosis, 2020).

The method by which the 2019/20 surveys were undertaken and the rationale for the location of surveys is detailed below from Biosis (2020, pp. 23-25):

> *Potential Growling Grass Frog waterbodies within 100 metres of the boundaries of the Project Area were identified through aerial photo interpretation and ground truthing. Waterbodies both within and* outside the MSA area *were assessed. Waterbodies greater than 100 metres from the alignment were considered unlikely to be directly affected by the Project and were not inspected. A daytime habitat assessment was made of each waterbody to determine whether, at the time of inspection, the waterbody displayed habitat attributes favoured by the species.*
>
> *Targeted survey was flagged for waterbodies that contained water at the time of the diurnal inspection and supported at least some emergent, submergent or floating aquatic vegetation. Farm dams that were heavily pugged and fouled through unrestricted stock access generally had no aquatic vegetation and were considered to represent poor quality habitat for the species.*

Waterbodies with potential to support the species were surveyed after dark in accordance with the methods described in Heard, Robertson & Scroggie (2006) and the DEWHA (2009c), as outlined below:

- *Surveys were carried out between 17 December 2019 and 17 February 2020, which is within the recommended survey period of November to March*
- *Each waterbody and stream crossing was subject to two (2) surveys. The exception being 10LP5364 where Growling Grass Frog were detected during the first survey.*
- *Surveys were undertaken at night under conditions thought to be suitable for Growling Grass Frog Activity; night time temperatures above 12 degrees Celsius with little or no wind*
- *Each waterbody was surveyed for 60 person-minutes and followed the general procedures for visual encounter surveys for amphibians (Crump & Scott 1994). Surveys commenced with a quiet observation from the waterline for a period of 10 minutes, listening for calling males. Call playback was also used to elicit a response from males that might be present in a waterbody but not calling spontaneously.*
- *The circumference of each off-stream waterbody was systematically searched for active Growling Grass Frog with the aid of headlamps. All habitat was searched including submerged and floating vegetation, bankside vegetation, rocks and logs within and on the margin of the waterbody and areas of bare ground around the margin of the waterbody. Active searching included lifting rocks and other potential refugia within 20 metres of the margin of the waterbody to locate inactive individuals.*

Data recorded during each night time survey included:

- *Site location*
- *Date of survey and survey number (1 or 2)*
- *Start and finish time*
- *Personnel involved*
- *Weather conditions (air temperature and wind strength)*
- *Detection or non-detection of Growling Grass Frog during call survey*
- *Detection or non-detection of Growling Grass Frog during visual encounter searching*

WORM alignment crossing points at Jacksons, Deep and Merri Creeks were not subject to survey as Growling Grass Frog is known to occur within these streams and in the case of Merri Creek, the crossing is within a Growling Grass Frog Conservation Area established under the BCS.

Twenty-six waterbodies consisting of three (3) streams (Tame Street Drain, Kalkallo Creek and an adjacent unnamed channel) and 23 dams were surveyed during the day for potential habitat. Day time access to one dam at 2LP130112 was unavailable. Of the eight waterbodies recommended for targeted night time surveys, seven were surveyed. Night time access to the parcel 2LP113763 which contains the eighth waterbody was not possible, however this parcel lies within the approved MSA area.

Many of the waterbodies within 100 metres of the WORM alignment identified as potential Growling Grass Frog habitat were dry at the time of inspection and hence were not subject to targeted survey. The assessment coincided with an extended period of below average rainfall in the Melbourne region and this may have resulted in some of the waterbodies being dry or drying during the spring and summer of 2019/20 when in years of 'average' or above-average rainfall they might hold water throughout spring and summer.

Additional surveys were undertaken in November and December 2020 to supplement the assessments detailed above as part of Biosis (2020). These surveys aimed to determine the suitability of additional waterbodies identified as a result of habitat assessments of areas where the Project Area had been revised since that time, and also to determine if waterbodies previously assessed as dry now held water. Assessments were restricted to the area outside of the MSA area. Consequently, diurnal habitat assessments were undertaken on 16 waterbodies.

Subsequent nocturnal assessments (in line with the methods detailed above) were undertaken at all waterbodies (outside of the MSA area) that were within or immediately adjacent to the Project Area (within 10 m). Given the nocturnal surveys took place during the peak breeding/calling season, survey time was reduced to 45 person minutes at very small and degraded waterbodies, e.g. <10 m and or lacking emergent and/or surrounding vegetation.

In some parcels where access was not permitted, nocturnal Growling Grass Frog surveys were restricted to audio and call play back surveys only from either an adjacent property or road reserve. Given the proximity, surrounding noise levels and survey conditions, there is a high level of confidence that if the species was calling, then it would have been heard via this method.

Details of all Growling Grass Frog surveys are provided in Appendix Q and locations are mapped in Figure 11. Areas mapped as “Potential habitat, not surveyed” represent the locations detailed above where potential habitat was identified but the condition of the waterbody was not suitable for night survey because it was dry at the time of assessment. Those locations were then not surveyed in December 2020 as they were considered to have a low risk of impact on the species, and they were outside the Project Area. Areas mapped as “Surveys not required” do not contain suitable habitat for the species within 100 m of the WORM alignment.

6.2.6 Targeted fish surveys – aquatic ecology

Targeted surveys were conducted for Australian Grayling *Prototroctes maraena*. As methods used for targeted surveys also allow for collection of other fish species, the targeted surveys also provided data on native and exotic fish species to inform the general aquatic ecosystem condition assessment. Surveys were undertaken at the sites listed in Table 14.

The Australian Grayling is a migratory species that inhabits estuarine waters and coastal seas as larvae/juveniles, and freshwater rivers and streams as adults. Australian Grayling are thought to disperse as juveniles in the marine environment, and ascend freshwater systems independent of their origin (DELWP, 2015). This leads to the potential for expansion of the distribution of Australian Grayling population in the Yarra and Maribyrnong Rivers into other tributaries with suitable habitat.

Each site was visited during daylight hours to determine the presence of instream habitat (e.g. macrophytes, substrate type, submerged woody habitat and pool/riffle sequences), connectivity and local barriers. Photographs were taken at locations as a record of the habitats encountered.

Double-wing 4 mm mesh fyke nets were deployed overnight (12-hour soak time) in the best available habitat in each waterway and where access permitted. That is, where depth was not too great or flow too fast, and where coverage of each waterway was maximised. All nets were within 50 to 100 metres of the Project Area at each site. One net was set facing upstream and another net facing downstream. Nets were retrieved the following morning and all fish captured were identified and enumerated.

Electrofishing was undertaken using an e-Fish 500W backpack operated by a pair of experienced aquatic ecologists, in accordance with the Australian Code of Electrofishing Practice (NSW Fisheries, 1997). Electrofishing was undertaken for a minimum of 1200 seconds of pulse time at each site, extending along each waterway for 200 metres. All fish captured were identified and enumerated. In Jacksons Creek, electrofishing occurred immediately upstream of the Project Area as water depth prevented access to other areas. In both Deep Creek and Merri Creek electrofishing occurred either side of the Project Area.

Duplicate environmental DNA (eDNA) samples were collected from three sites on each waterway. The sites were located within the Project Area, and locations further upstream and downstream to provide an understanding of whether Australian Grayling are likely to be present throughout each sub-catchment (Figure 4). The upstream and downstream locations were predominately based on areas where public access was permitted, although other factors were also consider. For example, in Jacksons Creek, there was a ford approximately 100 metres downstream of the Project Area and samples were collected at this location to investigate whether this acted as a barrier to migration (i.e. detection downstream of the ford and no detection at the crossing or further upstream). In Merri Creek habitat and connectivity upstream of the Project Area was limiting and the presence of Australian Grayling were not anticipated further upstream so the sample was collected only 500 metres from the proposed crossing.

Note that eDNA sampling is a relatively new, cheap, quick and non-invasive method for detecting species. Currently, there are many applications for eDNA including the detection of threatened species and monitoring biodiversity. As its name suggests, it is the DNA that a target species leaves behind in its environment that is used to confirm presence. All living organisms leave fragments of their DNA in the environment and extracting eDNA from an environmental sample such as water can determine what has been there without actually observing or capturing the species. The general stages used in the context of the targeted fish surveys were; 1) collection of water samples, 2) extraction of DNA from the samples, 3) amplification of the DNA using polymerase chain reaction to create many copies, 4) comparison of the results to established Australian Grayling primers (i.e. fingerprints) to determine if there was evidence of presence for the species.

For eDNA samples collected from a river or stream, a potential benefits is that eDNA can disperse small distances or even kilometres away from its original source depending on flow and DNA degradation rates (EnviroDNA, 2019). Consequently, rather than just providing local information, the results potentially indicate the presence of the target species further upstream. Limitations to the use of eDNA is that it cannot necessarily determine the sex, size, developmental stage or health of individuals which can only be done using traditional trapping and surveying techniques (EnviroDNA, 2019). Further limitations are that non-detection of a species does not automatically imply absence (particularly when individuals are rare and eDNA sparse), while a positive signal does not necessarily mean presence as the eDNA may have been preserved after an individuals death (Roussel et al., 2015). Finally, false positive signal occur when a positive signal is obtained, although the sample does not contain any DNA of the target species. This may be an artefact of the detection process with the DNA amplified even though the species is absent from the water, such as when predator faeces transport DNA from one waterway to another (Roussel et al., 2015).

Ultimately, eDNA is a power tool for assessing the presence of a target species within a waterway. However, limitations to its application should be considered during a sampling program and the use of traditional trapping and surveying techniques to compliment or confirm the results are encouraged (Roussel et al., 2015).

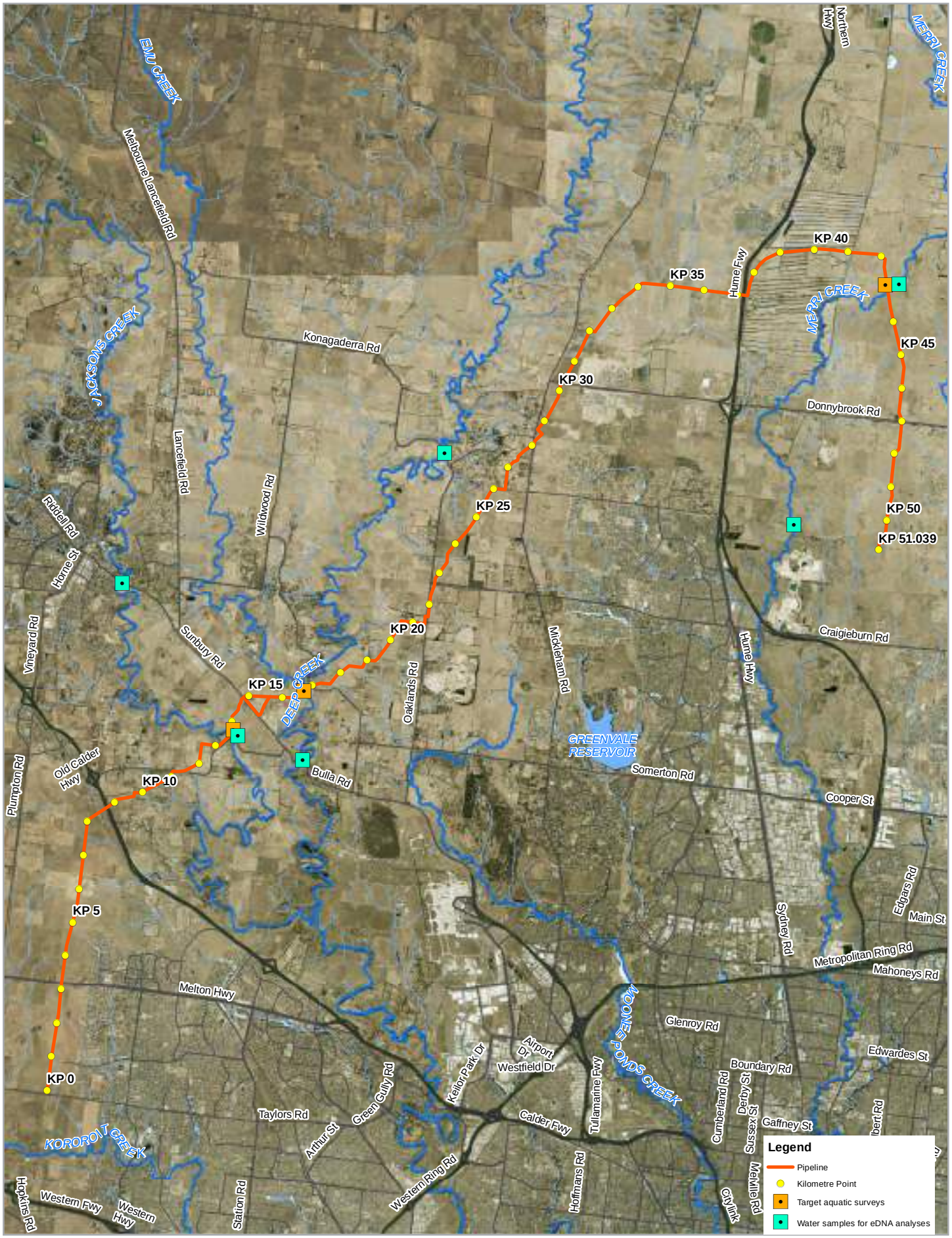
Table 14 Summary of fish survey methods

Site	Survey technique
Deep Creek at Kongaderra Road (approximately 17 river kilometres upstream Project Area)	eDNA
Deep Creek at proposed pipeline crossing	1 night x 2 Fyke Nets, Backpack electrofishing (200 m), 6 baited box traps
Deep Creek at Bulla-Sunbury Road (approximately 4 river kilometres downstream Project Area)	eDNA
Jacksons Creek at Sunbury Road, Sunbury (approximately 12 river kilometres upstream Project Area)	eDNA
Jacksons Creek at proposed pipeline crossing	1 night x 2 Fyke Nets, Backpack electrofishing (200 m), 6 baited box traps
Jacksons Creek at Bulla-Diggers Rest Road (approximately 100 m downstream Project Area)	eDNA
Merri Creek 500 m upstream from crossing	eDNA
Merri Creek – 200 m downstream from proposed pipeline crossing	1 night x 2 Fyke Nets, Backpack electrofishing (200 m), 6 baited box traps
Merri Creek at Summerhill Road (approximately 11 river kilometres downstream Project Area)	eDNA

Surveys were undertaken during August 2020 during a period of relatively low and stable flow. All sites were wadeable, allowing for suitable survey coverage using electrofishing (as per recommendations by DSEWPAC, 2011b) at each waterway. The recommended time to survey fish in Victoria is December through to April as flows are lower and migratory fish (such as Australian Grayling) are more likely to be collected (DSEWPAC, 2011b). However, under stable flows, and where turbidity does not hinder detection, fish can be surveyed outside this window if appropriate techniques are selected such as electrofishing are complemented by netting (DSEWPAC, 2011b).

Furthermore, the spawning and migration of adult Australian Grayling is triggered by increases in flow and although there is some uncertainty about specific timing, it is thought to occur from around April to July (Amtstaetter, et al., 2016; Koster and Dawson, 2010). As such, the surveys occurred outside of the migration period. However, Dawson and Koster (2018) demonstrated that during non-migratory periods Australian Grayling typically occupy restricted areas of a stream (i.e. tens to hundreds of metres). Therefore, the timing of the surveys and use of multiple techniques (i.e. electrofishing, netting and eDNA) allows the following information and inferences to be made based on the results:

- If the species is collected (electrofishing and netting) or detected (eDNA) at a site, then this indicates that site may be an important habitat for resident individuals outside of the migration period
- If the species is not collected or detected at a site, but are detected (eDNA) upstream and/or downstream of the site, then they may migrate through during adult spawning periods



Paper Size ISO A4

0 2,000 4,000

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Project No. 12529997
Revision No. C
Date 12/08/2020

Aquatic Survey Locations

FIGURE 4

Data source: DELWP, VicMap, 2020; GHD, 2020; Biosis, 2020 . Created by: kgardner

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6.2.7 Permits

The GHD field surveys were conducted in accordance with the following permits and approvals:

- *Flora and Fauna Guarantee Act 1988* (FFG Act) Permit to Take Protected Flora 10008653
- *Fisheries Act 1995* General Research Permit 1347
- *Flora and Fauna Guarantee Act 1988* (FFG Act) Research Permit/Permit to Take/Keep Protected Fish Permit 10008853
- Animal Research Authority issued by the accredited GHD Animal Ethics Committee Scientific Procedures Fieldwork Licence GHD SPFL20067

6.2.8 Vegetation Quality Assessment competency

Vegetation Quality Assessments were conducted by botanists with DELWP-accredited VQA competency.

6.2.9 Mapping

Shapefiles containing the results of flora and fauna surveys were provided to APA by GHD and Biosis.

6.3 Risk assessment

A risk assessment for the Project was carried out using an approach that is consistent with Australian/New Zealand Standard AS/NZS ISO 31000:2018 Risk Management Process. The identification, analysis and evaluation of risks was conducted within each technical area and across technical areas where there was input or connection across disciplines. Applying the risk framework across all technical studies allowed an approach to identify potential impacts to guide the subsequent assessment of impacts and mitigation and management measures. This risk assessment was used to inform the focus of assessment of the potential environmental effects within each technical study.

Risk can be defined as a combination of:

- The magnitude of potential consequences of an event
- The likelihood of the event occurring

The risk assessment methodology included:

- Defining the context for the risk assessment based on assessments of the existing conditions and the proposed Project activities that interact with those existing conditions
- Development of a risk matrix derived from the likelihood and consequence of a risk occurring that identified the risk pathways for the Project based on a specific cause and effect
- Identifying standard management/mitigation measures (including those in guidelines and standards) and whether additional mitigation measures may be required
- Analysing the consequence and likelihood of the identified risk based on a consequence guide developed for each technical area and a likelihood guide
- Defining the risk level based on the risk matrix

Risk ratings were determined by considering the consequence and likelihood of an event occurring. The consequence of a risk was derived from an estimate of the extent, severity and duration of the potential risk and likelihood was determined according to the predicted possibility of its occurrence (see Sections 6.3.1.1 below). Level of risk was derived from the risk matrix (Section 6.3.1.3, below). Once completed, the risk assessment was used to inform the assessment of the severity of impacts on biodiversity resulting from construction and operation of the Project.

The impact assessment then focussed on additional management/mitigation measures required to reduce risks, in particular those risks with a higher rating. Once completed, the residual risks to biodiversity were re-assessed. These residual risks are the unavoidable effects of the project on biodiversity and habitats from construction and operation of the Project.

In summary, the risk assessment method:

- Provided a screening approach across all disciplines, for identification of the potential environmental risks from construction and operation of the Project
- Identified risks that pose the most significant impacts to biodiversity in the Project Area and informed the impact assessment
- Provided focus for development and application of mitigation measures specific to impacts.

6.3.1.1 Assigning the consequences of risks

'Consequence' refers to the maximum credible outcome of an event affecting an asset, value or use. The consequences of a risk to biodiversity occurring were evaluated in the context of the existing conditions in the Project Area. Consequence categories from insignificant to severe were developed for terrestrial and aquatic biodiversity that took into account the extent of loss (ha) of native vegetation, magnitude of change in the size or likely persistence of a threatened species' population, extent of habitat loss and the magnitude of measurable decrease in aquatic ecosystem health.

The development of the consequence criteria considered the following attributes:

- Extent of impact
- Severity of impact
- Duration of impact

Each risk pathway was assigned a value derived from consideration of each of these three characteristics, to provide an overall consequence rating.

Table 15 Consequence rating criteria rationale

Biodiversity value	Consequence criteria rationale
Native vegetation	Based on the area (ha) and number of patches of EVCs mapped within the Project Area and the effectiveness of the mitigation hierarchy
Flora, fauna, aquatic species	Based on an individual population size and/or the estimated number and distribution of populations in Victoria and the effectiveness of the mitigation hierarchy
Threatened ecological communities	Based on the proportion of the TEC in the Project Area relative to its national distribution and the effectiveness of the mitigation hierarchy. Note, TECs recorded in the Project Area are endemic to Victoria in managing impacts

Biodiversity value	Consequence criteria rationale
Aquatic ecosystems	Based on a measurable decrease in ecosystem health as determined by a loss of diversity or abundance of plants and animals, or a deterioration in water quality or habitat conditions that may impact on those plants and animals

6.3.1.2 Assigning the likelihood of risks

'Likelihood' refers to the chance of an event happening with the maximum credible consequence occurring from that event.

A likelihood rating for each identified risk was assigned to each risk, ranging from ''almost certain' where the event is expected to occur, to 'rare', where the event may occur only in exceptional circumstances.

The likelihood criteria used for this assessment are provided in Appendix A.

6.3.1.3 Risk assessment matrix and risk rating

The consequence and likelihood criteria were combined to arrive at a risk rating using the matrix provided in Appendix A.

6.4 Impact assessment

This assessment addresses potential impacts of construction and operation of the proposed Project on terrestrial flora, terrestrial and aquatic fauna, and terrestrial and freshwater ecosystems (biodiversity assets and values) identified in the existing conditions assessment (Section 7). It aligns with Section 4 of the *Scoping Requirements for the Western Outer Ring Main Gas Pipeline Environment Effects Statement*. The same impact assessment method was applied to the construction and/or operational phases of the Project.

Loss, reduction or reduced viability of some biodiversity values within and around the Project Area are expected as a result of activities during construction and operation of the Project. These activities will include vegetation clearing, soil disturbance, disturbance to waterways and vehicle movement. Potentially, direct impacts to biodiversity include loss of habitat, death of fauna, loss of hollow-bearing trees and degradation of aquatic habitat. Examples of indirect effects include spread of weeds, soil compaction and mobilisation, and environmental changes including generation of noise, dust and light, and spills of hazardous materials or waste. Losses of indigenous vegetation and scattered trees were determined from the field surveys. Within the construction corridor, temporary laydown and works areas, 100 per cent vegetation loss was conservatively assumed. The 'existing conditions', 'risk assessment' and 'impact assessment' steps have been separated into key themes to address 'biodiversity' impacts identified within the scoping document. These include:

- **Native vegetation:** including all remnant vegetation (patches of remnant vegetation, large trees within patches, and scattered indigenous trees) that occur in the terrestrial environment. Riparian corridors are considered as terrestrial environments.
- **Terrestrial fauna:** any fauna that occur in the terrestrial environment that largely reside in the terrestrial environment for all or dominant life stages. For this Project, amphibians are considered as terrestrial fauna, while platypus and turtles are considered as aquatic fauna.
- **Aquatic ecology:** aquatic ecology considers plants and animals that occur primarily in freshwater waterbodies. For this Project, Platypus and turtles are considered as aquatic fauna, while amphibians are considered as terrestrial fauna.

The impact assessment approach included:

- Identifying key issues and risks
- Characterising the existing environment by referring to the existing conditions identified by the desktop assessments and field assessments and the likelihoods of threatened species presence (Section 7)
- Rating the risks to biodiversity and ecological values as a consequence of Project activities (Section 9)
- Assessing impacts on biodiversity with consideration of:
    i) The extent and quality of indigenous native vegetation that would be impacted during construction and the quantum of offsets that may be required (Sections 7 and 13.4)
    ii) Impacts on threatened flora, fauna and ecological communities (Section 10)
    iii) Impacts on known and potential fauna habitat (terrestrial and aquatic) within the Project Area (Section 10)
    iv) The construction and operation of the Project (Sections 10.1 and 10.2)
    v) Potential impacts on MNES during construction, assessed against the applicable significant impact guidelines and thresholds in accordance with Department of Environment (2013), listing and conservation advice, policy statements and recovery plans (Section 12)
    vi) Cumulative impacts as a result of other planned or future projects (Section 10.3)
    vii) State and Commonwealth policy and legislation relating to native vegetation and threatened species and ecological communities (Section 5)
- Developing mitigation and/or management measures to avoid, minimise and/or offset impacts (Sections 13 and 14)
- Determining the residual environmental effects, with respect to the residual risks of the Project and evaluating their significance, assuming implementation of design and mitigation measures (Section 13).
- Developing performance criteria and management measures to evaluate whether the Project's environmental effects can be maintained within permissible levels and propose contingency approaches if they are not (Section 14.2)

6.4.1.1 Application of mitigation measures

The mitigation hierarchy was applied to develop a set of EMMs to reduce the impacts of the Project on biodiversity and habitats (refer Section 13). Application of the hierarchy incorporated the following steps:

1. Avoidance: measures taken to avoid creating adverse effects on the environment from the outset, such as re-alignment of infrastructure or boring to avoid habitat
2. Minimisation: EMMs taken to reduce the duration, intensity and extent of impacts that cannot be avoided that are typically incorporated into the delivery of infrastructure projects of similar type, scale and complexity. EMMs were developed through a process of identifying values within the Project Area, the risk to those values and then the measures that would minimise impacts to the identified values.

3. Rehabilitation/restoration: measures taken to improve or re-instate a degraded environment following exposure to impacts that cannot be completely avoided or minimised
4. Offsets: measures taken to compensate for any residual, adverse impacts after full implementation of the previous three steps of the mitigation hierarchy. Both Commonwealth and State offset requirements were addressed

6.4.1.2 Supporting information

Information was lacking for Matted Flax-lily, NTGVVP and GEWVVP that provided any realistic estimate of their current distributions with regard to widespread land clearance over recent decades. Thus, a precautionary approach was used to estimate their 2020 area of occupancy and extent. Considerations included ongoing native vegetation clearing because of increased urban development and infrastructure projects in Victoria and observed decline in floristic composition in comparable vegetation. Also considered was the current reservation status of EPBC Act-listed TECs in Victoria and ecological requirements, particularly in relation to disturbance regimes and the presence of key structural elements.

The following sources were used to aid assessment of impacts on FFG and EPBC Act listed species and communities:

- Department of Environment (2013a) Matters of National Environmental Significance: Significant impact guidelines 1.1., *Environment Protection and Biodiversity Conservation Act 1999*. Department of Environment, Australian Government.
- DELWP (2015). Action Statement No 257 Australian Grayling *Prototroctes maraena* FFG Act 1988, State Government of Victoria
- Department of Environment (2013). Matters of National Environmental Significance: Significant impact guidelines 1.1., *Environment Protection and Biodiversity Conservation Act 1999*. Department of Environment, Australian Government. Available at: http://www.environment.gov.au/epbc/what-is-protected
- DoEE (2017c). EPBC Act Policy Statement 3.21. Industry Guidelines for Avoiding, Assessing and Mitigating Impacts on EPBC Act Listed Migratory Shorebird Species. Australian Government Department of the Environment and Energy, Canberra
- DNRE (2003). Swift Parrot, *Lathamus discolor*, Action Statement No. 169; *Flora and Fauna Guarantee Act 1988*. Department of Natural Resources and Environment, Victoria.
- DSE (2004). Golden Sun Moth, *Synemon plana*, Action Statement No. 106, *Flora and Fauna Guarantee Act 1988*. Department of Sustainability and Environment, Victoria.
- DSEWPAC (2011a). Survey guidelines for Australia's threatened fish - Guidelines for detecting fish listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth of Australia
- DSEWPAC (2011b). Survey guidelines for Australia's threatened reptiles - Guidelines for detecting reptiles listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth of Australia
- DSEWPaC (2011c) *Nationally threatened ecological communities of the Victorian Volcanic Plain: Natural Temperate Grassland & Grassy Eucalypt Woodland.* EPBC Act policy statement: nationally threatened species and ecological communities guidelines
- DEWHA (2009b). Significant impact guidelines for the critically endangered golden sun moth (*Synemon plana*). Department of the Environment, Water, Heritage and the Arts, 2009

- DEWHA (2009c). Significant impact guidelines for the vulnerable growling grass frog (*Litoria raniformis*) Department of the Environment, Water, Heritage and the Arts, 2010
- Melville J, Chaplin K, Hutchinson M, Sumner J, Gruber B, MacDonald AJ, & Sarre, SD (2019). Taxonomy and conservation of grassland earless dragons: new species and an assessment of the first possible extinction of a reptile on mainland Australia. Royal Society Open Science 6(5)
- Threatened Species Scientific Committee (2008) Commonwealth Listing Advice on Natural Temperate Grassland of the Victorian Volcanic Plain
- Threatened Species Scientific Committee (2009). Commonwealth Listing Advice on Grassy Eucalypt Woodland of the Victorian Volcanic Plain
- Carter (2010). National Recovery Plan for the Matted Flax-lily *Dianella amoena*. Department of Sustainability and Environment, Victoria

Impacts on EVCs were assessed with consideration to known existing conditions compiled from vegetation quality assessments and targeted surveys for threatened flora (refer Section 8.3.3). Both these types of assessments followed standard methods. Primary sources of data were:

- Biosis (2019). *Western Outer Ring Main (WORM): Desktop biodiversity assessment.* Project no. 29802. Biosis Pty Ltd, Port Melbourne
- Biosis (2020). Biosis 31496. Western Outer Ring Main (WORM): Biodiversity assessment. Report for APA. Authors: Muchan, J, Cutler, S & Gilmore, D. Biosis Pty Ltd, Melbourne. Project no. 31496
- GHD (2020) *APA WORM Project EES Scoping – Targeted Flora and Vegetation Surveys*. Prepared for Australian Pipeline Limited. GHD Pty Ltd, Melbourne
- Vegetation quality assessments conducted in accordance with *the Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a). The method considers structure, floristic diversity and weed abundance in a patch of native vegetation assigned to an EVC, and its degree of landscape connectivity
- Guidelines for surveying Australia's threatened orchids listed under EPBC Act – applied to targeted surveys for threatened flora
- Published information (e.g. Action Statements or management plans) was lacking for the Tough Scurf-pea and Arching Flax-lily and impacts were assessed by drawing on GHD's and Biosis's knowledge of the species' ecology and disturbance responses. Since Tough Scurf-pea occurs within the MSA but will not be impacted during construction or operation, standard protection measures were deemed adequate. The single Arching Flax-lily recorded within the construction corridor will be directly impacted.

6.5 Communications and engagement

In accordance with the EES scoping requirements, a Consultation Plan was developed (APA 2020) to inform stakeholders and community members about the EES and consider stakeholder and community knowledge and views in the EES and Project planning. Through these consultation activities, APA has sought to:

- Inform stakeholders and community members of the EES process and timeline.
- Share the findings of technical studies with stakeholders and local communities.
- Provide stakeholders and community members with sufficient opportunities to provide input into the EES process.

- Obtain stakeholder input on Project issues, impacts and alignments.
- Outline current and future opportunities for community involvement with the Project.

Prior to the EES process, engagement with those most impacted and interested in the Project informed the business case and pipeline route selection in 2018 and 2019 (underpinned by requirements of the *Pipelines Act 2005*). Consultation in 2019 included engagement with the MSA area and Impact Assessment branches of DELWP and DAWE with regard to EPBC Act approvals within the MSA area.

The Project engagement approach and methodology is guided by principles based on the Victorian Auditor General's Office (VAGO) and the International Association of Public Participation (IAP2) guidelines, as outlined in Section 5 of the Community and Stakeholder Consultation Report (GHD 2021, attached to the EES), along with APA's own policy for community engagement.

A wide range of channels supported the consultation process, including emails, telephone enquiries, meetings and virtual information sessions. The majority of consultation on the Project was undertaken during Victoria's coronavirus (COVID-19) physical distancing restrictions. In keeping with State of Emergency requirements, consultation during EES preparation in 2020 was conducted almost exclusively online, with some opportunities for traditional channels such as mailshots and a Project hotline. The launch of an engagement hub has supported outward communications, and also the collation of feedback through the interactive map and community survey. Consultation on the Project will continue in early 2021 with face-to-face opportunities for engagement (dependent on Government restrictions).

A broad range of stakeholder groups was consulted throughout the engagement process, including extensive engagement with landowners and occupiers based on requirements set out in the Pipelines Act. A detailed description of the process and results of the consultation including the issues raised by stakeholders, residents or the public and the APA's responses to these issues in the context of the EES studies and the associated consideration of mitigation measures, is provided in the Community and Stakeholder Consultation Report (GHD, 2021).

Community and stakeholder feedback was collected, recorded and considered as part of the ongoing development and refinement of Project design.

Table 16 outlines how feedback has been used to inform design decisions since initial stakeholder engagement in 2018, and how it will be used to further inform the Project.

Table 16 How feedback is informing the Project

Project stage	Timing	How feedback is informing the Project
Information gathering for route selection Initial stakeholder engagement	Q3 2018 to Q1 2019	• Land owner/occupier, 3rd party utility providers, stakeholder feedback has been considered as part of the pipeline route options analysis.
Information to support proposed alignment	2019 to 2020	• Land owner/occupier, 3rd party utility providers, stakeholder and community feedback is progressing to support alignment refinement.
Obtaining land access for surveys Issue notice of pipeline corridor	2019 to 2020 Q2 2020	• Consultation on outcomes of investigations undertaken. • Feedback on draft reports was published in the referral documentation. • Engaged with affected parties to refine the pipeline route to minimise potential adverse effects.

Project stage	Timing	How feedback is informing the Project
Detailed planning and preparation of the EES	Q3 2020 to Q1 2021	• Consultation on detailed aspects of the Project including potential environmental impacts and mitigations, including ways to manage construction impacts. • Report to TRG and Project specialist groups on consultation so far • Feedback from TRG and stakeholders to inform existing conditions studies and impact assessment • Explain how feedback helped in developing the technical assessments in the Consultation Report attached to the EES
Formal EES exhibition and inquiry	Q2 to Q3 2021	• Public submissions through the formal exhibition of the EES. • Presentations to independent inquiry (appointed by the Minister). • Minister for Planning's EES assessment and subsequent approvals.

6.5.1 Communications and engagement snapshot

Information gathering for Route Selection took place in late 2018 and included engagement with key stakeholders of relevance to the route selection process. The Initial Stakeholder Consultation stage commenced in November 2018 with Project information and briefings being provided to relevant federal, state, local government authorities and utilities.

Methods of communications and engagement have included meetings, letterbox drops, newsletter publication, email distribution, launch of a Project website with a map of the Project alignment. Key activities included:

Throughout:

- Engagement with affected landholders

2018 to 2019

- March 2019: publication of an online presence for the Western Outer Ring Main Project on the APA website
- March 2019: Project fact sheet published on the APA website
- March 2019: APA Worm Pipeline Licence Consultation Plan published on the APA website
- March 2019 – ongoing: council briefings and meetings
- October 2019: distribution of Project newsletter by post to approximately 1,750 residents local to the alignment
- November 2019: Land Use factsheet published on the APA website

January to December 2020 (completed)

- March 2020: distribution of Project newsletter by post to local residents
- 14 July 2020: Publication of draft Scoping Requirements and launch of Scoping Requirements exhibition
- 14 July 2020: Notification of draft Scoping Requirements exhibition
- 30 August 2020: Launch of Engagement Hub incorporating an interactive map, opportunity to pin comments, discussion forum and Project survey
- 8 September 2020: Notice of Pipeline Corridor Letter Clarification (physical and digital)
- 5 October 2020: Distribution of Project newsletter (physical and digital)
- October 2020: Advertising for Online Community Session (physical and digital)
- 28 October 2020: Online Community Session (Project introduction)
- October/November 2020: Council meetings and correspondence
- November/December 2020: Advertising for topic focused community session (physical and digital)
- 9 December 2020: Topic focused community session #1 (Ecology and Cultural Heritage)
- 14 December 2020: Topic focused community session #2 (Community impacts and opportunities)

Stakeholders consulted belonged to the following groups:

- Asset/infrastructure owners impacted by pipeline route (e.g. Melbourne Water)
- Regulatory authorities (State & Federal, e.g. DELWP, DAWE)
- Registered Aboriginal Parties and Traditional Owner Groups (Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation; Boon Wurrung Foundation; Bunurong Land Council Aboriginal Corporation)
- Elected Representatives – (relevant local, State and federal members of Parliament State MPs
- Local councils (Melton City Council; Hume City Council; Mitchell Shire Council; Whittlesea City Council)
- Community, Environment and Action Groups (clubs, land care groups, resident groups and friends of parks groups in the area, e.g. Friends of Merri Creek)
- Media (news organisations that publish in print, on television and online)
- Local residents (residents of towns and locations close to works)
- Local businesses (e.g. Mickleham Musallah Muslims Sunni)
- Emergency services (operating in the Project area)
- Property developers (Olivine by Mirvac; Peppercorn Hill)

6.6 Residual risk – environmental effects

Once the impact assessment was complete and EMMs were refined, the residual risks posed by the Project were re-calculated using the same risk assessment method assuming that the identified mitigation measures were in place. The adjusted consequence and likelihood ratings were combined in the risk matrix and residual risk ratings were derived to identify the residual environmental effects from construction and operation of the Project.

7. Communications and engagement

Community feedback, including queries from community and comments from stakeholders, was categorised into 15 themes for consistent analysis (Community and Stakeholder Consultation Report, GHD 2021). Following land use planning, biodiversity was the next most popular topic raised by local councils, asset owners, regulatory authorities, community action groups and residents. The proportion of feedback regarding biodiversity was 13% of the entire feedback for the Project.

Stakeholder engagement has been reported on up to December 2020 and is expected to continue into early 2021. If the Project receives statutory approvals, stakeholder engagement will be reviewed to consider how to best engage with the community during construction. Engagement during construction will keep the community and stakeholders informed and will include consultation with potentially affected members of the community where required, about specific mitigation measures. APA will continue to engage with stakeholders throughout the operational life of the pipeline.

A list of consultation activities relevant in preparation of this report is provided in Table 17, below.

Table 17 Stakeholder engagement for biodiversity and habitats

Activity	When	Matters discussed	Outcome
Meeting with DELWP	16/07/2020	MSA obligations Environment Mitigation Levy	Environment Mitigation Levy triggered by utility infrastructure on Crown land or where a building permit or subdivision required. Payment of levy is post construction and subject to prices at that time. Conservation Areas are not subject to levies. Construction mitigation is not considered necessary within the MSA with the exception of adherence to Conservation Areas and salvage and translocation requirements. DELWP to be notified of any species that warrant translocation – to be undertaken at DELWP's expense.
Meeting with DELWP	21/08/2020	Survey status Survey methods Offsets process and timing	DELWP generally happy with the approach. Offsets can be clarified prior to construction.
Meeting with Merri Creek Management Committee (MCMC)	02/09/2020	MCMC concerns over construction impacts	Further engagement expected as part of the Project Consultation Plan.

Activity	When	Matters discussed	Outcome
Meeting with DAWE and DELWP	07/09/2020	EPBC Act significant impacts Offset strategy and timing Targeted survey effort	DAWE generally happy with the Project approach. Presence of threatened species should be assumed where surveys could not be completed as per the relevant Guidelines. Offsets can be clarified prior to construction.
Meeting with Technical Reference Group	24/09/2020	Presentation of existing conditions	Consider Platypus further. Consider micrositing of the pipeline to avoid and minimise ecological values.
Meeting with DAWE	07/10/2020	Potential alignment changes	Potential need to consider formal versus informal variations to the EPBC Act referral
Meeting with DELWP	15/10/2020	DELWP comments on Existing Conditions chapter of report including: - Vegetation mapping outside of Project Area - Further clarification or justification required to account for areas not considered suitable habitat for various species - Demonstration of avoid and minimisation	Vegetation mapping to include extent of patches beyond the construction corridor as required by the Guidelines. Further justification of targeted survey areas to be provided. Avoidance and minimisation steps to be outlined.
Meeting with DELWP	20/10/2020	Survey methods for potential alignment changes	VQA required. Walk over required to determine extent of targeted surveys required.
Meeting with Technical Reference Group	11/11/2020	Presentation of full biodiversity and habitats technical report	Information outside of the Project Area requested in some places to provide context for impacts.
Meeting with DELWP	03/12/2020	Survey results of EPBC extent in key areas	Request to identify and offset patches of native vegetation that may lose the size requirement for EPBC listing through being split by the alignment.
Meeting with DELWP	15/01/2021	Presentation of Offset Strategy document.	Table of contents of strategy generally accepted. Needs to demonstrate that offsets are available and provide outline of process and timing for confirming impacts, offsets and setting up the offset management plan.
Meeting with DELWP and DAWE	20/01/2021	Striped Legless Lizard habitat and survey guidelines.	The Project will assume presence in all areas considered to include habitat regardless of outcome of targeted survey.

Activity	When	Matters discussed	Outcome
Ecology and cultural heritage community information session	09/12/2020	Presentation of existing conditions	No ecological issues were identified or raised during the session
Community information session	30/01/2021	Melton City Council	Public sessions to seek community feedback
Community information session	03/02/2021	Mitchell Shire Council	Public sessions to seek community feedback
Community information session	11/02/2021	Whittlesea City Council	Public sessions to seek community feedback
Community information session	13/02/2021	Hume City Council	Public sessions to seek community feedback

In addition to the specific consultation activities above, APA's Project consultation activities outlined in section 6.5 have also generated limited feedback on biodiversity and habitat issues.

Primary concerns raised through engagement activities are in relation to impact on pipeline construction on waterways (particularly the Merri Creek and Jacksons Creek) and habitat disruptions in biodiversity hotspots and conservation areas. More specifically, stakeholders and the community were concerned with protecting the habitats of native species, such as the Growling Grass Frog and wombats, avoiding the spread of weeds, minimising the removal of trees and adjusting pipeline alignment where possible to minimise impact on sensitive areas (Table 18).

Table 18 Summary of Project response to biodiversity issues and concerns

Issue/concern	APA Response	Location in EES
Removal of vegetation, potential impacts on flora and fauna	• During construction, APA have environmental management plans in place to control construction. For example, if there are weeds on a particular property, the management plan is there so that there would not be spread of weeds and mitigation measures are in place to support this, including protocols for checking machinery is clean before entry and exit from site. • These also apply to the impact on fauna, for example in an area which is identified as a habitat for growling grass frog. Controls will also be in place to avoid peak breeding seasons and grass removal. • The pipeline alignment has been chosen to avoid where possible conservation areas, such as Mount Ridley Nature Conservation Reserve. • APA will work with landholders to retain trees where practicable, and to replace trees were this is appropriate in consultation with landholders. • Underboring in some locations will avoid important vegetation e.g. the one identified Matted Flax Lilly plant will be protected by avoiding surface level disturbance in that location.	This report, Section 10 and 13

Issue/concern	APA Response	Location in EES
	• Reduction of construction corridor in some locations to avoid vegetation • Offsets will be sought where native vegetation removal is unavoidable	
Water: Potential impacts to waterways (Jacksons Creek, Merri Creek and Deep Creek) and groundwater (water quality and water movement)	The surface water report assessed impacts on the three main waterways being intersected by the Project. APA propose to undertake additional mitigation measures to minimise impacts where possible. • *Jacksons Creek:* The proposed pipeline at this creek is to be constructed using open trench construction methods. The construction method proposed considered a number of factors including existing ground conditions, constructability constraints and environmental aspects in this area. Fish surveys have taken place, but these didn't identify any of the threatened species. While the presence of growling grass frogs has been established at that creek, the crossing actually falls in the most degraded part of the creek, where frogs are least likely to occur. To manage potential impacts to the creek during construction and operation, additional management measures are proposed including site-specific design and construction specifications, site rehabilitation measures including restoration of waterway bed and banks in accordance with stringent requirements, and surface water and biological monitoring. Remedial action would be carried out if monitoring and inspection results indicate a potential impact from the works to the environment. • *Merri Creek:* The proposed pipeline at this creek is to be constructed using open trench construction methods. It will be located within an existing APA easement, which has an existing gas pipeline that was constructed via an open trench construction methodology in 2014. The proposed pipeline will be co-located with the existing gas pipeline infrastructure to minimise environmental disturbance in this area. To manage potential impacts to the creek, such as erosion, surface water and biological monitoring would be undertaken during construction, and periodic visual monitoring would be undertaken to monitor the waterway after rehabilitation. • *Deep Creek:* The proposed pipeline at this creek is to be constructed using HDD methodology. There will be no above ground disturbance within the creek corridor at this location. Specific HDD mitigation measures would be applied as standard controls to minimise potential residual impacts associated with erosion. • The groundwater report assessed impacts on groundwater levels, flow paths and quality during construction and operation of the Project. Six	Chapter 8 – Water Technical report B – Surface water Technical report C – Groundwater

Issue/concern	APA Response	Location in EES
	areas were identified where the pipeline may interact directly with the water table aquifer (approximately five percent of the alignment) which can impact water quality and availability. To minimise impacts associated with Project construction and operation, management measures including pipeline design requirements to prevent referential flow paths, and construction management requirements to minimise potential impacts to groundwater quality would be implemented.	

8. Existing conditions

The existing conditions of the assets, values and uses being considered throughout this assessment are described in the following sections.

8.1 Landscape context

The Project Area is within the Port Phillip Basin and traverses sections of the Werribee River, Yarra River and Maribyrnong River catchments. It spans the Victorian Volcanic Plain bioregion and a small area of the Central Victorian Uplands. The Project Area traverses a landscape that has been highly fragmented by past land use including agricultural, infrastructure and urban development.

The Werribee catchment is located west of Melbourne and covers an area of approximately 2,715 square kilometres. The landscape within Werribee catchment is varied; from flat plains, gorges and steep sided hills. Wetlands and grass lands of regional and national significance are present in the lower area of this catchment. Agricultural practices and urban development have impacted the catchment significantly, resulting in approximately three quarters of natural vegetation being removed (Melbourne Water, 2018b).

The Maribyrnong catchment is located to the north of Melbourne. Covering an overall area of 1,408 square kilometres, this catchment feeds the 41 kilometre long Maribyrnong River which originates from the southern slopes of the Great Dividing Range and discharges into Port Phillip Bay. Approximately 10 per cent of the Maribyrnong catchment is used for urban development, 80 per cent for agricultural use with only 10 per cent of natural vegetation still present. (Melbourne Water, 2018b).

The Yarra catchment is located north-east of Melbourne and covers an area of 4,046 square kilometres. The catchment feeds the 245 kilometre long Yarra River which originates east of Warburton in the Great Dividing Range and discharges into Port Phillip Bay. Approximately 15 percent of the area is urbanised, 30 per cent is utilised for agriculture with the remaining 55 per cent retaining its natural vegetated state (Melbourne Water, 2018a).

Although no waterways are crossed by the alignment in the Werribee catchment, fourteen waterways are crossed in the Yarra catchment and seven in the Maribyrnong catchment (Alluvium, 2019). Of these waterways, Alluvium (2019) determined that five are named:

- Yarra catchment – Merri Creek and Kalkallo Creek
- Maribyrnong catchment – Jacksons Creek, Deep Creek and the Tame Street Drain

Additional aquatic habitat in the catchments includes wetlands and farm dams within or adjacent to the alignment (Biosis, 2020).

Climate data obtained from SILO (Queensland Government, 2018) for Bureau of Meteorology (BOM) station 86232, located in Melbourne, provides a broad overview of climatic conditions based on the period 1970 to 2018 (Table 19). The long-term mean rainfall at the site is 648.9 mm with the long term mean evaporation (1314.7 mm) approximately double that of the average rainfall.

Table 19 Climate data summary

Month	Average rainfall (mm)	Average evaporation (mm)
Jan	47.6	194.8
Feb	48.1	163.6
Mar	42.9	134.5
April	55.3	84.3
May	55.9	54.9
Jun	49.2	39.4
Jul	49.1	46.4
Aug	54.4	63.5
Sep	56.2	86.1
Oct	63.7	122.2
Nov	66.2	145.1
Dec	60.3	180.0
Annual total	**648.9**	**1314.7**

8.2 Literature review

Published and unpublished documents that were reviewed as part of the desktop assessment are listed in Table 20. Each document is summarised, along with its geographic relevance to approved MSA areas and Precinct Structure Plans, and the ecological values that are addressed.

Table 20 Reports and publications reviewed as part of the ecological assessment for the Project

Title, author and date	Scope/abstract	Geographic relevance: MSA/PSP	Ecological values identified
Western Outer Ring Main – Surface Water and Groundwater Alluvium Consulting Australia (2019)	Desktop review of surface and ground water hydrology or hydrogeology of the WORM Project Area. The report informs the potential impacts on surface water and groundwater, impacts on regional groundwater resources, and potential for major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems in the long-term.	Melton, Hume, Mitchell Shire and Whittlesea	The Werribee River, Maribyrnong River and Yarra River, as well as current wetlands.
Route Options Report - Western Outer Ring Main (WORM) APA (2019)	This report discusses the summarised selection processes for the preliminary pipeline route for WORM, and provides further information and background to assess the potential ecological impacts to MNES in the Project area.	Melton, Hume, Mitchell Shire and Whittlesea	Golden Sun-Moth, Growling Grass Frog, Striped Legless Lizard, Spiny Pimelea and Matted Flax-Lily.
Whole of Water Cycle Assessment: PSP 1067 Donnybrook and PSP 1096 Woodstock Arup (2014)	Whole of Water Cycle Assessment (WoWCA) to inform the development of two PSPs that will guide future urban development in the area. A WoWCA recognises that water can enhance social infrastructure and open space making it more attractive and sustainable. EVCs were modelled in the Project Area and Growling Grass Frog corridors have been mapped by DEPI within both precincts, focusing on establishing conservation buffers around the Merri and Darebin Creeks and in areas of potential Growling Grass Frog habitat.	Donnybrook and Woodstock PSPs	Growling Grass Frog and three EVCs: Plains Grassy Wetland Plains Grassland Plains Grassy Woodland

Title, author and date	Scope/abstract	Geographic relevance: MSA/PSP	Ecological values identified
Use of underpass culverts by the Growling Grass Frog *Litoria raniformis* Biosis (2014)	This report addressed the Growling Grass Frog's use of underpass culverts using mark-recapture to estimate population size and document movement within the population. The study revealed that the Growling Grass Frog uses culverts to cross under roads and for various reasons, are unlikely to move overland.	Wollert	Growling Grass Frog
Lindum Vale PSP 1202: Updated Biodiversity Assessment Biosis (2018)	A biodiversity assessment of land proposed to be included within PSP 1202 that reviewed flora and terrestrial fauna, conducted a field assessment, identified and mapped patches of native vegetation, documented rare or threatened flora and fauna species and identified state and federal legislative implications of the potential impacts of the proposed subdivisions.	Lindum Vale PSP	Plains Grassy Woodland EVC and Golden Sun Moth habitat
Western Outer Ring Main (WORM): Desktop biodiversity assessment. Project no. 29802. Biosis (2019)	Biosis (2019) conducted a desktop biodiversity assessment of the proposed WORM Project Area. Based on their assessment, a total of up to 59.57 ha of potential native vegetation will be removed, along with a small number of scattered native canopy trees. The report found that there was potential for loss of habitat for species of national and state significance, and potential impact to aquatic ecosystems and waterways.	Melton, Hume, Mitchell Shire and Whittlesea, MSA	The results of this report form the basis of the current report and are referred to throughout See Section 8.3
Western Outer Ring Main (WORM) Biodiversity Assessment. Project no. 31496 Biosis (2020)	This report discusses the findings of the ecological surveys in Revision 5 of the Project Area. Targeted flora and fauna surveys were carried out over the summer 2019/20 survey season. Native vegetation and threatened ecological communities	Melton, Hume, Mitchell Shire and Whittlesea, MSA	Flora include Matted Flax-lily, Tough Scurf-pea and Arching Flax-lily. Fauna include the Growling Grass Frog, Golden Sun Moth and the Striped Legless Lizard.

Title, author and date	Scope/abstract	Geographic relevance: MSA/PSP	Ecological values identified
	were also mapped. Targeted fauna surveys detected all three EPBC Act listed fauna species, while the botanical surveys identified three threatened flora and two EPBC Act listed threatened communities within the Project Area		FFG Act listed threatened communities – Western (Basalt) Plains Grassland and Western Basalt Plains (River Red-gum) Grassy Woodland. The distribution of, and impacts to, EPBC Act-listed communities *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* and *Natural Temperate Grassland of the Victorian Volcanic Plain* were also discussed.
Melbourne Airport Link to Outer Metropolitan Ring and Bulla Bypass Planning Study – Flora, Fauna and Net Gain Assessment BL&A (2013)	BL&A conducted a flora, fauna and net gain assessment for an approximately 650 ha Project Area in and around Bulla. The Project Area is within Central Victorian Uplands (CVU) and VVP bioregions, with four EVCs recorded. Potential impacts on Growling Grass Frog were identified in most of the alignment options. An assessment of threatened fish presence and potential impacts was completed.	Bulla	Growling Grass Frog Australian Grayling
Growling Grass Frog Masterplan for Melbourne's Growth Corridor DELWP (2017)	This Masterplan is intended to guide the implementation of habitat protection measures outlined in the Sub-regional Species Strategy for the Growling Grass Frog, and investment in relation to creating and enhancing habitat within Growling Grass Frog conservation areas, to mitigate the impacts of urban development.	MSA	Growling Grass Frog
Biodiversity Conservation Strategy for Melbourne's Growth Corridors DEPI (2013a)	The Biodiversity Conservation Strategy is an overarching strategy for the protection of biodiversity in the growth corridors. It sets out all conservation measures required for MNES and values of state significance to satisfy the commitments to the Commonwealth Government and to meet	MSA	Fauna include Growling Grass Frog, Southern Brown Bandicoot, Golden Sun Moth and Striped Legless Lizard. Flora include Matted Flax Lily, Spiny Rice-flower. Threatened ecological community

Title, author and date	Scope/abstract	Geographic relevance: MSA/PSP	Ecological values identified
	state requirements. The BCS identifies 36 conservation areas within the growth corridors that will be protected and managed. The BCS has been prepared in accordance with the guiding principles considered in preparing the MSA.		include Natural Temperate Grassland and Grassy Eucalypt Woodland communities.
Growling Grass Frog Habitat Assessment and Mapping: PSP 1067 Donnybrook and PSP 1096 Woodstock Ecology Australia (2014)	Ecology Australia (2014) was commissioned to undertake habitat assessment and mapping for the Growling Grass Frog within the Donnybrook and Woodstock PSP areas. They gathered information on existing habitat for Growling Grass Frog and developed concept plans for Conservation Areas 22, 25 and 34 within the two Precincts.	Donnybrook and Woodstock PSPs	Growling Grass Frog
Biodiversity Assessment for Precinct Areas 1062 and 1098, Beveridge, Victoria EHP (2012)	A biodiversity assessment was conducted as part of the 2011/2012 GAA biodiversity Mapping Project at Areas 1062 and 1098. This report summarises time-stamped native vegetation data, and outlines the results of a flora and fauna assessment and targeted flora surveys in Lockerbie North and Beveridge Central Precincts. DSE time-stamped data identified five native vegetation types in the precinct and one state significant vegetation community. One nationally significant species of flora was also recorded during the targeted flora surveys.	Lockerbie North (Area 1098) and Beveridge Central (Area 1062) Precincts	Matted Flax-lily, Western Basalt Plains Grassland (WBP) community and five EVCs: Plains Grassy Wetland Plains Grassland Swamp Scrub Creekline Tussock Grassland Stony Knoll Shrubland
Statement of Expert Evidence: Mitchell and Whittlesea Planning Scheme Amendment GC28 Donnybrook/Woodstock Precinct Structure Plan	EHP (2016) reviewed several matters relating to Conservation Area 22 (CA 22) under the BCS for Melbourne's Growth Corridors. Ecological values were documented and responses for the adjustment to the boundary of designated conservation areas were also provided.	Donnybrook/Woodstock Precincts (PSPs 1067 and 1069), MSA	MNES: • Matted Flax-lily, Curly Sedge, Adamson's Blown-grass and Golden Sun Moth • *Grassy Eucalypt Woodland of the Victorian Volcanic Plain*

Title, author and date	Scope/abstract	Geographic relevance: MSA/PSP	Ecological values identified
EHP (2016)	EHP also reviewed time-stamped vegetation data in the Project Area, assessed presence and extent of MNES		Three EVCs within the VVP were also identified to be removed: • Plains Grassy Woodland • Plains Grassland • Stony Knoll Shrubland
Lindum Vale Precinct Structure Plan (PSP 1202): Amendment C205 EHP (2018)	An ecological review was prepared for the expert witness statement relating to the proposed Lindum Vale PSP area. Relevant ecological investigations were completed and a site assessment was undertaken to identify ecological values present within the precinct.	Lindum Vale PSP	River Red-gum trees, Golden Sun Moth and *Grassy Eucalypt Woodland of the Victorian Volcanic Plain*

Title, author and date	Scope/abstract	Geographic relevance: MSA/PSP	Ecological values identified
Lockerbie Precinct Structure Plan Background Report GAA (2012)	This document discusses the general background of the Lockerbie PSP, the ecological values present within the precinct area.	Lockerbie PSP	Golden Sun Moth, Growling Grass Frog, Pied Cormorant and Yellow-bellied Sheathtail Bat. Six fauna habitats and four threatened flora: Matted Flax-lily, Pale Swamp Everlasting, Slender Tick-trefoil, Tough Scurf-pea
Hume City Council, Rural Areas Hume Integrated Growth Area Plan (HIGAP), Chapter 5.6 – Issues and Options Analysis, Environment section Hume City Council (no date)	This chapter from the HIGAP discusses the environmental characteristics in Hume LGA.	Hume	Swift parrot, Growling Grass Frog, Golden Sun Moth, Yarra Pygmy Perch. The most widespread EVCs identified were: Plains Grassland (endangered) Plains Grassy Woodland (endangered)
Aitken Boulevard Non Drinking Water and Drinking Water Mains – Ecology Report Jacobs (2017)	Jacobs (2017) was commissioned to provide the results of an ecological assessment to the Victorian government for progressing an EPBC Act referral for a Yarra Valley Water Project to construct drinking water and non-drinking water mains.		Fauna include Growling Grass Frog, Golden Sun Moth and Striped Legless Lizard. Flora include Matted Flax-lily. Threatened ecological communities include NTGVVP, Western (Basalt) Plains Grassland, and Matted Flax-lily community
Operational Management Plan for Kalkallo Common Grassland Merri Creek Management Committee (2010)	This plan was used as a guide for the activities of the contractors over two years. It addresses issues in regard to site conservation issues and operational management of botanical values.	Kalkallo	Thirteen national and State significant flora that may occur/have occurred in Kalkallo, and five newly identified species that are listed as having conservation significance in the area.

Title, author and date	Scope/abstract	Geographic relevance: MSA/PSP	Ecological values identified
Results and Review from three *Synemon plana* survey activities for volunteers at Craigieburn Grassland Reserve Epping/Wollert Merri Creek Management Committee (2017)	Surveys were carried out to identify the distribution patterns of Golden Sun Moth at Craigieburn Grassland Reserve in the summers of 2004-2007. The results assisted to understand the characteristics of Golden Sun Moth's preferred habitat in the Heavier-Soils Plains Grassland Ecological Vegetation Community of the VVP bioregion near Melbourne.	Craigieburn	Golden Sun Moth
Beveridge Golden Sun Moth Targeted Survey MWH (2009)	A targeted Golden Sun Moth survey of an 895 ha rural property in Beveridge was undertaken. Site assessment was undertaken during the optimal survey period of Golden Sun Moth which is between late November and early January.	Beveridge	Golden Sun Moth
Biodiversity Assessment Report (Native Vegetation) PSP 23: Greenvale South SMEC Australia (2010)	SMEC Australia (2010) provided information on native vegetation and fauna habitat for the PSP Area 23 – Greenvale South. Field assessments and mapping informed the preparation of the PSPs in areas designated for future development and assisted with long term planning over the next 30-50 years.	PSP 23 – Greenvale South	Two EVCs were identified: • Plains Grassy Woodland • Hills Herb-rich Woodland A population of Golden Sun Moth was identified in patches of Plains Grassy Woodland located north of Somerton Road.

8.3 Botanical values

8.3.1 Summary

Native vegetation mapped within the Project Area consists of scattered native trees, remnant grassy woodland and grassland on private property and along public road reserves within and outside the MSA area. Most native vegetation occurs outside the MSA area. The Project Area intersects six EVCs.

Native vegetation within the Project Area is generally degraded and fragmented, reflecting the area's long history of agricultural land use, and more recently urban development. For the most part, vegetation is dominated by pasture grasses and in some areas, extensive tracts of noxious weeds. Shelterbelts and windbreaks are common and mostly consist of Monterey Cypress *Hesperocyparis macrocarpa* or Sugar Gums *Eucalyptus cladocalyx*.

Remnant vegetation generally consists of grassland and grassy woodland associated with basaltic soils of the Victorian Volcanic Plain. Woodlands are characterised by River Red Gum *Eucalyptus camaldulensis* which forms remnant patches or occurs as isolated scattered trees. Trees within the Project Area range in size from saplings to very large trees with a diameter at breast height (DBH) of up to 143 centimetres. Ground layer forbs and graminoids (grass-like plants) are largely absent from these areas due to the presence of a range of high threat weeds.

Weed infestation, disturbance and a lack of traditional management practices in grassy ecosystems such as fire are the prime causes of decline in the condition and extent of native vegetation. However, despite this, some significant patches remain of the ecosystems that once characterised the area.

Riparian corridors along waterways including Jacksons Creek, Deep Creek and Merri Creek provide the most contiguous areas of native vegetation. Biosis (2020) noted that patches of trees within the northern extent of the Project Area also contribute to a broader area of open woodland that is unique within the local landscape. These trees can serve as stepping stones for more mobile species such as birds and bats and provide some level of habitat continuity with reserves in the local area, such as the reserve system proposed under the BCS (DEPI, 2013b).

Very few threatened flora were recorded within the Project Area during field surveys. The most significant of these was a relatively large population of Tough Scurf-pea *Cullen tenax*, recorded at Wollert Compressor Station.

Even though potential habitat was deemed possible from the desktop review, no suitable habitat or potential habitat was observed during field surveys in any of the parcels for any of the threatened flora that required additional targeted surveys. These species were also confirmed with a high degree of confidence, as highly likely to be absent from the Project Area.

8.3.2 Desktop assessments

This section summarises the botanical desktop search results of biodiversity databases curated by the Commonwealth and Victorian governments, conducted by Biosis (2019).

8.3.2.1 Matters of national environmental significance − EPBC Act

Using the Protected Matters Search Tool online, the following MNES were considered that may occur, or for which suitable habitat is predicted to occur within the associated five-kilometre buffer of the Project alignment are provided in Table 21. These include four threatened ecological communities and 19 threatened plant species.

Table 21 Summary of PMST results within the five-kilometre buffer

MNES	
Listed threatened flora	Threatened flora listed under the EPBC Act (19 species and/or FFG Act (30 species) that may occur, or for which suitable habitat may occur within the associated five-kilometre buffer of the Project Area are listed in Table 22 and Appendix B
Listed threatened ecological communities	• *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* • *Natural Temperate Grassland of the Victorian Volcanic Plain* • *Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains* • *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland*
Wetlands of International Importance (Ramsar Sites)	Port Phillip Bay (Western Shoreline) and Bellarine Peninsula
Commonwealth Marine Area	None

8.3.2.2 Threatened flora listed under the EPBC Act and FFG Act

Threatened flora listed under the EPBC Act (19 species) and/or FFG Act (30 species) that may occur, or for which suitable habitat may occur within the associated five-kilometre buffer of the Project Area are listed in Table 22 and in Appendix B.

Table 22 EPBC Act and FFG Act-listed species recorded within five kilometres of the Project Area

VU/v – vulnerable; EN/e – endangered; CR – critically endangered; L – listed as threatened

Scientific Name	Common Name	EPBC Act	FFG Act	PMST
Allocasuarina luehmannii	Buloke	-–	L	–
Amphibromus pithogastrus	Plump Swamp Wallaby-grass	–	L	–
Amphibromus fluitans	River Swamp Wallaby- grass	VU	–	–
Atriplex billardierei	Glistening Saltbush	–	L	–
Calotis anthemoides	Cut-leaf Burr-daisy	–	L	–
Carex tasmanica	Curly Sedge	–	L	–
Comesperma polygaloides	Small Milkwort	–	L	–
Cullen parvum	Small Scurf- pea	–	L	–
Cullen tenax	Tough Scurf-pea	–	L	–
Dianella amoena	Matted Flax-lily	EN	L	–
Diuris basaltica	Small Golden Moths	EN	L	–
Diuris fragrantissima	Sunshine Diuris	EN	L	–
Diuris palustris	Swamp Diuris	–	L	–
Diuris punctata	Purple Diuris	–	L	–
Dodonaea procumbens	Trailing Hop-bush	VU	-	–
Geranium sp. 1	Large- flower Crane's-bill	–	L	–
Glycine latrobeana	Clover Glycine	VU	L	–
Goodenia macbarronii	Narrow Goodenia	–	L	–
Lachnagrostis adamsonii	Adamson's Blown-grass	EN	L	–
Leiocarpa leptolepis	Pale Plover-daisy	–	L	–

Scientific Name	Common Name	EPBC Act	FFG Act	PMST
Lepidium hyssopifolium s.s.	Basalt Peppercress	EN	L	–
Leucochrysum albicans subsp. *tricolor*	Hoary Sunray	EN	L	–
Lindsaea trichomanoides	Oval Wedge-fern	–	L	–
Pimelea spinescens subsp. *spinescens*	Spiny Rice- flower	CR	L	–
Pomaderris vacciniifolia	Round-leaf Pomaderris	CR	L	–
Prasophyllum frenchii	Maroon Leek-orchid	EN	L	–
Pterostylis chlorogramma	Green- striped Greenhood	VU	L	–
Pterostylis cucullata	Leafy Greenhood	VU	L	–
Rutidosis leptorhynchoides	Button Wrinklewort	EN	L	–
Senecio macrocarpus	Large-headed Fireweed	VU	L	–
Senecio psilocarpus	Swamp Fireweed	VU	-	–
Thelymitra matthewsii	Spiral Sun- orchid	VU	L	–
Xerochrysum palustre	Swamp Everlasting	VU	L	–

8.3.2.3 Flora recognised as rare or threatened in Victoria on DELWP's advisory list

Within the five-kilometre buffer, 26 species of rare or threatened flora have been recorded (excluding those only modelled as likely to occur by the PMST). These records include two species listed under the EPBC Act, 14 species listed under the FFG Act and 26 species considered rare or threatened in Victoria (DEPI, 2014). These species are listed in Table 23.

In most cases, EPBC Act and FFG Act-listed species are also listed under DELWP's advisory list.

Table 23 DELWP advisory list threatened species recorded within five kilometres of the Project Area

v – vulnerable; EN/e – endangered; L – listed as threatened; VICADV – DEPI (2014)

Scientific name	Common name	EPBC	VICADV	FFG
Allocasuarina luehmannii	Buloke	–	e	L
Amphibromus pithogastrus	Plump Swamp Wallaby-grass	–	e	L
Carex tasmanica	Curly Sedge	–	v	L
Chloris ventricosa	Plump Windmill Grass	–	v	-
Comesperma polygaloides	Small Milkwort	–	v	L
Coronidium gunnianum	Pale Swamp Everlasting	–	v	-
Cullen parvum	Small Scurf- pea	–	e	L
Cullen tenax	Tough Scurf-pea	–	e	L
Dianella amoena	Matted Flax-lily	EN	e	L
Dianella longifolia var. *grandis*	Arching Flax-lily	–	v	-
Diuris fragrantissima	Sunshine Diuris	EN	e	L
Diuris palustris	Swamp Diuris	–	v	L
Diuris punctata	Purple Diuris	–	v	L
Eleocharis plana	Flat Spike- sedge	–	v	-
Eucalyptus leucoxylon subsp. *connata*	Melbourne Yellow-gum	–	v	-
Eucalyptus X studleyensis	Studley Park Gum	–	e	-
Geranium solanderi var. *solanderi* s.s.	Austral Crane's-bill	–	v	-
Geranium sp. 1	Large- flower Crane's-bill	–	e	L
Goodenia macbarronii	Narrow Goodenia	–	v	L
Leiocarpa leptolepis	Pale Plover-daisy	–	e	L
Lepidium hyssopifolium s.s.	Basalt Peppercress	EN	e	L
Lindsaea trichomanoides	Oval Wedge-fern	–	e	L
Microseris scapigera s.s.	Plains Yam-daisy	–	v	-
Podolepis linearifolia	Basalt Podolepis	–	e	-
Prasophyllum pyriforme s.s.	Silurian Leek-orchid	–	e	-
Pterostylis pedoglossa	Prawn Greenhood	–	v	-

8.3.2.4 Additional assessments to address knowledge gaps

Herbarium records exist (dating from 1984 to 2018) within five km of the unsurveyed parcels for six of the species that required targeted surveys: *Coronidium gunnianum* (Pale Swamp Everlasting), *Cullen tenax* (Tough Scurf-pea), *Lachnagrostis adamsonii* (Adamson's Blown-grass), *Lepidium hyssopifolium* (Basalt Peppercress), *Pimelea spinescens* subsp. *spinescens* (Spiny Rice-flower) and *Senecio macrocarpus* (Large-headed Fireweed).

Lachnagrostis adamsonii had been recorded in 2002 approximately 2.5 km east of parcel 1LP221466, in a pond within a minor tributary of Merri Creek with other wetland species (MEL1586953A). No comparable habitat existed in or near the alignment in any of the parcels visited.

The herbarium record for *Cullen tenax* described plants that had self-sown from cultivated stock at the Organ Pipes nursery (specimen record MEL 2040962A).

Herbarium records for the remaining species mainly described their habitat as grassland or modified grassland dominated by *Themeda triandra* (Kangaroo Grass), often on red-brown earths with outcropping basalt or on grey clay soil south of the parcels surveyed in the Melton, Kalkallo and Calder Park areas, and north near Beveridge. All parcels visited were on basalt, except one parcel (6LP136262) that was on granite. They contained no suitable habitat for any of the targeted flora and were dominated by noxious weeds and pasture. Some small patches of native grassland occurred in grazed paddocks on two properties but no habitat existed for threatened flora since inter-tussock spaces were lacking or occupied by weeds, grass cover was relatively high, and soils were compressed owing to grazing by horses or cattle species (see site descriptions, below).

Recovery Plans, Action Statements and VicFlora descriptions for the remaining species with no AVH records in the study area described a range of habitats including native grasslands, wetlands and open forests. Of these habitats, only grassland and grassy woodland were observed in the unsurveyed parcels.

All three species (Hoary Sunray, Maroon Leek-orchid and Swamp Everlasting) that required additional consideration by DAWE were found by Biosis (2019) to have a low to unlikely likelihood of occurring in the Project Area, since either no habitat was present and there were no records within eight km, and to more than 100 km. This was confirmed by GHD (2020). DAWE since confirmed (7 September 2020) that additional assessment was not required if MNES has undergone reasonable assessment at desktop level.

Hoary Sunray prefers clay soils on basalt, where plants occupy inter-tussock spaces with other forbs typical of grassland dominated by *Themeda triandra* (Kangaroo Grass), *Dichelachne crinita* (Long-hair Plume-grass), *Austrostipa* spp. (Spear-grasses) and *Rytidosperma* spp. (Wallaby-grasses). There is one record (2016) from Gordon's Rd, South Morang 20-30 km from the alignment (Victorian Biodiversity Atlas 3.2.7[6]). No habitat details are available but aerial imagery implies an open area of grassland in a public reserve. Otherwise there has been a substantial decline in its range mainly as a result of weed invasion and habitat destruction. Hoary Sunray is now very rare in Victoria with other recent records only from west of Inverleigh.

Maroon Leek-orchid occurs in grassland and grassy woodland on a range of soils, often damp to seasonally waterlogged. However, its habitat requirements and ecology are poorly understood. The closest recent record is from near Bacchus Marsh (2009, Atlas of Living Australia), 25-50 km from the pipeline alignment. Otherwise this species has a patchy distribution west of Meredith, with most populations occurring in eastern Victoria. Although this species is difficult to detect and *Prasophyllum* plants, like most orchids do not always emerge above ground or flower annually (Coates et al., 2002; Coates et al., 2006; Coates, 2014).

[6] https://www.environment.vic.gov.au/biodiversity/victorian-biodiversity-atlas [accessed April 2020]

However, the genus is readily recognised in the field when flowering and suitable habitat is likely to have been observed during 2019/2020 surveys. Although dormant at the time of the current surveys, no suitable habitat was identified.

Swamp Everlasting is confined to swamps and marshes with genera *Amphibromus*, *Baumea*, *Carex*, *Chorizandra*, *Craspedia*, *Eleocharis*, *Isolepis*, *Lachnagrostis*, *Lepidosperma*, *Myriophyllum*, *Phragmites*, *Themeda* and *Villarsia*. Widespread but sparse throughout southern Victoria. The nearest record for Swamp Everlasting was at Somerton in 2005 (8-20 km form the alignment, VBA).

Otherwise, the most recent record for Swamp Everlasting was in February 2020, at Pirron Yallock (south of Lake Corangamite and >100 km from the alignment (Atlas of Living Australia). This species is recognisable and is highly likely to have been recorded during the earlier survey, especially since potential wetland habitat was assessed in detail for a TEC. No suitable habitat occurs in any of the parcels surveyed by GHD in 2020 and no species of any of the associated genera were recorded.

8.3.2.5 Ecological Vegetation Classes

Database searches identified the potential for seven EVCs in the VVP and nine EVCs in the CVU bioregions with a bioregional conservation status of endangered to be present within five kilometres of the Project Area (refer to Table 24). Although the Project Area is mainly within the VVP bioregion, it overlaps slightly into the Central Victorian Uplands (CVU) bioregion.

Table 24 EVCs within five kilometres of the Project Area

EVC No.	EVC name	Conservation status
Victorian Volcanic Plain		
55	Plains Grassy Woodland	Endangered
68	Creekline Grassy Woodland	Endangered
125	Plains Grassy Wetland	Endangered
132	Plains Grassland	Endangered
641	Riparian Woodland	Endangered
649	Stony Knoll Shrubland	Endangered
654	Creekline Tussock Grassland	Endangered
Central Victorian Uplands		
55	Plains Grassy Woodland	Endangered
47	Valley Grassy Forest	Vulnerable
22	Grassy Dry Forest	Depleted
62	Creekline Grassy Woodland	Endangered
71	Hills Herb-rich Woodland	Vulnerable
175	Grassy Woodland	Endangered
641	Riparian Woodland	Vulnerable
851	Stream Bank Shrubland	Endangered
895	Escarpment Shrubland	Endangered

8.3.2.6 Mapped wetlands

All mapped wetlands (i.e. the current wetland layer in DELWP's NVIM) that would be within the Project area are considered as a remnant patch, and so must be included in the extent of native vegetation removal (DELWP, 2017a; 2018). The modelled condition score, provided by DELWP, is assigned to these wetlands.

Four mapped wetlands were identified within the Project Area:

- KP 41 – Part of a single mapped wetland partially within the Project Area and within approved MSA area
- KP 44-45 – Three small wetlands, two of which are partially within the Project Area and are within the approved MSA area

The mapped wetlands are listed as Plains Grassy Wetland and Plains Grassland EVCs. Most of the impacts on these wetlands are within the existing Victorian Northern Interconnect Expansion (VNIE) pipeline easement, which has been subject to past disturbances under existing approvals. The alignment follows the VNIE pipeline easement at this location, with an additional five metres adjacent to the existing easement required to maintain a safe working distance to the existing pipeline while allowing construction of the WORM.

8.3.2.7 Groundwater Dependent Ecosystems

Groundwater Dependent Ecosystems (GDEs) within the Project Area were identified by Biosis (2019) from DELWP's *Terrestrial Groundwater Dependent Ecosystem Density* dataset models. In addition, the Bureau of Meteorology's (BoMs) Groundwater Dependent Ecosystem Atlas was interrogated to identify any further GDEs near the pipeline alignment as part of Technical report C – Groundwater Assessment. GDEs that may potentially have relevance to the Project with respect to existing biodiversity conditions are included in Table 25.

Table 25 Summary of identified and potential GDEs

Approximate kilometre point (km)	Description
KP0 – KP5	Scattered wetlands (aquatic GDEs) away from the alignment.
KP5 – KP7, KP8 – KP9	Scattered modelled GDEs (as reported in Biosis, 2019)
KP10 – KP11	Potential aquatic GDE associated with Jacksons Creek tributary and uncultivated grassland
KP13 – KP14	Jacksons Creek – potential terrestrial and aquatic GDEs
KP15 – KP 24, KP26 – KP27	Deep Creek – potential terrestrial and aquatic GDEs Potential terrestrial GDE, will be difficult to avoid if present Along the alignment between Deep Creek and Oaklands Road and scattered potential GDEs between KP25 and KP30 Low potential aquatic GDE west of the alignment, between approximately KP25 and KP30
KP30 – KP31	Potential terrestrial GDE
KP34 – KP35 KP35 – KP37	Kalkallo Creek; potential aquatic GDE A large potential GDE has been mapped immediately north of the alignment adjacent Kalkallo Creek
KP38 – KP39	Potential terrestrial GDE
KP43	Merri Creek. Potential aquatic GDE
Note: GDEs identified in Technical report C – Groundwater assessment and Biosis (2019)	

8.3.3 Field assessments

This section describes the results of the field surveys completed for vegetation and flora within the Project Area. Biosis (2020) and GHD (2020) provide the most up to date botanical information available. The majority of the surveys was conducted based on 2019 Project Areas with additional survey completed to collect key information gaps with the minor changes in alignment during mid and late 2020. Surveys were completed within the approved MSA areas and outside the MSA area (i.e. the entire Project Area). The results below refer to the VQA field survey results throughout the Project Area. Time-stamped data for the approved MSA areas are provided below in Table 27, for comparison. Results of the VQAs are provided in Appendix E.

8.3.3.1 Native vegetation

A total of 141 flora (86 native, 55 introduced), including one moss species were recorded within the Project Area during field surveys in 2019 and 2020 (Appendix C).

Six EVCs were recorded within the Project Area in two bioregions (Table 26). All EVCs recorded have a Bioregional Conservation Status of endangered.

In total 15.32 ha of native vegetation was mapped between 2019 and 2020 within the Project Area, with the majority occurring outside the MSA area. A summary of the total vegetation mapped is provided in Table 27 and mapped in Figure 8. Due to the surveys being undertaken over a long time period and by different consultants, a further figure containing records of all vegetation mapping throughout all GHD and Biosis surveys is included in Appendix DD for reference if required.

Riparian Woodland (EVC 641) was mapped at each of the three major stream crossings (Deep, Jacksons and Merri Creeks) (e.g. Plate 1). Condition scores for these three patches ranged from 0.42 to 0.53, ranking them amongst the highest quality patches within the Project Area. Large trees, which provide important habitat value, were also recorded in all three Riparian Woodland patches.

Table 26 Summary of EVCs mapped in the Project Area

Ecological Vegetation Class	EVC number	Bioregional Conservation Status
Central Victorian Uplands		
Plains Grassland	132	Endangered
Riparian Woodland	641	Endangered
Victorian Volcanic Plain		
Plains Grassland	132	Endangered
Plains Grassy Woodland	55	Endangered
Plains Grassy Wetland	125	Endangered
Riparian Woodland	641	Endangered
Stony Knoll Shrubland	649	Endangered
Aquatic Herbland	653	Endangered





Riparian Woodland at Jacksons Creek: overhanging trees (left) and vegetation corridor (right) (photo: GHD 2020)



Plains Grassy Woodland/ *Grassy Eucalypt Woodland of the Victorian Volcanic Plain on* private property (photo: GHD 2020)



Plains Grassland, grazed by stock on private property (photo: GHD 2020)

Plate 1 Examples of native vegetation in the Project Area

Approved MSA area

Six EVCs are mapped as time-stamped data in the approved MSA areas that fall within the Project Area (KP 0 - KP 3.15, KP 28.16 - KP 28.57 and KP 32.07 – KP 51.04). Five of these were mapped during the botanical surveys; however, the field assessments demonstrated that the actual extent of native vegetation within the approved MSA areas is significantly lower (1.93 ha) than the time-stamped mapping (5.94 ha) (Table 27).

DELWP's time-stamped dataset identified vegetation with condition scores from 0.11 to 0.6 within the Project Area lying within the approved MSA areas. Field survey scores for patches inside the approved MSA areas ranged from 0.17 to 0.42.

Outside MSA area

The extent of native vegetation patches surveyed outside the MSA area was 13.39 ha and ranged in condition from 0.18 to 0.56, summarised in Table 27.

Table 27 Summary of DELWP MSA time-stamped native vegetation mapping within the approved MSA area and native vegetation mapped during field assessments in 2019/2020, within and outside MSA area

Ecological Vegetation Class	Time-stamped mapping (ha)	Biosis / GHD field survey (ha)*
Approved MSA area		
Plains Grassland	1.89	1.38
Plains Grassy Woodland	2.47	0.32
Plains Grassy Wetland	0.17	–
Riparian Woodland	0.01	0.08
Stony Knoll Shrubland	1.37	0.14
Creekline Tussock Grassland	0.03	–
Sub-total	**5.94**	**1.93**
Areas outside MSA area	Biosis / GHD field survey (ha)*	
Plains Grassland	8.98	
Plains Grassy Woodland	4.30	
Plains Grassy Wetland	–	
Riparian Woodland	0.05	
Aquatic Herbland	0.06	
Sub-total	**13.39**	
Total	**19.33**	**15.32**

8.3.3.2 Native trees

Native canopy trees were recorded within the Project Area as both scattered trees and as trees within patches (Figure 8). Trees ranged from saplings to large individuals with a DBH up to 143 cm. A total of 32 scattered trees (16 large and 16 small) and 12 large canopy trees in patches of native vegetation were recorded within the entire Project Area. Trees with potential for loss are assessed either as direct loss within the Project Area or indirectly due to encroachment of the Project Area into the Tree Protection Zone (TPZ). A tree is deemed indirectly lost if encroachment into the TPZ area is greater than 10 per cent (DELWP, 2018).

Each scattered tree is assigned a default condition score of 0.2. Scattered trees are assigned a default area of extent by placing a 10 m buffer around small scattered trees and a 15 m buffer around large scattered trees). These areas are included in calculations for vegetation losses (refer 13.4 and Appendix BB). Within a patch, the area of a canopy tree that extends beyond the construction boundary (i.e. the canopy overhangs outside the construction corridor) is also included in calculations for the total loss (ha) of native vegetation. For offsetting purposes 19 large trees are proposed for removal during construction of the Project, as a result of direct and indirect impacts and are included in the Native Vegetation Removal report for the Project (Appendix BB). Trees that were recorded only within the construction corridor are listed in Appendix F.

The majority of canopy trees (9) and scattered trees (10 large and 10 small) occur outside the MSA area (Table 28).

Table 28 Summary of native canopy trees and scattered trees impacted by construction of the Project (Biosis, 2020; GHD, 2020)

Category	Inside approved MSA areas (ha	Outside approved MSA areas (ha)	Total
Large canopy tree within a patch	3	9	12
Scattered tree (large)	6	10	16
Scattered tree (small)	6	10	16
TOTAL	15	29	44

8.3.3.3 Threatened species

An extremely low number of threatened flora were found during the targeted surveys. This result is attributed to the generally poor condition of native vegetation and the majority of the Project Area being located within non-native vegetation. The extent and abundance of weeds that are not controlled throughout the Study Area despite being listed under the CaLP Act, widespread disturbance both historically and in contemporary times and the dominance of non-native vegetation are all significant factors in determining the absence of, or potential habitat for, threatened flora. Relatively low rainfall in the 2019 survey is not considered to have influenced detectability since such conditions are likely to have constrained weed proliferation and actually increase detectability. Thorough searches using sound methods were conducted by Biosis and GHD for all species and the extremely low number of species found is indicative of the degraded nature of the native vegetation, rather than rainfall. Should rainfall have been higher, then the most likely outcome would be increased weed growth and increased competition from weeds.

Spiny Rice-flower

Owing to a lack of access to some properties, a very small amount of fieldwork was conducted out of season, with the remainder conducted during the appropriate season (winter). Both Biosis and GHD consider that were few parcels within the Project Area that contained suitable habitat for Spiny Rice-flower. Regardless, survey effort was increased by spacing transects 2.5 m apart. VQA surveys were conducted in conjunction with targeted flora surveys and no plants in the *Pimelea* genus were detected either during targeted surveys or during vegetation assessments, regardless of the season (Appendix C).

Small Golden Moths

Small Golden Moths is an extremely rare species that is only known with certainty from one site west of Melbourne at Caroline Springs and was checked as a reference site at the same time that targeted surveys were conducted. The genus is still be identifiable a week after flowering (if that had indeed occurred) but difficult to detect if non-reproductive. However, no orchids at all were recorded during surveys (Appendix C), including in patches with relatively high species richness, so the chance of this species being missed is remote and it is considered that adequate survey effort has been undertaken.

Swamp Diuris

Swamp Diuris grows on gravelly soils and is not found anywhere near the Project Area and is highly likely to occur there. *Diuris* plants would still be recognisable to genus level until they have set seed (if pollinated) up to around 6 weeks after flowering. Biosis found no material from any orchids - including leaves, spent seed pods, flowers throughout the entire field survey. Since no orchids were recorded in the study area (Appendix C) it is considered that adequate survey effort has been undertaken.

Sunshine Diuris

Diuris fragrantissima is only known from a small population of 30-35 plants, supplemented by reintroductions, at a tiny single site at Tottenham and from a declining reintroduced population at Laverton North Grassland Reserve, in Melbourne's western suburbs. The Tottenham site is rocky and thus relatively open and is actively managed. Sunshine Diuris is absent from the surrounding area, which largely consists of Chilean Needle-grass, and indeed from the rest of Victoria and beyond. Despite numerous surveys by former DELWP departments, field naturalists, consultants, and during implementation of the EPBC recovery plan, no other populations have ever been found.

It is unlikely that season has played a part in detectability during field surveys. Monitoring conducted at Tottenham over many years has demonstrated that plants do not regularly appear above ground and/or flower, which is typical of orchids. For example, DELWP's data show that in 2019, 15-18 plants flowered and in 2020 only one plant flowered. Thus, the information that exists for Sunshine Diuris is based on very little information from a single site and determining suitable seasonal conditions for flowering cannot be derived from a handful of plants whose flowering, dormancy rates and survival is heavily influenced by other factors. One of these factors is that plants are manually watered to the monthly mean average rainfall to mimic conducive seasonal conditions, yet flowering is still sporadic each year. The site is also burnt to manage biomass. Additionally, given that the distribution of this species is well understood owing to the extent of surveys and studies conducted, it is considered virtually certain that Sunshine Diuris does not occur in the Project Area. Since no orchids were recorded during field surveys (Appendix C), it is considered that adequate survey effort has been undertaken.

EPBC Act-listed flora

Biosis (2020) recorded one EPBC Act listed species (Matted Flax-lily − *Dianella amoena*) during the late spring / summer phase of the targeted flora surveys (Table 29). A single Matted Flax-lily individual was identified within the fence line along an uncultivated area of roadside (218268306, KP 23) adjacent to a paddock of Plains Grassy Woodland in parcel 1PS733045 (KP 23 – KP 24) (Figure 7). The Matted Flax-lily recorded is on public land outside the MSA area.

No other EPBC Act-listed flora were recorded in the Project Area during the field assessments. Targeted surveys were conducted in the areas shown in Figure 5, Figure 6 and Figure 7.

FFG Act listed flora

Biosis (2020) recorded two species listed as threatened under the FFG Act within the Project Area during field surveys (Table 29) (Figure 7). These are:

- Matted Flax-lily (*Dianella amoena*) – one individual (as above)
- Tough Scurf-pea (*Cullen parvum*) – 48 individuals

The Matted Flax-lily recorded during the field surveys is on public land outside the MSA area.

All Tough Scurf-pea individuals were recorded on private land within the approved MSA area. Each Tough Scurf-pea individual encountered was marked with a numbered yellow sand peg (1 - 48) to aid future detection for avoidance or translocation if desired. This parcel is subject to livestock grazing and it is likely that there are more individuals than the 48 recorded during the field assessment.

No other FFG Act listed flora were recorded during the field assessments.

DELWP Advisory list flora

Biosis (2020) recorded three DELWP Advisory listed species within the Project Area (Table 29) (Figure 7). These are:

- Arching Flax-lily (*Dianella longifolia* var. *grandis*, vulnerable) – one individual
- Matted Flax-lily (*Dianella amoena*, endangered) – one individual (as above)
- Tough Scurf-pea (*Cullen tenax*, endangered) – 48 individuals

The single Arching Flax-lily individual occurs on private land outside the MSA area.

The single Matted Flax-lily individual recorded during the field surveys occurs on public land outside the MSA area.

All Tough Scurf-pea individuals were recorded on private land within the approved MSA areas.

No other DELWP Advisory listed flora were recorded during the field assessments.

8.3.3.4 Additional autumn and winter targeted surveys and habitat assessments to address knowledge gaps

There were no species observed during the additional surveys that resembled any of the targeted threatened flora (refer 8.3.2.4).

Furthermore, it was considered by GHD (2020) that if present, these species would have had a high chance of being detected during seasonal targeted flora surveys carried out, given the high degree of survey effort completed. These species are not discussed further.

Table 29 Threatened flora summary

Species	Number of populations	Number of plants	EPBC	FFG	DELWP Advisory list
Matted Flax-lily	1	1	Threatened	Threatened	endangered
Tough Scurf-pea	1	48	–	Threatened	endangered
Arching Flax-lily	1	1	–	–	vulnerable

8.3.3.5 Threatened ecological communities − EPBC Act

Two threatened ecological communities were recorded during field surveys. No other EPBC Act-listed threatened ecological communities were present in the Project Area.

Natural Temperate Grassland of the Victorian Volcanic Plain

Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) is listed as Critically Endangered. This community has the potential to occur in areas of grassland and may correlate with areas of Plains Grassland (EVC 132) and Creekline Tussock Grassland (EVC 654), provided the condition thresholds outlined in the key diagnostic characteristics and condition thresholds set out in the Listing Advice for the community are met (Threatened Species Scientific Committee, 2008).

In total, 4.16 ha of NTGVVP was mapped within the entire Project Area, with the majority (3.43 ha) occurring outside the MSA area. The extent of NTGVVP mapped within the approved MSA areas and outside the MSA area is summarised in Table 30.

Grassy Eucalypt Woodland of the Victorian Volcanic Plain

Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVVP) is listed as Critically Endangered. This community has the potential to occur in areas of woodland including Plains Grassy Woodland (EVC 55) and Stony Knoll Shrubland (EVC 649), or where scattered River Red-gum trees are present or likely to have been formerly present (Threatened Species Scientific Committee, 2009).

In total 2.26 ha of GEWVVP was mapped within the entire Project Area, almost all of which (2.20 ha) occurred outside the MSA area. The extent of GEWVVP mapped within the approved MSA areas and outside the MSA area is summarised in Table 30.

Table 30 Areas of EPBC Act-listed TECs within the Project Area

Nationally significant ecological community	Inside approved MSA areas (ha)	Outside approved MSA areas (ha)	Total (ha)
Natural Temperate Grassland of the Victorian Volcanic Plain	0.73	3.43	4.16
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	0.06	2.20	2.26

Seasonal Herbaceous Wetlands of the Temperate Lowland Plains

Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (SHWTLP) TEC is listed as Critically Endangered. The wetlands occur on seasonally filled drainage lines or depressions, are generally treeless and dominated by an herbaceous ground layer (Threatened Species Scientific Committee, 2012).

A potential occurrence of this community was initially identified by Biosis during spring surveys at parcel 2LP130112 (KP 18) associated with EVC 125 Plains Grassy Wetland, which lies outside the approved MSA areas. Further assessment of this potential occurrence concluded that the ecological community is not present since no native wetland graminoid or forb species were observed within the area during spring or when re-surveyed in March 2020. No other areas within the study area met the landscape or hydrology key diagnostic criteria for SHWTLP. Consequently, no occurrences of SHWLTP were recorded within the Project Area.

8.3.3.6 Threatened communities − FFG Act

Two FFG Act-listed communities were mapped within the Project Area. However, the removal of these communities will only require a permit under the FFG Act for vegetation on public land. Most FFG Act-listed communities occurred on private property outside the MSA area (Table 31).

Western (Basalt) Plains Grasslands Community was the more widespread of the two communities, occupying 10.36 ha, the majority of which (8.98 ha) occurred outside the MSA area on private property.

In total, 4.62 ha of floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland was mapped within the Project Area but occurred almost entirely on private property outside the MSA area (4.30 ha).

The areas of the FFG Act listed communities mapped within the Project Area on public land are provided in Table 31.

Table 31 FFG Act listed communities within the Project Area

From Biosis (2020) and GHD (2020), excludes time-stamped data

FFG community	Inside approved MSA areas (ha)		Outside MSA area (ha)		Total (ha)
	Public land	Private land	Public land	Private land	
Western (Basalt) Plains Grasslands Community	-	1.38	0.04	8.69	10.11
Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland	-	0.32	0.02	4.27	4.62

8.3.3.7 Mapped wetlands

Four mapped wetlands within the Project Area were dry at the time of the 2019 botanical surveys and could not be accurately assessed in the field, due to insufficient rainfall. Instead, modelled condition scores were incorporated into the assessment of native vegetation removal, as per the Guidelines (DELWP, 2017a). None of the mapped 'wetlands', with the exception of the area identified as potential SHWTLP (found later not to be present), provided any biotic indication that they were wetlands (Biosis, pers. comm., October 2020).

8.3.3.8 Groundwater Dependent Ecosystems

Groundwater underlying the study area within the Kororoit Creek catchment was estimated by Alluvium (2019) to be greater than 5 m deep. Alluvium (2019) states that water table depth in the Maribyrnong catchment segment of the study area exceeds 10 m, except for the Jacksons Creek & Deep Creek crossings - both of which are gaining streams. Technical report C – Groundwater also found that the majority of the alignment travels through areas where the depth to groundwater has been interpreted to be greater than 5 m.

A summary of areas where shallow (<5 m depth) groundwater have been reported in Technical report C are included in Table 32.

Table 32 Summary of potential shallow groundwater and interpreted salinity

Approx. KP	Approx. location	Interpreted groundwater salinity (mg/L TDS)	Interpreted aquifer
1	Vacant land south of Beatty's Road	3,500 – 7,000	Newer Volcanics
7	North of Holden Road	3,500 – 7,000	Newer Volcanics
8	Adjacent minor creek south of Tame Street drain Tame Street drain	3,500 – 7,000	Newer Volcanics
14	Jacksons Creek	3,500 – 7,000	Palaeozoic bedrock
17	Deep Creek	1,000 – 3,500	Palaeozoic bedrock
28	Mickleham Road	3,500 – 7,000	Palaeozoic bedrock/ Newer Volcanics (near boundary)
29 – 30	South of Donnybrook Road	3,500 – 7,000	Palaeozoic bedrock
30.5 – 37	Donnybrook Road – Kalkallo Creek – Gunns Gully Road	3,500 – 7,000 (Donnybrook Rd – Kalkallo Creek) 1,000 – 3,500 (Kalkallo Creek – Gunns Gully Road)	Paleozoic bedrock and Quaternary alluvials
39 – 43	Donovans Lane – Merri Creek	1,000 – 3,500	Newer Volcanics
43	Merri Creek	1,000 – 3,500	Newer Volcanics
45	South of Merri Creek	1,000 – 3,500	Newer Volcanics
47	Donnybrook Road	1,000 – 3,500	Newer Volcanics
47 – 50	South of Donnybrook Road to Wollert Compressor Station	1,000 – 3,500	Newer Volcanics

Notes:
"shallow" groundwater is that interpreted at less than 5 m bgl
TDS – Total Dissolved Solids
KP – Kilometre Point
Interpreted aquifer based on regional mapping

Biosis (2020) did not observe any groundwater discharge areas in the section of the Project Area within the Kororoit Creek catchment nor did they observe GDEs in that section of the Project Area, other than at the Jacksons Creek and Deep Creek crossings where Riparian Woodland was mapped (Figure 8).

Alluvium (2019) acknowledged the possibility that there may be groundwater seeps in the Merri Creek catchment. Biosis (2020) did not observe any instances of salt tolerant wetland or other swamp vegetation within the study area that would correspond with such seeps.

8.3.3.9 Declared weeds

The Project Area and surrounding area has generally high levels of weed infestation, including widespread populations of CaLP Act-listed noxious weeds (Plate 2) and Weeds on National Significance (WoNS). Additional noxious weeds may also occur in the Project Area (e.g. *Nassella leucotricha* – Texas Needle-grass). The species recorded during the field assessments are listed in Table 33 below, and include:

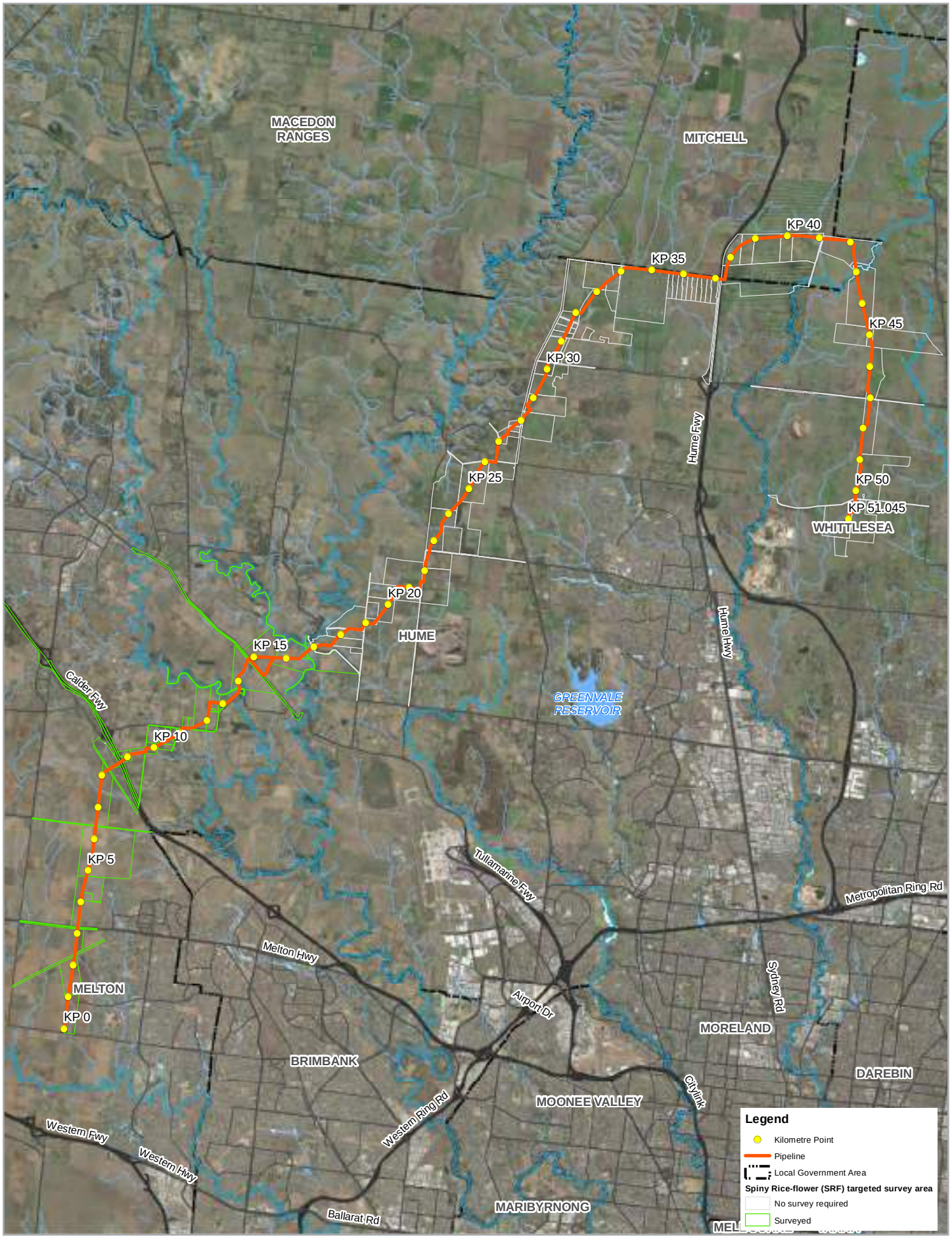
- Eight Regionally Controlled species
- Two Restricted species
- One State Prohibited species

Table 33 CaLP Act listed noxious weeds recorded within the Project Area

Scientific name	Common name	Status in Port Philip and Westernport CMA
Chrysanthemoides monilifera	Boneseed	Regionally Controlled
Cirsium vulgare	Spear Thistle	Regionally Controlled
Cynara cardunculus subsp. *flavescens*	Artichoke Thistle	Regionally Controlled
Lycium ferocissimum	African Box-thorn	Regionally Controlled
Marrubium vulgare	Horehound	Regionally Controlled
Nassella charruana	Lobed Needle-grass	State Prohibited
Nassella neesiana	Chilean Needle-grass	Restricted
Nassella trichotoma	Serrated Tussock	Regionally Controlled
Opuntia spp.	Prickly Pear	Restricted
Rosa rubiginosa	Sweet Briar	Regionally Controlled
Ulex europaeus	Gorse	Regionally Controlled



Plate 2 Extensive infestations of Artichoke Thistle (left) and Serrated Tussock (right) on private property in the Project Area (photo: GHD 2020)



Paper Size ISO A4

0 1 2 3 4

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

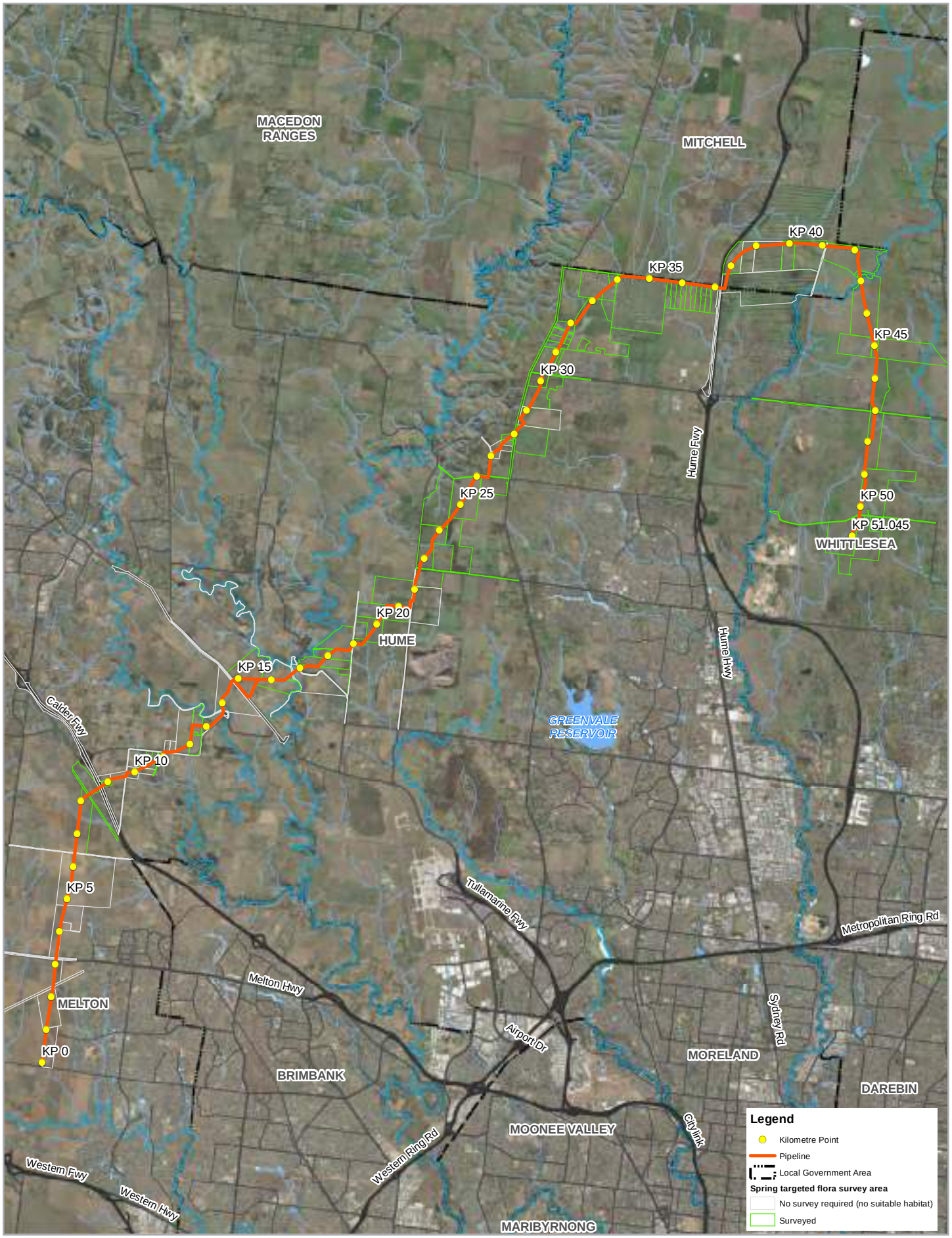
Parcels surveyed for Spiny Rice-flower within the construction corridor

Project No.	12529997
Revision No.	C
Date	21/01/2021

FIGURE **5**

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 1 2 3 4

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

N

GHD

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

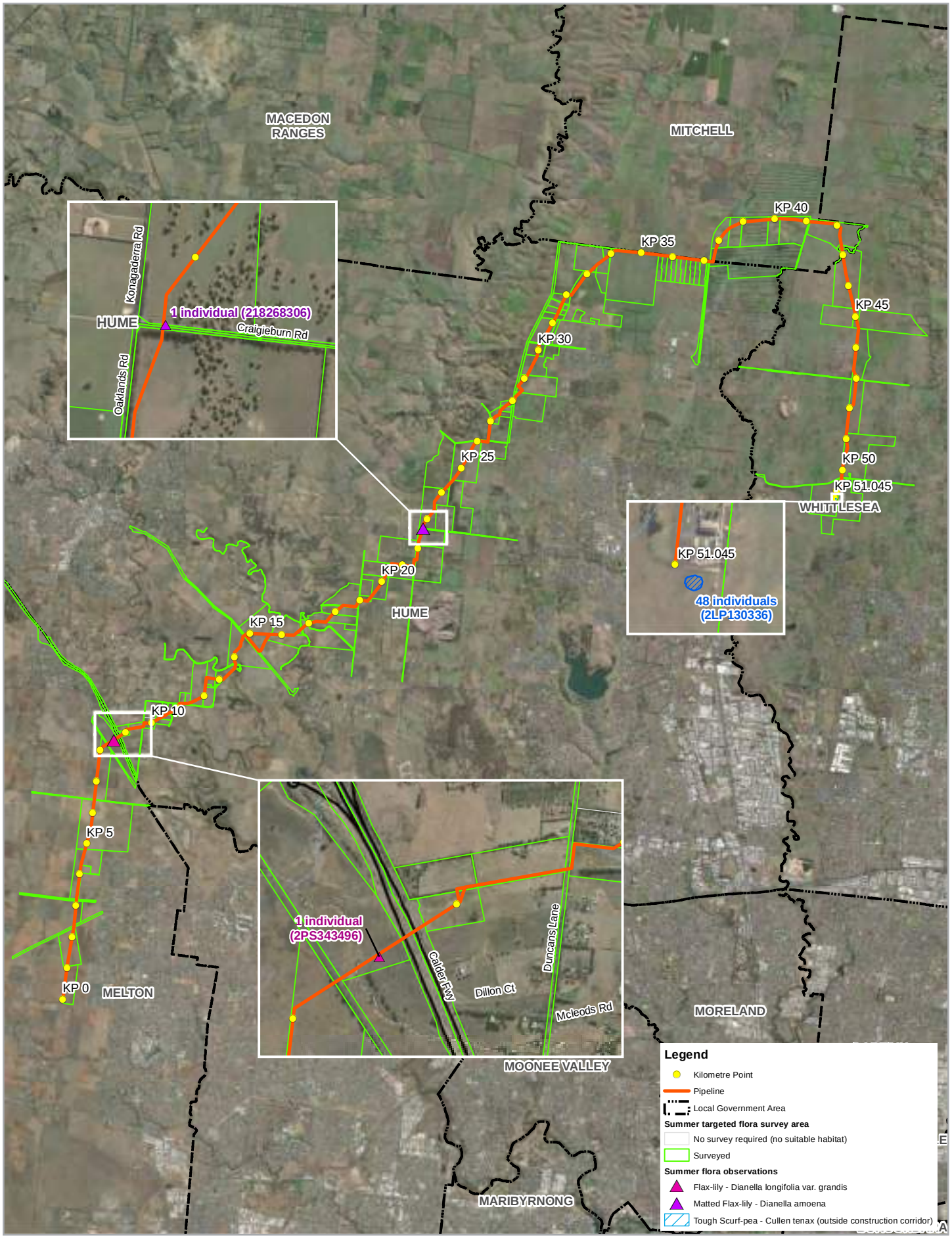
Parcels surveyed for spring-flowering threatened flora within the construction corridor

Project No. 12529997
Revision No. C
Date 21/01/2021

FIGURE 6

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 1 2 3 4

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Late spring/summer targeted flora survey area and results

Project No. 12529997
Revision No. C
Date 21/01/2021

FIGURE 7

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.1

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.2

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Project No. 12529997
Revision No. D
Date 05/03/2021

Native vegetation impacted by construction footprint

FIGURE 8.3

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

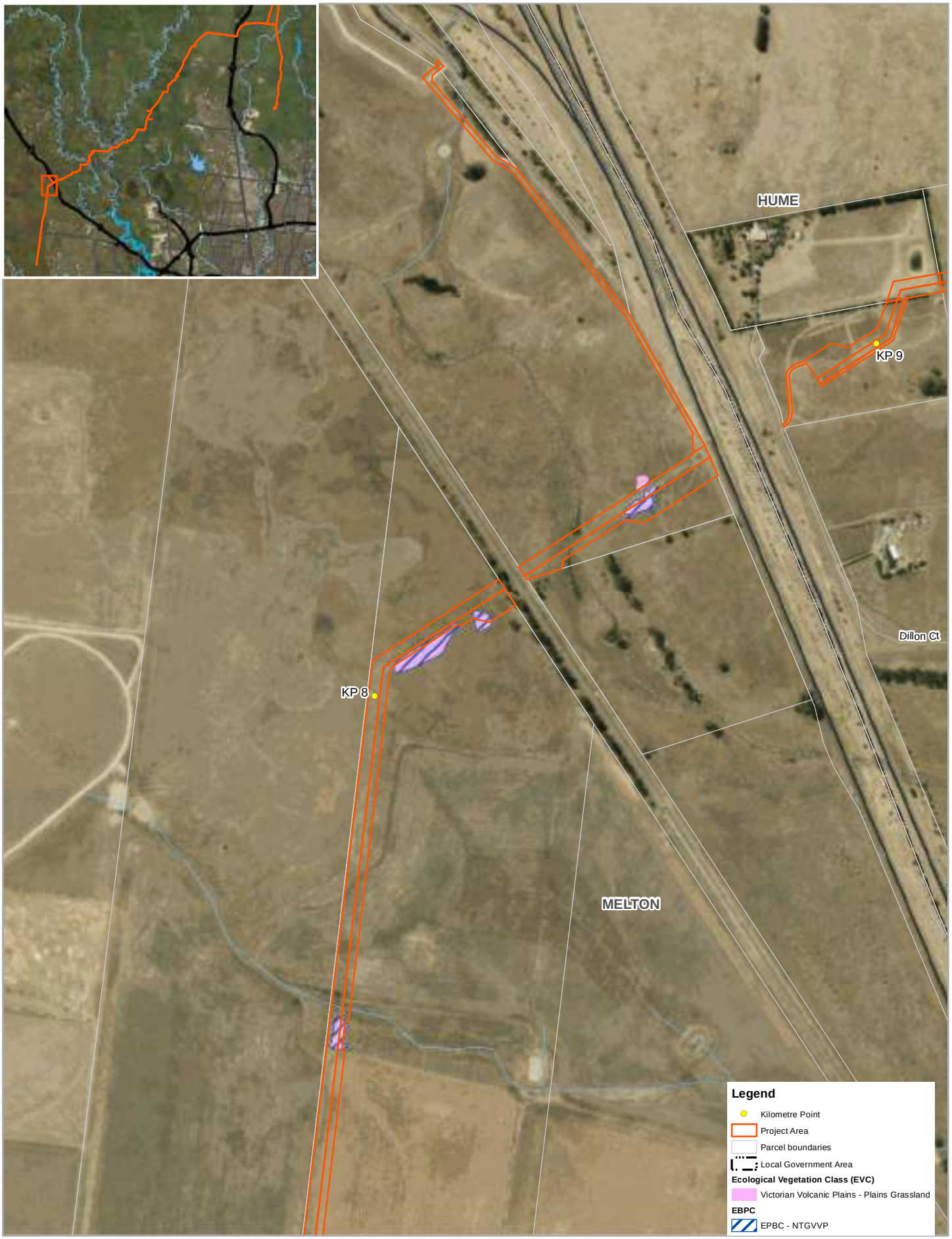
Native vegetation impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.4

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.5

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

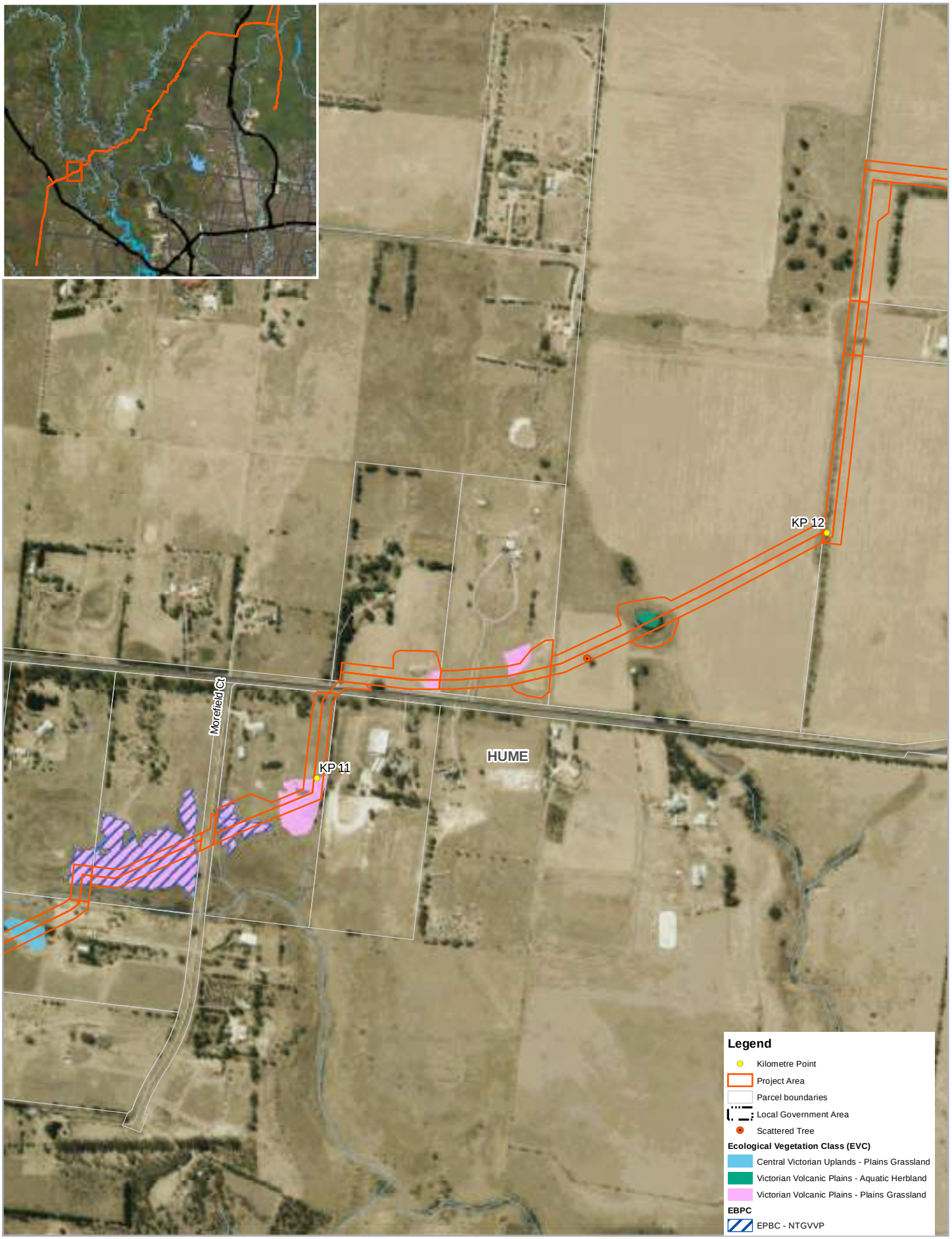
Native vegetation
impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.6

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

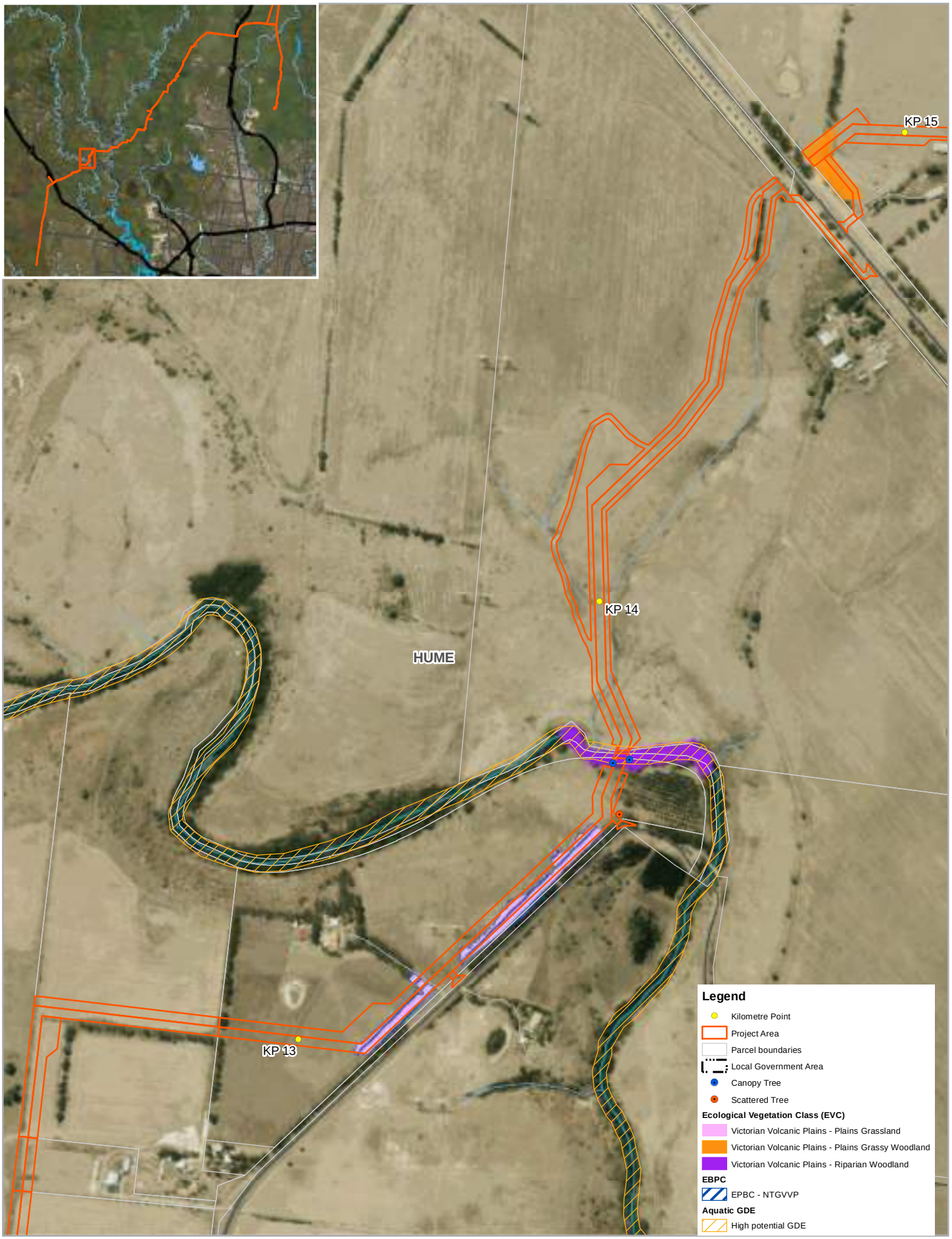
Native vegetation impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.7

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation
impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.8

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.9

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

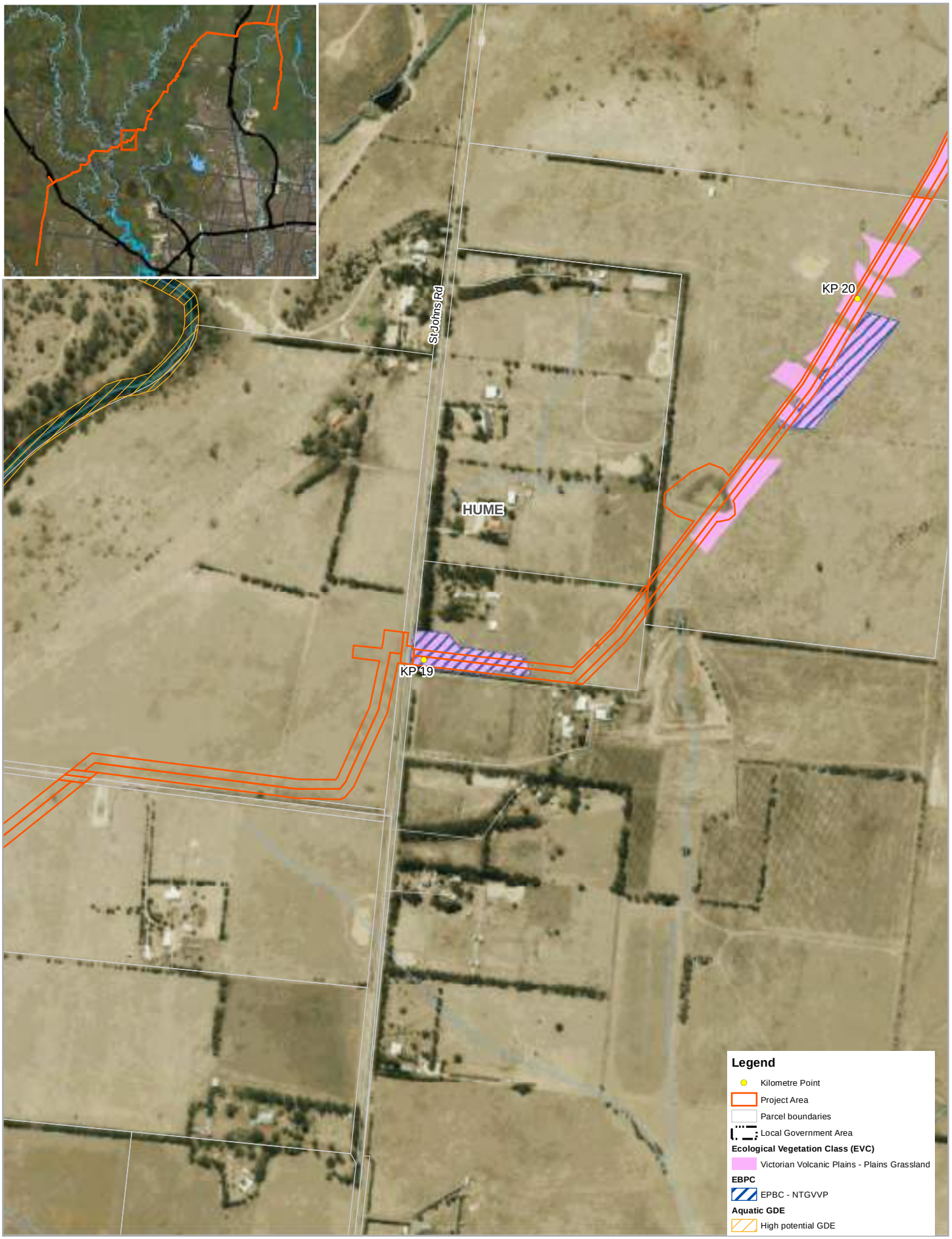
Native vegetation
impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.10

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

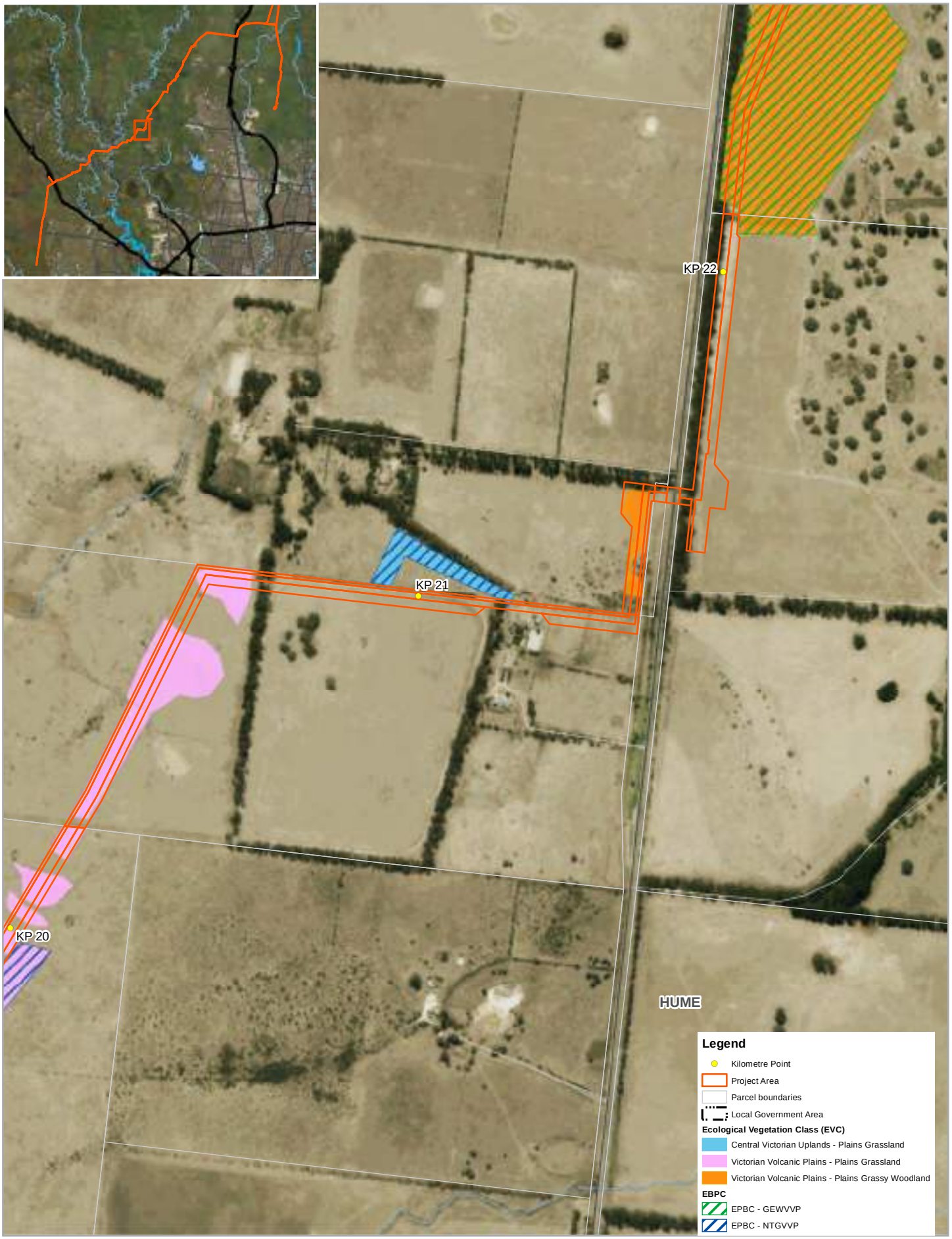
Native vegetation impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.11

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

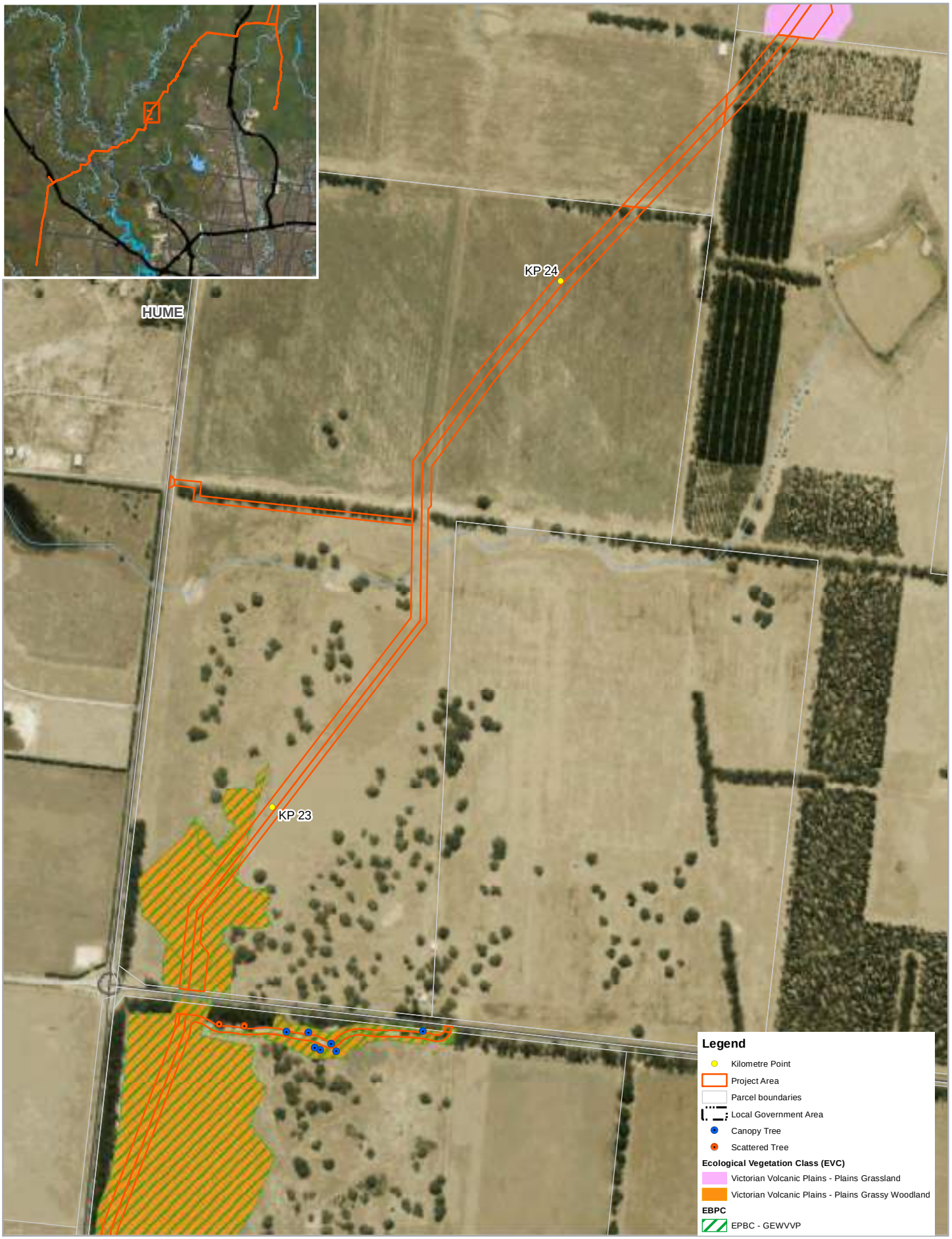
Native vegetation impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.12

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

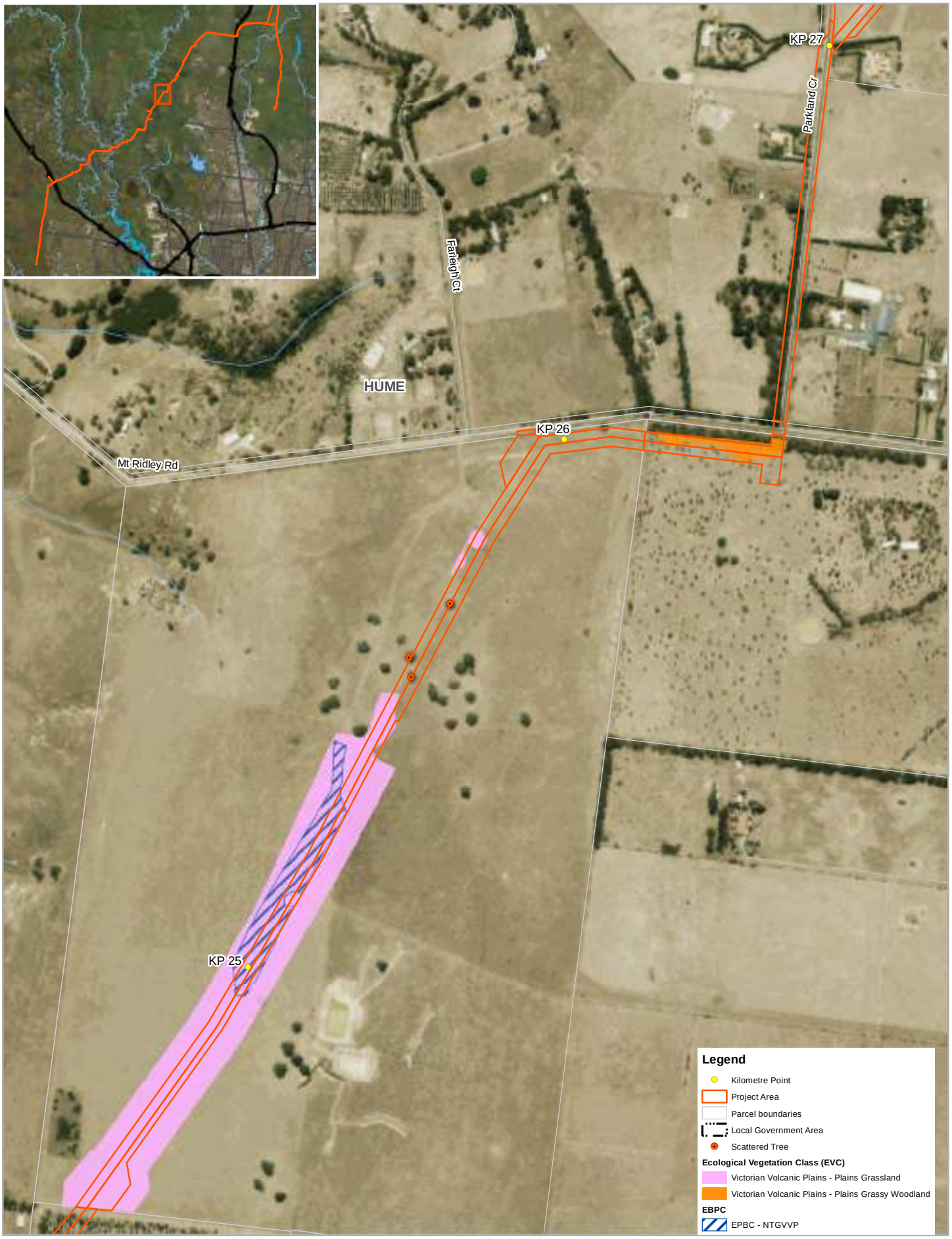
Native vegetation impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.13

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.14

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation
impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.15

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation
impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.16

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.17

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.18

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.19

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation
impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.20

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.21

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

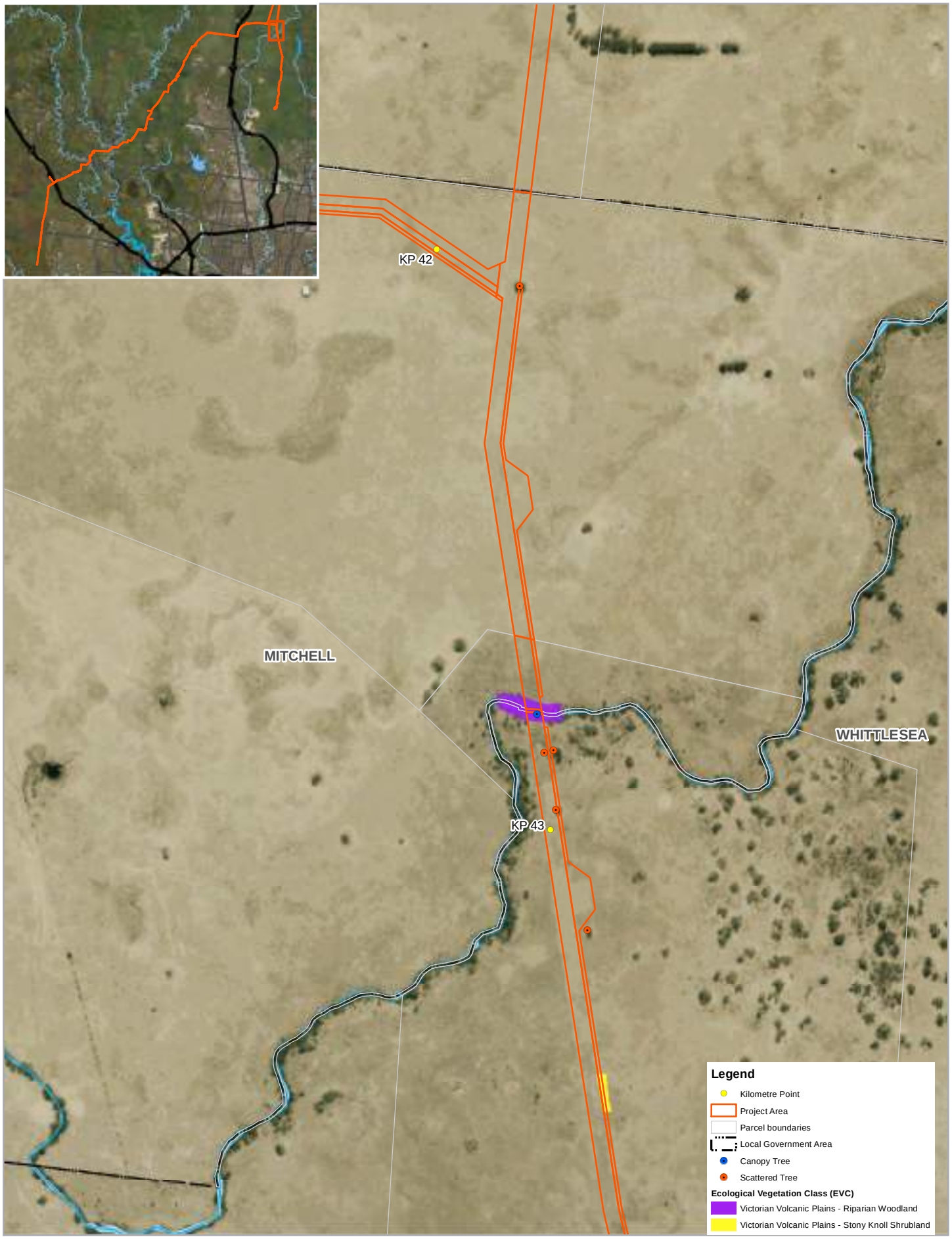
Native vegetation
impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.22

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Western Outer Ring Main Gas Project

Native vegetation impacted by construction footprint

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Date 05/03/2021

FIGURE 8.23

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation
impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.24

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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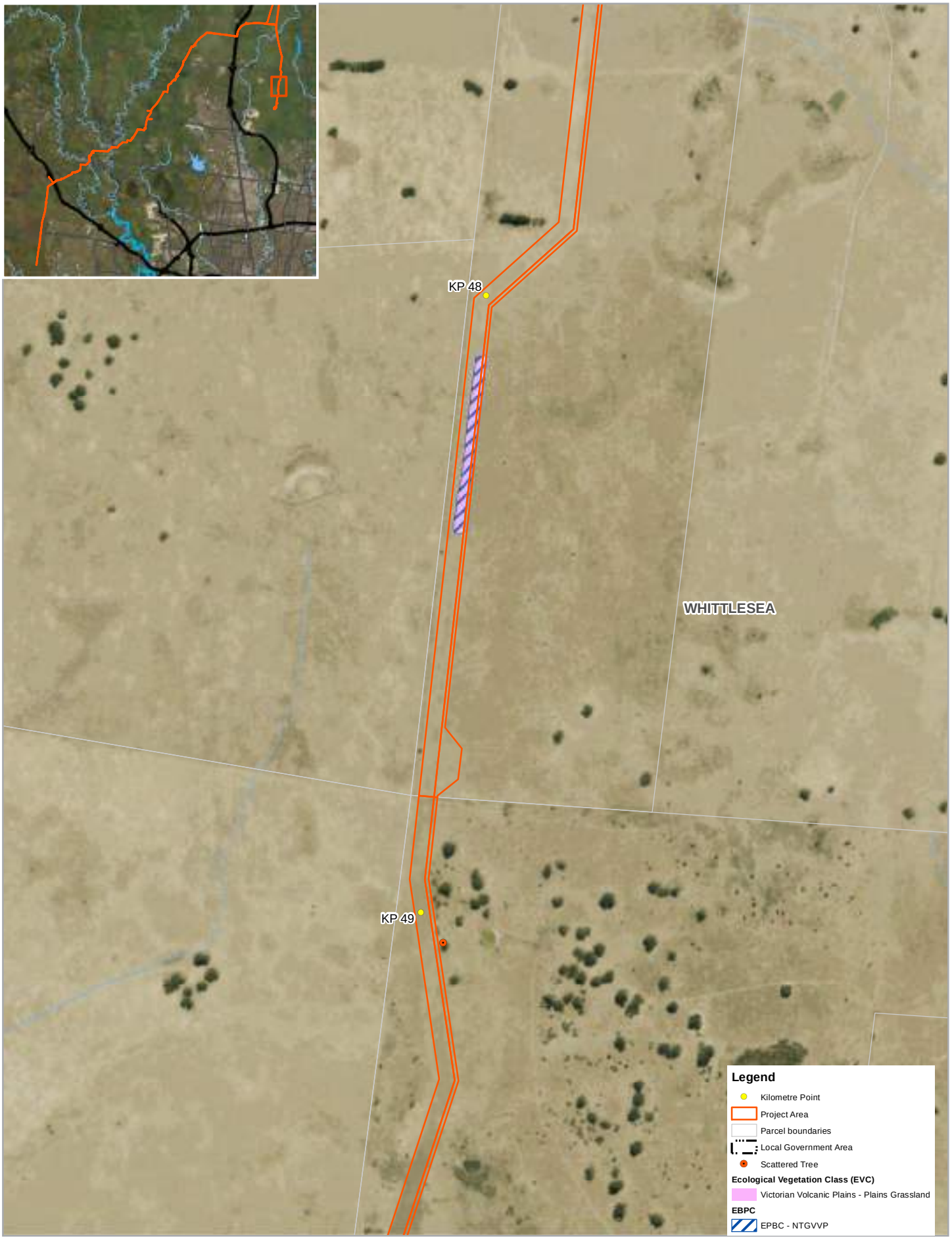
Native vegetation
impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.25

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Western Outer Ring Main Gas Project

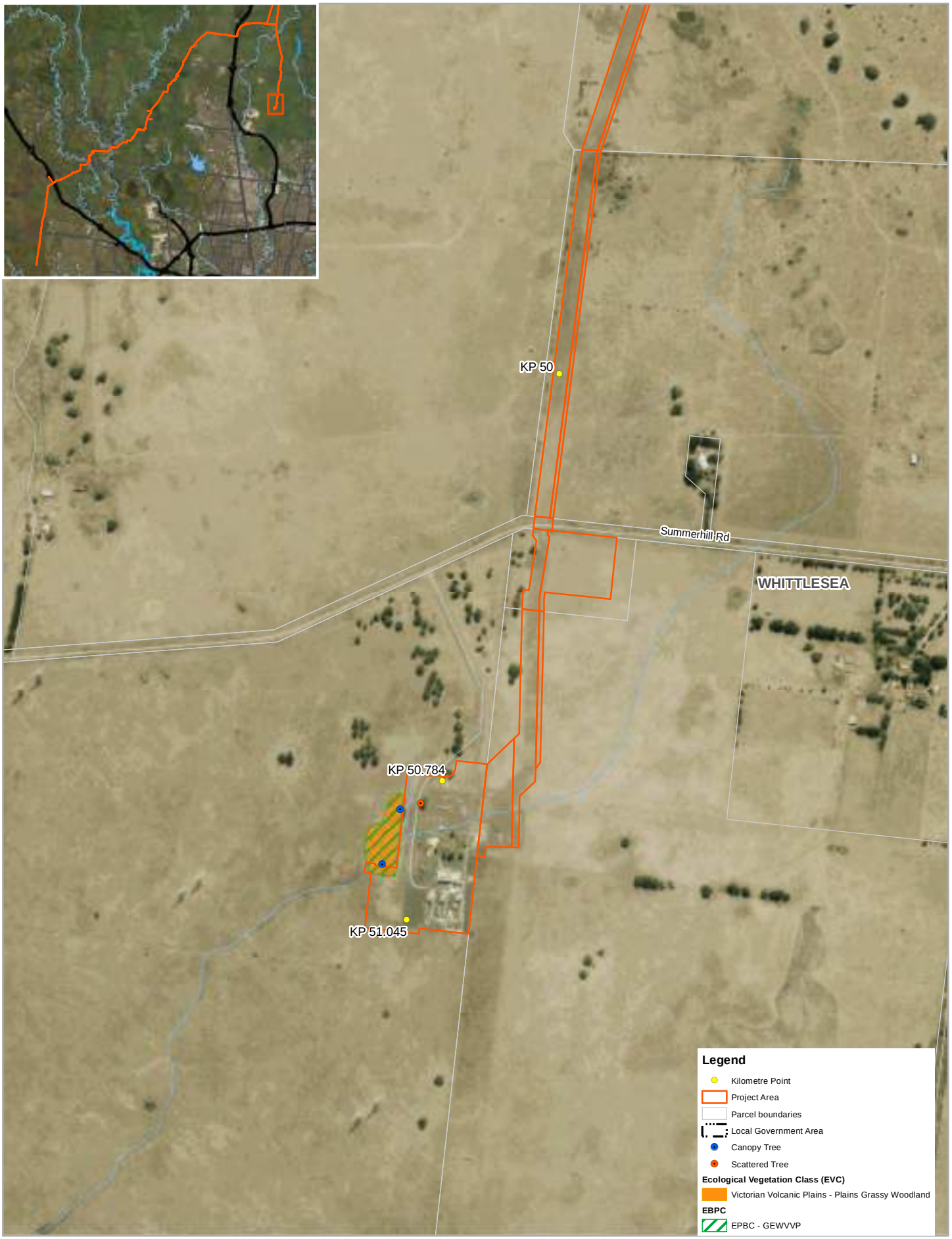
Native vegetation impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.26

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation impacted by construction footprint

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 8.27

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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8.4 Terrestrial fauna values

8.4.1 Summary

A review of desktop information for the Project Area was undertaken to develop a picture of the key issues for assessment and inform measures to avoid and minimise potential effects. A search of the PMST and VBA indicates 58 threatened fauna species occur, or are predicted to occur, in the Study Area (i.e., within 5 km of the Project Area) (Biosis, 2019). These include 23 species (21 threatened species and two Migratory species) with a medium or higher likelihood of occurring in the Project Area. No listed fauna communities were considered relevant to the Project Area (see 6.2.1.1 for Acts under which species and communities were considered).

A total of 20 migratory species have been recorded from, or are predicted to occur within, the Study Area. The majority of migratory species are unlikely to make significant use of, or have important habitat within, the Project Area, with the exception of Latham's Snipe which may visit seasonal wetlands supporting tussock-grasses and rushes as well as vegetated farm dams.

Areas of potential habitat for significant fauna include forest, grassland and grassy woodland habitat, pasture supporting spear grasses and wallaby grasses, grassland dominated by introduced tussock grasses, scattered indigenous and planted eucalypts, wetlands and farm dams, and aquatic habitat along Jacksons Creek, Deep Creek and Merri Creek (Biosis 2019).

Targeted surveys were conducted for Striped Legless Lizard, Golden Sun Moth and Growling Grass Frog. Each of these species was found to occur within parts of the Project Area. Other species that may also be present (e.g., Swift Parrot, Grey-headed Flying-Fox) were not surveyed for and their likelihood of presence was based on incidental observations, desktop data and habitat assessment. For these wide-ranging and highly-mobile species, targeted surveys were considered unlikely to add value to the assessment, because not detecting the species would not provide confidence in a conclusion of absence.

Surveys were also not conducted for some species with more localised habitats including Brown Toadlet and Tussock Skink. Whilst the Brown Toadlet was awarded a medium likelihood of occurrence (based on a historic record) this species was not surveyed for as it is considered possible that this species no longer persists in Greater Melbourne; the species has not been recorded in the area despite targeted survey where it formerly occurred (Biosis 2020). Tussock Skink records indicate it was already known from the area so presence can be presumed; this was confirmed through Striped Legless Lizard surveys.

Table 34 summarises the species most likely to occur within the Project Area (Biosis, 2019, 2020). A full list of species considered is presented within Appendix K and Appendix L.

Table 34 Terrestrial fauna most likely to occur within the Project Area (adapted from Biosis 2019, 2020)

Scientific name	Common name	Conservation status			Most recent record^	Likelihood to occur within Project Area	Targeted Surveys conducted/ recorded during assessment
		EPBC	FFG	DELWP Adv.			
Threatened fauna							
Lathamus discolor	Swift Parrot	CR	L	e	2009	Medium	No/No
Pteropus poliocephalus	Grey-headed Flying-fox	VU	L	v	No records	High	No/No
Delma impar	Striped Legless Lizard	VU	L	e	2012	High	Yes/Yes

Scientific name	Common name	Conservation status			Most recent record^	Likelihood to occur within Project Area	Targeted Surveys conducted/ recorded during assessment
		EPBC	FFG	DELWP Adv.			
Litoria raniformis	Growling Grass Frog	VU	L	e	2017	High	Yes/Yes
Synemon plana	Golden Sun Moth	CR	L	e	2017	High	Yes/Yes
Hirundapus caudacutus	White-throated Needletail**	VU		v	2014	High	No/No
Egretta garzetta	Little Egret		L	e	1980	Medium	No/No
Stictonetta naevosa	Freckled Duck		L	e	2009	Medium	No/No
Oxyura australis	Blue-billed Duck		L	e	2015	Medium	No/No
Pseudophryne bibronii	Brown Toadlet		L	e	2010	Medium	No/No
Ardea intermedia	Intermediate Egret		L	e	1980	Medium	No/No
Turnix pyrrhothorax	Red-chested Button-quail		L	v	2010	Medium	No/No
Lewinia pectoralis	Lewin's Rail		L	v	1991	Medium	No/No
Porzana pusilla	Baillon's Crake		L	v	2006	Medium	No/No
Falco subniger	Black Falcon		L	v	2007	Medium	No/No
Miniopterus schreibersii oceanensis	Common Bent-wing Bat (eastern ssp.)		L	v	2013	Medium	No/No
Ardea alba modesta	Eastern Great Egret		L	v	2014	High	No/No
Spatula rhynchotis	Australasian Shoveler			v	2005	Medium	No/No
Aythya australis	Hardhead			v	2015	Medium	No/No
Biziura lobata	Musk Duck			v	1996	Medium	No/No
Pseudemoia pagenstecheri	Tussock Skink			v	2016	High	No/Yes
Migratory species							
Gallinago hardwickii	Latham's Snipe				2006	Medium	No/No
Hirundapus caudacutus	White-throated Needletail**	VU		v	2014	High	No/No
Apus pacificus	Fork-tailed Swift				2007	Medium	No/No

** Species listed as threatened and migratory

^ Most recent record from VBA (does not take into account Biosis 2020 survey results)

8.4.2 Desktop assessments

The existing conditions for terrestrial fauna considered throughout this assessment are described in the following sections.

Terrestrial fauna are defined as any fauna that occur in the terrestrial environment that largely reside in the terrestrial environment for all or for dominant life stages. For this Project, amphibians are considered as terrestrial fauna, while platypus and turtles are considered as aquatic fauna (refer to Section 8.5).

This section summarises the results of the ecological database searches relating to terrestrial fauna. A full assessment of the likelihood of occurrence of all threatened and migratory fauna within the Project Area is provided in Appendix K and Appendix L.

8.4.2.1 Matters of national environmental significance

The Protected Matters Search Tool (PMST) identified a number of Matters of National Environmental Significance (MNES) that may occur, or for which suitable habitat may occur within the Study Area.

Threatened Fauna

A total of 23 terrestrial EPBC Act listed threatened fauna species occur or are predicted to occur within the Study Area (Appendix K). This includes six species with a medium or higher likelihood of occurring in the Project Area (see Table 34). Prior to the field assessments, three of these species had been previously recorded within the Biosis Survey Area (BSA) (within 100 m of the proposed Revision 5 pipeline alignment) and/or Project Area (Biosis, 2019; 2020):

- Growling Grass Frog (two records within the Project Area near KP 40.6 within the approved MSA area)
- Golden Sun Moth (eight records within the BSA between KP 30.4-44.6 within the approved MSA area, four records in the Project Area at KP 40, 44.4, 44.6 and 45 within the approved MSA area)
- White-throated Needletail (two records in the Project Area near KP 40.5 within the approved MSA area)

White-throated Needletail is an aerial species which occurs over most habitats but particularly wooded areas (Biosis, 2019). The species migrates from Asia where it is detectable between December and March. Whilst it has the potential to use the aerial space over the entire Project Area, the Project is unlikely to pose a significant risk to the species.

A fourth EPBC Act listed species, the Grassland Earless Dragon, has also historically been recorded within the BSA but is no longer considered likely to occur within the Project Area as discussed below:

The Grassland Earless Dragon record in the Project Area (last recorded in 1990) is near KP 42.7 and inside the approved MSA area. Extensive surveys for this species have been conducted at this location and the surrounding area to the north and west of Melbourne (Robertson and Evans, 2009; 2012) and the species has not been detected (Biosis, 2019). It is accepted that this species is likely to now be extinct within northern Melbourne and potentially within Victoria (Melville et al., 2019). The likelihood of occurrence or potential for significant impact on this species resulting from the Project is considered low (Biosis, 2019) and the species is not considered further.

All threatened and/or migratory fauna predicted to occur by the PMST are combined with the VBA data in lists of threatened and migratory species in Appendix K and Appendix L, along with an evaluation of the likelihood of those species occurring in the Project Area.

Fauna Communities

No fauna communities listed on the EPBC Act have been identified as relevant to the Project Area.

Migratory species

A total of 20 migratory species have been recorded or are predicted to occur within the Study Area (Appendix L). The majority of these species are unlikely to make significant use of or have important habitat within the Project Area, with the exception of Latham's Snipe (Biosis, 2019).

Latham's Snipe may visit seasonal wetlands supporting tussock-grasses and rushes as well as vegetated farm dams (Biosis, 2020). Latham's Snipe does not commonly aggregate in large flocks or use the same habitats as many other migratory shorebird species (DoEE 2017c). Consequently, the Industry Guidelines for Avoiding, Assessing and Mitigating Impacts on EPBC Act Listed Migratory Shorebirds (DoEE 2017c) outline different threshold criteria for identifying important habitat for this species compared to other migratory shorebird species. The threshold criterion for identifying important sites for Latham's Snipe is described as areas that have previously been identified as internationally important for the species, or areas that support at least 18 individuals (DoEE 2017c, in Biosis, 2019). The Project Area does not include any areas of habitat currently recognised as internationally important for this species, nor areas that are considered likely to support at least 18 individuals (Biosis, 2019; 2020). Potentially suitable habitat within the Project Area is largely limited to seasonal wetlands and farm dams and the likelihood of 18 individuals using these areas is considered low due to the limited extent of these habitat areas (Biosis, 2019; 2020).

Two other migratory species may occur within the Project Area occasionally: White-throated Needletail and Fork-tailed Swift.

The White-throated Needletail has previously been recorded from within the Project Area (near KP 40.5 within the approved MSA area). This is an almost entirely aerial species which occurs over most habitats, particularly wooded areas (Biosis, 2019). The species migrates from Asia and is usually detectable in Australia between December and March. Whilst it has the potential to use the aerial space over the entire Project Area, the Project is unlikely to pose a significant risk to the species and the Project Area is not expected to constitute important habitat.

The Fork-tailed Swift breeds in Asia and winters in Australia. Like the White-throated Needletail, it is predominantly an aerial species and it is not limited to particular land habitats. Whilst it has the potential to use the aerial space over the entire Project Area, the Project is unlikely to pose a significant risk to the species and the Project Area is not expected to constitute important habitat.

8.4.2.2 FFG Act listed fauna

A total of 42 FFG Act listed terrestrial fauna species occur (VBA) or are predicted to occur (PMST) within the Study Area (Appendix K). This includes 16 with a medium or higher likelihood in the Project Area (Table 34 and Appendix K). Prior to the field assessments, five of these species had been previously recorded within the BSA and/or Project Area (Biosis, 2019; 2020); three of these are discussed above in 8.4.2.1 and the remaining two species are:

- Red-chested Button Quail (one record from the BSA near KP 42.6 within the approved MSA area)
- Black Falcon (one record from the BSA near KP 42.6 within the approved MSA area)

8.4.2.3 FFG communities

No fauna communities listed on the FFG Act have been identified as relevant to the Project Area.

8.4.2.4 DELWP Advisory Listed fauna

A total of 55 DELWP Advisory listed terrestrial fauna species occur (VBA) or are predicted to occur (PMST) within the Study Area (Appendix K). This includes 22 with a medium or higher likelihood in the Project Area (Table 35 and Appendix K). Prior to the field assessments, six of these species had been previously recorded within the BSA and/or Project Area (Biosis, 2019; 2020); these are discussed in 8.4.2.1 and 8.4.2.2.

8.4.3 Field assessment

8.4.3.1 Fauna habitats

This section describes the habitat values for terrestrial fauna within and around the Project Area based on the findings of both the desktop and field assessments.

The Project Area generally comprises a range of residential, agricultural, open space, commercial, industrial and quarrying, and community facilities-based land uses. Broadly, land across the Project Area is within an urbanisation growth area subject to a current or future Precent Planning Scheme (PSP), or within a green wedge (GHD, 2020).

The majority of the Project Area has been subject to some level of disturbance as a result of farming (predominantly cropping and grazing) and urban development (Biosis, 2020). Native vegetation (which typically represents higher value fauna habitat) still persists within the Project Area though is generally degraded and fragmented, reflecting the area's long history of agricultural land use and more recently, urban development. The Project Area is dominated by pasture grasses and in some areas, extensive tracts of noxious weeds. Shelterbelts and windbreaks are common and mostly consist of non-indigenous trees (Monterey Cypress and Sugar Gums).

Native vegetation mapped within the Project Area consists of scattered native trees, remnant grassy woodland and grassland on private property and along public road reserves within and outside the MSA area. Most native vegetation occurs outside the MSA area (Biosis, 2020). Habitat values within the Project Area comprise extensive areas of grassland (native and exotic). The Project Area also contains small areas of woodland and scattered trees (both native and exotic), some of which are hollow-bearing and which provide a foraging resource and nesting and roosting habitat for fauna. Other habitat features include dams and waterways, areas of embedded rock and rocky outcrops and cracking clay soils (Biosis, 2020).

Riparian corridors along waterways including Jacksons Creek, Deep Creek and Merri Creek, provide contiguous areas of native vegetation and provide important habitat networks for fauna movement. Biosis (2020) noted that patches of trees within the northern extent of the Project Area also contribute to a broader area of open woodland that is unique within the local landscape. These trees can serve as stepping stones for more mobile species such as birds and bats and provide some level of habitat continuity with reserves in the local area, such as the reserve system proposed under the BCS (DEPI, 2013b).

Although habitats in the Project Area are typically degraded and fragmented, threatened fauna can and do persist in the landscape (Biosis, 2020). Areas of potential habitat for significant fauna include forest, grassland and grassy woodland habitat, pasture supporting spear grasses and wallaby grasses, grassland dominated by introduced tussock grasses, scattered indigenous and planted eucalypts within or adjacent to the proposed alignment, wetlands and farm dams within or adjacent to the alignment, and aquatic habitat along Merri Creek, Jacksons Creek and Deep Creek (Biosis, 2020).

Overall, the Project Area is characterised by three main fauna habitat types (Grasslands, Woodlands and Waterways/Wetlands), and these are described below.

Grasslands

Much of the Project Area has been cleared for agricultural purposes. Consequently, the Project Area is now dominated by grasslands, and mostly 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 Project Area are dominated by non-native flora species, and show evidence of frequent or occasional disturbance. Most of the grassland areas are used for grazing or cropping.

Only small patches of grassland within the Project Area appeared to support high proportions of native flora species and very little unmodified grassland remains in the Project Area. Some areas are considered of sufficient quality to qualify as threatened grassland communities: Grassy Eucalypt Woodland of the Victorian Volcanic Plain, Natural Temperate Grassland of the Victorian Volcanic Plain, Western (Basalt) Plains Grassland.

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, sections of this habitat within the Project Area are known to provide suitable habitat for threatened species including Striped Legless Lizard, Golden Sun Moth and Tussock Skink. Each of these were recorded during targeted assessments (Biosis, 2020).

Woodlands

Small parts of the Project Area contain woodland and scattered trees (both native and non-native), some of which are hollow-bearing and which provide foraging, nesting and roosting habitat for fauna (Biosis, 2020). In the Project Area, treed habitats occur mostly along roadways and as wind rows along property boundaries, but also along creeklines and in some larger blocks of remnant native woodland habitat.

Woodland occurs as Plains Grassy Woodland and Riparian Woodland EVCs. Riparian Woodland is present at each of the three main waterway crossings: Deep, Jacksons and Merri Creeks (Biosis, 2020). Large trees which provide important habitat value were recorded in all three Riparian Woodland patches (Biosis, 2020).

A small amount of woodland was found to be of sufficient quality to qualify as Grassy Eucalypt Woodland of the Victorian Volcanic Plain and Western Basalt Plains (River Red Gum) Grassy Woodland (Biosis, 2020; GHD, 2020).

Given that a substantially higher proportion of the Project Area would have supported woodland or grassy woodland habitat 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 Project Area varies widely. Larger patches of remnant woodland are typically of very high quality for woodland fauna and more likely to support threatened fauna (e.g. Swift Parrot). Smaller and narrower patches tend to be of medium quality, but still of value for fauna dispersal. Patches of newly-planted or non-native woodland are typically of low value for woodland-dependent fauna.

The largest patch of woodland in the Project Area is near KP22 and 23 which also correlates to the GEWVVP community, though the Project Area as a whole does not contain much of this habitat type; with the Project Area being dominated by grassland habitats.

Waterways and Wetlands

Watercourses, waterbodies and their margins often provide important habitat for native fauna and flora. The Project Area contains suitable wetland habitat for common and threatened species in the form of creeks, farm dams and other off-stream waterbodies both within and adjacent to the Project Area (Biosis, 2020). The Project Area crosses three main waterways (Jacksons Creek, Deep Creek and Merri Creek) all of which are known to support the threatened Growling Grass Frog (Biosis, 2020). The habitats (and aquatic values) at Jacksons Creek, Deep Creek and Merri Creek are described in more detail in section 8.5.3.

Waterway and wetland habitat occurs both within and outside the MSA area. Within the approved MSA areas, there are Conservation Areas established under the Biodiversity Conservation Strategy for the protection of Growling Grass Frog, its habitat and to preserve connectivity in this area (see section 8.7).

Farm dams assessed were of varying quality with some supporting a high cover of submergent and floating aquatic vegetation, through to those that were dry (when assessed in the summer of 2019/2020). The majority of dams were considered relatively isolated with a small cover of aquatic vegetation. It is acknowledged that under the right conditions, some of currently dry wetlands may re-establish, however in the state in which they were initially assessed, most do not offer habitat for many wetland or aquatic fauna. Subsequently, all dams identified as dry during the summer of 2019/2020 were found to be holding water during November/December 2020.

A majority of dams assessed have been constructed with earth banks/walls built up higher than the surrounding ground level.

Some waterways and wetlands are expected to support common frogs and birds and may on rare occasions support threatened frog and bird species. Habitat assessments were undertaken at thirty-four waterways or dams as part of the Biosis 2020 and GHD 2020 assessments. The threatened Growling Grass Frog was observed at two locations during site assessments (Biosis, 2020) and is discussed further in 8.4.3.2.

8.4.3.2 Threatened species

All threatened fauna identified with potential presence in the Study Area are listed in Appendix K. Most of those species are considered unlikely to occur within the Project Area, as explained in Appendix K.

Habitat assessments were undertaken to determine the likely presence of species and targeted surveys for selected species were completed where the results had a chance of changing the understanding of that species at a particular site based on existing information. The locations of targeted surveys are shown in Figure 9, Figure 10 and Figure 11. Species shown in Appendix K as having a medium or higher likelihood of occurrence within the Project Area are discussed in more detail below. These tend to be the species known to visit or reside in parts of the Project Area, or that may visit the area occasionally and are considered to be of high ecological significance for some other reason (such as those considered to be nationally threatened under the EPBC Act).

A summary of the results of the threatened species' habitat assessment and targeted surveys are shown in Table 35 below. Four threatened species were recorded during targeted surveys: Striped Legless Lizard, Golden Sun Moth, Growling Grass Frog and Tussock Skink. Full survey results and weather conditions during the surveys are provided in Appendix N, Appendix O, Appendix P and Appendix Q.

Four additional EPBC Act listed species that are considered to have a low likelihood of occurrence have also been discussed below as they were identified in the EPBC Act referral decision notice (EPBC Ref. 2019/8569) to "have a real chance or possibility that Project activities will significantly impact" upon them. These species are: Australasian Bittern, Grassland Earless Dragon, Painted Honeyeater and Pink-tailed Worm-lizard.

Table 35 Summary of results of threatened terrestrial fauna targeted surveys

Locations surveyed	Survey Effort	Survey Timing	Number of individuals recorded	Recorded within/outside MSA area?
Striped Legless Lizard				
Western Section (west of Calder Freeway; KP0 to KP9)	5 tile grids	Grids checked once between 5 September 2019 to 29 November 2019 and fortnightly between December 6 and 19 December 2019.	0	Outside
North-west Section (east of Calder Freeway and west of Hume Freeway; KP9 to KP37)	10 tile grids (stratified)		6 (from 2 grid locations) near KP 11	
Northern Section (east of Hume Freeway; KP37 to KP51)	5 tile grids		0	
Golden Sun Moth				
88 parcels	4 surveys; weekly intervals	18 November 2019 to 23 December 2019 and 27 November to 21 January 2021	90 (across 14 parcels from approximately KP 10 to KP 51)	Both
20 parcels	1 – 3 surveys			
1 parcel	Not surveyed (due to access and/or weather)			
Growling Grass Frog				
31 waterbodies (3 streams and 28 dams) within 100 m of construction corridor	Diurnal survey – habitat identification	17 December 2019 to 15 December 2020	1 incidental (Deep Creek – assumed presence) Presence also assumed at Jacksons and Merri Creeks	Both
19 waterbodies (18 dams and 1 waterway)	2 Nocturnal surveys		Multiple Growling Grass Frogs recorded in 1 dam near KP 40 (5 adults and 3 metamorphs) approximately 100 m from construction corridor	
Tussock Skink				

Locations surveyed	Survey Effort	Survey Timing	Number of individuals recorded	Recorded within/outside MSA area?
Incidental observations during Striped Legless Lizard tile surveys (see Striped Legless Lizard locations)	20 grids	See Striped Legless Lizard	93 records (across 10 grids)	Both

8.4.3.3 EPBC Act Matters of national environmental significance- listed threatened fauna

Swift Parrot, *Lathamus discolor* (EPBC, critically endangered; FFG, Listed; DELWP, endangered)

The Swift Parrot is a winter migrant to Victoria (and other parts of south-eastern Australia) from breeding areas in Tasmania. In Victoria, it prefers dry, open eucalypt forests and woodlands, especially Box-Ironbark Forest in north-central Victoria. Occasionally, this species is recorded in urban parks, gardens, street trees and golf courses with flowering ornamental trees and shrubs. Typically, small numbers of birds fly through the Melbourne area on their northerly and southerly migrations, mostly *en route* to or from central or western Victoria and further north. Birds are reported sporadically in small numbers across Melbourne (mainly in the northern and north-western suburbs) in most years, where suitable eucalypts occur and flower at appropriate times of the year.

The Swift Parrot is known to forage in a wide variety of eucalypt species. Species that appear to be particularly favoured in Victoria include: Grey Box (*Eucalyptus microcarpa*), Red Ironbark (*E. tricarpa*), Mugga Ironbark (*E. sideroxylon*), Yellow Gum (*E. leucoxylon*), White Box (*E. albens*) and Yellow Box (*E. melliodora*) (DNRE 2003 and Saunders and Tzaros 2011).

This species was not detected during the assessment. Targeted surveys for this species in the Project Area were not done, due to: i) the low likelihood of detecting the species, and ii) the fact that not detecting the species would not increase confidence in a conclusion that the species is absent. Additionally, habitat assessment can be used to predict the importance of feeding habitat (Biosis, 2020). Through desktop investigations and field habitat assessments, it was determined that the Swift Parrot has the potential to make occasional use of scattered indigenous or planted eucalypts within or adjacent to the Project Area on rare occasions; including favoured food trees Grey Box, Yellow Box and Yellow Gum which are present in the Project Area, though River Red-gum was most prevalent. The Project is unlikely to pose a significant risk to the species and the Project Area does not constitute critical habitat (Biosis, 2020).

Grey-headed Flying-fox, *Pteropus poliocephalus* (EPBC, vulnerable; FFG, Listed; DELWP, vulnerable)

The Grey-headed Flying-fox uses a wide range of habitats in Victoria, from lowland rainforest and coastal Stringybark forests to agricultural land and suburban gardens. It occurs across the Melbourne area, foraging in densely vegetated flowering and fruiting trees.

Roosts (camps) in the Melbourne area are well-documented and it is unlikely that any occur within or near the Project Area. Survey for the species was not considered necessary as an assessment of vegetation can be used to predict and rank the importance of feeding habitat. Whilst the species has not been recorded within Project Area (VBA), the species may utilise flowering indigenous and planted trees within or adjacent to the Project Area for foraging (Biosis, 2020).

The vegetation within the Project Area is not considered to constitute important or limiting habitat for the species and the proposed works are considered highly unlikely to have a significant impact on this highly mobile species (Biosis, 2020).

Striped Legless Lizard, *Delma impar* (EPBC, vulnerable; FFG, Listed; DELWP, vulnerable)

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 Project Area has been subject to agricultural practices, 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 Project Area contains some areas of vegetation (habitat) considered to have a high likelihood of supporting Striped Legless Lizard populations, through to areas with a low likelihood of supporting the species (Biosis, 2020).

Tile grid surveys were undertaken in 2019 (Biosis, 2020), focussing on areas of native grassland and to a lesser extent exotic grassland that contained appropriate habitat structure (tussock grasses, embedded and surface rock). Habitat considered unlikely to support the species included land subject to historic and/or ongoing significant ground disturbance such as cropping and ploughing. No sampling was undertaken in those areas (Biosis, 2020).

Striped legless lizards were recorded in two of the 20 grids deployed across the Project Area within one parcel at approximately KP 10.7, outside the MSA area. Grid and species record locations are provided in Appendix N.

The two grids where Striped Legless Lizards were detected were Grids 6 and 7 on 12LP92520 (Appendix N). From these grids, six individual lizards were found to occur (determined from head scale analysis) (Biosis, 2020). These records are approximately 3.9 km north of the nearest known VBA record within Organ Pipe National Park and is the first record observed within Hume City Council. There are also records of the species to the east (between Craigieburn and Campbellfield), to the west (Deer Park) and the north (Redesdale). These records are within the area shown as “species or species habitat likely to occur” according to the modelled distribution (DSEWPAC 2011d).

Based on the definition of important populations in the conservation advice for the species (TSSC 2016), the population found on 12LP92520 is an important population. TSSC (2016 pp. 4) states: “All populations of the striped legless lizard are likely to be important for the species recovery” and “...it is considered that when one or more individuals are found on a site that they are members of an important population”.

Based on the results of the targeted surveys, all patches of native and non-native vegetation within the Project Area in 12LP92520 are confirmed habitat. This is in accordance with the Striped Legless Lizard referral guidelines: “If the species is detected during a survey, all potentially suitable habitat at the site should be considered occupied by the species” (Commonwealth of Australia 2011). The native and non-native vegetation in the adjacent parcel (11LP92520; 0.18 ha) that is contiguous with (west of) the native vegetation in 12LP92520 (0.49 ha) is therefore also considered confirmed habitat. The total area of confirmed Striped Legless Lizard habitat within the Project Area is 0.67 ha (Table 36).

Habitat assessment outside the Project Area was undertaken within both 12LP92520 (confirmed habitat) and 11LP92520 (adjacent habitat). Suitable habitat for the species was confirmed to occur across the extent of the parcel where the species is confirmed (excluding the waterway area) but was not identified in the adjacent parcel outside the Project Area.

The highest quality habitat in the Project Area was sampled and the species was detected at two grids in that area. No Striped Legless Lizards were detected at any of the other 18 tile arrays. Whilst there is some confidence that the species does not occur in any other habitat patches traversed by the Project Area and in parcels sampled with a tile array, there are numerous parcels that were not surveyed using tile arrays and where there is little context about the residency of the species in the areas immediately adjacent to the Project Area. The quality of the habitat for much of the area considered as potential habitat is marginal and the likelihood of the species occurring there is considered low.

However, following consultation with DELWP, a conservative approach has been adopted whereby the species is presumed present in all areas containing suitable habitat for the species. This includes areas where targeted surveys have been undertaken and areas where they have not been undertaken.

One parcel occurs where access was not permitted so the suitability of habitat could not be determined. The Striped Legless Lizard is assumed to be present in this location.

Table 36 Extent of Striped Legless Lizard habitat outside the MSA area

Species' habitat presence/absence	Striped Legless Lizard surveys	Extent of Project Area (ha)
Habitat Present (habitat where species detected)	15 surveys completed – species detected (12LP92520)	0.49
Habitat Assumed (potential habitat where species assumed to be present)	Parcel adjacent confirmed habitat (11LP92520)	0.18
	No access to assess habitat (4LP126752)	1.0
	15 surveys completed – species not detected	14.73
	10 surveys completed – species not detected	2.17
	Habitat present – not surveyed	20.74
Total area considered habitat		**39.34**
Habitat Absent (no suitable habitat)	No surveys	50.39
Total area not considered habitat		**50.39**
Total Project Area outside MSA		**89.73**

*Note this extent does not exactly equal the total extent of the current Project Area (89.68 ha outside of the MSA) due to minor overlap in parcel boundaries.

Growling Grass Frog, *Litoria raniformis* (EPBC, vulnerable; FFG, Listed; DELWP, vulnerable)

The Growing Grass Frog is a member of the 'Bell Frog' species complex (Anura: Hylidae) and is distributed across a large portion of south-east Australia. In Victoria it was previously widespread and common, absent only from the driest and highest parts of the state. In the last few decades, the species suffered widespread population declines and has now disappeared from most of its former range. Causes of this decline are likely to be multifactorial and include invasion by the novel disease Chytridiomycosis, caused by the Amphibian Chytrid Fungus. On-going loss of habitat and habitat connectivity may have increased the severity and consequence of the disease, by limiting genetic resilience in the frogs.

The species is found mostly amongst non-shaded emergent vegetation, including rushes, reeds and sedges, in or at the edge of still or slow-flowing water bodies such as lagoons, swamps, lakes, ponds and farm dams. Growling Grass Frogs may utilise permanent or semi-permanent waterbodies. Persistence of the species now appears to depend on access to a matrix of connected wetlands/waterbodies/waterways, rather than one wetland alone (Heard, 2013). Typical habitats include lowland grasslands, open vegetated wetlands, flooded paddocks and drains. Floodplains tend to provide suitable habitat for this species, in that they are predominantly wet and contain a range of waterbody types.

Habitat suitable for this species was identified from a combination of desktop information and onsite rapid assessments. Twelve waterbodies (outside of the MSA area) identified as potential Growling Grass Frog habitat were dry during initial inspection and hence were not subject to targeted survey in 2019/20 (Biosis, 2020) (Table 39). A total of eight waterbodies were found to contain water and had at least some habitat attributes known to be positively associated with occupancy by Growling Grass Frog at the time of assessment, and thus warranted a targeted survey (Biosis 2020). Rainfall was higher leading up to the 2020/21 breeding season for the species and subsequent habitat assessments found that 10 of the 12 ‘dry’ waterbodies contained water during November and December 2020 habitat assessments, the remaining two waterbodies could not be accessed (permission not granted) but were assumed to also contain water. Subsequently, those waterbodies that were expected to be directly impacted were subject to nocturnal survey in the 2020/21 season. The locations of targeted surveys are provided in Appendix Q.

Growling Grass Frogs were recorded within Deep Creek and also within an offline waterbody within the approved MSA area near KP 40. Growling Grass Frogs have been previously recorded from the three major streams (Jacksons, Deep and Merri Creeks) crossed by the Project Area (Biosis 2020). Consequently, Jacksons and Merri Creeks were not surveyed and presence of Growling Grass Frogs at these waterways is assumed.

Growling Grass Frogs were also recorded in a farm dam supporting a high cover of submergent and floating aquatic vegetation at 10LP5364 (Biosis, 2020). The presence of multiple individuals, including metamorphlings, indicates this waterbody was a breeding site in 2019/20. A dam less than 100 metres north-east of the occupied dam was dry at the time of inspection but, due to its proximity, is considered likely to support the species when it contains water (Biosis, 2020). These dams span both 10LP5364 and 1LP113763. Both dams lie within the approved MSA area (Biosis, 2020).

Growling Grass Frog surveys were undertaken over two nights each at 19 locations outside the MSA (Biosis 202 and GHD 2020) area though no individuals were detected (Table 37). The species is known or assumed to be present at only two locations outside of the MSA area: Deep and Jacksons Creeks (Table 38), one of which is expected to be HDD (Deep Creek).

Growling Grass Frogs were not recorded in any offline waterbodies outside the approved MSA areas surveyed during the 2019/20 or 2020 active season. Most of the dams surveyed were considered to have a low probability of supporting the Growling Grass Frog due to their relative isolation (distance to known Growling Grass Frog populations) and low proportional cover of aquatic vegetation (Biosis, 2020).

Based on the definition of important populations in the significant impact guidelines for the species (DEWHA 2009), any populations that occur at the two locations outside the MSA areas would be considered important. According to DEWHA (2009): “Any viable population is considered an important population for the persistence and recovery of the Growling Grass Frog. For this species, a viable population is one which is not isolated from other populations or water bodies, such that it has an opportunity to interact with nearby populations or has the ability to establish new populations when water bodies fill and become unavailable.”

Table 37 Locations considered for Growling Grass Frog surveys outside the MSA area

Growling Grass Frog habitat	No. of locations (parcels)
Locations surveyed for potential habitat (day survey)	31
Locations recommended for night survey	24
Locations where access was unavailable - not assessed during the day or night	Day 0, night 11

Table 38 Summary of Growling Grass Frog presence and absence outside the MSA area (Biosis 2020 and GHD 2021)

Species/habitat presence/absence	Location
Present	2002PP2258 – Deep Creek (observed during night survey) (KP 16.7)
Assumed present	2029PP2761 and 2010PP2258 – Jacksons Creek (KP 13.7)
Absent (surveys completed and species not detected)	2PS343496 – Tame Street Drain and 1 x dam (KP 8.3-8.7)
	11LP92520 – 1 x dam (KP 10.5 to 10.6)
	12LP92520 – 1 x dam and associated drainage line (KP 10.6 to 10.8)
	13LP92520 – 1 x dam (KP 10.8-11.1)
	2LP137651 – 1 x dam (KP 11.2 to 11.3)
	1LP137651 – 1 x dam (KP 11.3 to 11.5)
	D16PP2761 – 1 x dam (KP 11.5 to 12.0)
	2LP130112 – 1 x dam (KP 17.6 to 17.9)
	1LP130112 – 1 x dam (KP 17.9 to 18.3)
	B7PP2258 – 2 x dam (KP 18.3 to 19.0)
	10LP110642 – 1 x dam (KP 19.4-20.2)
	1PS733045 – 1 x dam (KP 22.7-24.2)
	32LP93445 – 1 x dam (KP 27.0 to 27.4)
	PPS816942 – 1 x dam (KP 29.1-30.3)
	1LP126752 – 1 x dam (KP 31.1 to 31.3)

Table 39 Locations where suitable habitat was identified but night surveys were not completed (outside of the MSA area)

Parcel	KP	Comment
1TP710576	9.1 to 9.2	Waterbody outside Project Area – 14 m
1TP333383	12.9 to 13.7	Waterbody outside Project Area – 30 m
5LP88261	19.0 to 19.4	Waterbody outside Project Area – 27 m

Golden Sun Moth *Synemon plana* (EPBC, critically endangered; FFG, Listed; DELWP, vulnerable)

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 Project Area has been subject to agricultural practices, 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.

A total of 90 Golden Sun Moths were recorded in areas within and outside of the approved MSA areas from approximately KP 10 through to KP 51 (Table 35, Table 40 and Appendix O).

Overall, 111 parcels were identified as containing potentially suitable habitat. The completeness of these surveys was constrained by access restrictions and weather constraints, however the following surveys were undertaken:

- Four rounds of surveys in 88 parcels
- One to three rounds of surveys in 20 parcels (of which 13 are within the MSA)
- No surveys in one parcel

Golden Sun Moths were detected within the construction corridor in 14 parcels (Appendix O). Seven of these parcels lie wholly within the approved MSA areas. Two parcels where Golden Sun Moths were recorded have contiguous suitable habitat both within and outside of the approved MSA areas and the remaining five are outside of the MSA area (Table 40).Where GSM have been found within a parcel that overlaps the MSA area the portion of the parcel outside of the MSA has been considered to support the species regardless of whether the actual location of the record was inside or outside the MSA area.

Table 40 Summary of Golden Sun Moths detected during surveys

Parcel	# valid surveys	Total # Golden Sun Moth recorded	Parcel inside/outside MSA area
11LP215406	2	2	Outside
1PS733043	4	18	Outside
1PS733045	4	1	Outside
2LP218323	4	1	Outside
32LP93445	1	1	Outside
GPS806997/PPS816942	4	2	Outside/Inside
1PS714688	4	41	Outside/Inside
CPS805151	3	1	Inside
6TP394032	2	2	Inside
1TP746632	3	1	Inside
2LP133657	4	1	Inside
1TP168481	4	4	Inside
1TP710356	4	11	Inside
2LP130336	4	4	Inside
Total		**90**	

Where four valid surveys were conducted with no moths found, the species is considered absent for the purposes of this assessment (DEWHA, 2009b). Based on the results of the 2019/20 and 2020/21 surveys, Golden Sun Moth is considered absent from 81 parcels within the construction corridor. This is in addition to 24 parcels which were not surveyed due to lack of suitable habitat for the species (Appendix O).

Based on the survey data, confirmed Golden Sun Moth habitat within the Project Area outside the MSA area is approximately 19.93 ha (Table 41 and Table 42). This includes areas where Golden Sun Moth were detected during targeted surveys and areas where habitat was identified but four targeted surveys were not completed.

Table 41 Extent of Project Area considered for Golden Sun Moth surveys outside the MSA area

Golden Sun Moth habitat	Extent of Project Area (ha)
Suitable habitat – surveyed	76.45
No suitable habitat – not surveyed	13.13
Total	**89.59***

*Note this extent does not exactly equal the total extent of the current Project Area (89.68 ha outside of the MSA) due to minor overlap in parcel boundaries.

Table 42 Extent of known and assumed Golden Sun Moth habitat outside the MSA area

Species/habitat presence/absence	Golden Sun Moth surveys	Extent of Project Area (ha)
Known habitat – species present	Surveys completed – species detected	11.05
	Surveys incomplete – species detected	0.80
Potential habitat – species assumed present	Surveys incomplete – species not detected	8.08
Total area considered habitat		**19.93**
Potential habitat	Surveys completed – species not detected	56.53
No suitable habitat	No surveys	13.13
Total area not considered habitat		**69.66**

The locations of Golden Sun Moth surveys and records are provided in Appendix O.

White-throated Needletail, *Hirundapus caudacutus* (EPBC, vulnerable; DELWP, vulnerable)

This species is reported to be almost exclusively aerial within Australia, although birds are reported to roost in trees at least occasionally (Corben et al., 1982; Day, 1993; Quested, 1982; Tarburton, 1993 in Department of Environment, 2018a). This species occurs over most types of habitat, particularly wooded areas, including forest and rainforest and less commonly above woodland.

The species has previously been recorded within the Project Area near KP 40.5 within the approved MSA area, though was not detected during field assessments for this Project (Biosis, 2019; 2020).

White-throated Needletails are likely to forage occasionally in the airspace of the Project Area, but unlikely to have a substantial association with the terrestrial habitats and the Project is unlikely to pose a significant risk to the species.

Australasian Bittern, *Botaurus poiciloptilus* (EPBC, endangered; FFG, listed; DELWP, endangered)

The Australasian Bittern is a cryptic species, rarely seen or reported. The species prefers dense tall vegetation in permanent freshwater swamps and wetlands, particularly when dominated by sedges, rushes and reeds.

Field habitat assessment determined that suitable wetland habitat for this species does not occur within the Project Area. Additionally, the species has not been observed in the Project Area for more than 30 years, last recorded in 1989 (VBA) (Biosis, 2020). It was determined that the likelihood of this species occurring within the Project Area is low (Biosis, 2020).

Grassland Earless Dragon, *Tympanocryptis pinguicolla* (EPBC, endangered; FFG, listed; DELWP, endangered)

The Grassland Earless Dragon is associated with natural temperate grasslands. It has previously been recorded in the Project Area (one record from 1990 within the Project Area near KP 42.7 inside the approved MSA areas; though Museum Victoria question the validity of this record, the last confirmed record in Victoria is 1969 (Melville et. al 2019). Extensive surveys for this species have been conducted at this location and the surrounding area to the north and west of Melbourne (Robertson and Evans 2009/2012) and the species has not been detected (Biosis 2019). It is accepted that this species is likely to now be extinct within northern Melbourne and potentially within Victoria [Melville et al., (2019), as cited in Biosis (2020)]. The likelihood of occurrence within the Project Area or potential for interaction with the Project is considered low (Biosis, 2019).

Painted Honeyeater, *Grantiella picta* (EPBC, vulnerable; FFG, listed; DELWP, vulnerable)

The Painted Honeyeater is a nomadic or migratory, uncommon species. Its habitat is forest, woodland, dry scrub, often with abundant mistletoe. This species is rarely recorded in the Melbourne area and is more typically found in northern Victoria. There is a possibility that this species is a rare visitor to any well-treed areas, though it has never been recorded from within the Project Area.

The likelihood of occurrence within the Project Area or interaction with the Project is considered low (Biosis 2019).

Pink-tailed Worm-lizard, *Aprasia parapulchella* (EPBC, vulnerable; FFG, listed; DELWP, endangered)

The Pink-tailed Worm-lizard is found in woodland and grassland with partially buried rocks. In Victoria the only known population is around Bendigo. There is a single record of this species approximately 30 km west of the Project Area near Ballan though this is a known database location error and is actually located at One Tree Hill reserve, Bendigo.

There are no known populations of this species in the Melbourne area. The likelihood of occurrence or potential for interaction with this species resulting from the Project is considered low (Biosis 2019).

8.4.3.4 EPBC Act Matters of national environmental significance- listed Migratory species

Twenty species (all birds) known or predicted to occur within the Study Area are listed as Migratory under the EPBC Act. These species are listed in Appendix L. The Migratory listing of some Australian fauna under the Commonwealth EPBC Act is intended to protect and conserve habitat within Australia for species that depend on habitats within and outside Australia. While some of those species may use or visit habitats within the Project Area occasionally, the majority of these species are unlikely to make significant use of or have important habitat within the Project Area, with the exception of Latham's Snipe which may visit seasonal wetlands supporting tussock-grasses and rushes as well as vegetated farm dams (Biosis, 2020).

The White-throated Needletail and Fork-tailed Swift have also been specifically addressed, given their higher likelihood of occurrence within the Project Area.

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

- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species

The significant impact criteria for Migratory species are addressed in Appendix Z.

Latham's Snipe, *Gallinago hardwickii (EPBC Act, Migratory; DELWP, near-threatened)*

Latham's Snipe is listed as Migratory under the EPBC Act and as Near Threatened on the Advisory List of Threatened Vertebrate Fauna in Victoria (DSE, 2013). Latham's Snipe is a summer migrant/visitor to south-eastern Australia, returning each year to Japan and eastern Russia to breed during the northern summer. This species is present in southern Australia only during the warmer months, from August to March.

Latham's Snipe is a highly mobile species that forages in wet and flooded grasslands that are subjected to little disturbance. Preference of habitat does not appear to be determined by the diversity of native or introduced plants, but more related to the availability of suitably damp/wet habitat, food resources and level of disturbance (particularly people on foot, and presence of dogs). The species is omnivorous and feeds predominately on seeds, plant material and invertebrates.

For Latham's Snipe, if the habitat regularly supports 18 or more individuals, or has been identified as internationally important for the species, then it should be considered important habitat (Commonwealth of Australia, 2015). Within the Project Area, Latham's Snipe may visit seasonal wetlands supporting tussock-grasses and rushes as well as vegetated farm dams (Biosis, 2020). The Project Area does not include any areas of habitat currently recognised as internationally important, nor areas that are considered likely to support at least 18 individuals of this species (Biosis, 2019; 2020). Habitat within the Project Area is largely limited to seasonal wetlands and farm dams and the likelihood of 18 individuals using these areas is considered low due to the limited extent of these habitat areas (Biosis, 2019; 2020).

White-throated Needletail, *Hirundapus caudacutus* (EPBC, vulnerable/migratory; DELWP, vulnerable)

This species is reported to be almost exclusively aerial within Australia, although birds are reported to roost in trees at least occasionally (Corben, et al.; 1982, Quested, 1982; Day, 1993; Tarburton, 1993 in Department of Environment, 2018a). This species occurs over most types of habitat, particularly wooded areas, including forest and rainforest and less commonly above woodland.

The White-throated Needletail has previously been recorded from within the Project Area (near KP 40.5 within the approved MSA area) though was not detected during field assessments for this Project (Biosis, 2019; 2020). This is an almost entirely aerial species which occurs over most habitats, particularly wooded areas (Biosis, 2019). The species migrates from Asia and is detectable in Australia between December and March. Whilst it has the potential to use the aerial space over the entire Project Area, the Project is unlikely to pose a significant risk to the species and the Project Area is not expected to constitute important habitat.

Fork-tailed Swift*, Apus pacificus* (EPBC migratory)

The Fork-tailed Swift breeds in Asia and winters in Australia. Like the White-throated Needletail, it is predominantly an aerial species and it is not strongly associated with particular land habitats. The species has not been observed within the Study Area since 2007. Whilst it has the potential to use the aerial space over the entire Project Area, the Project is unlikely to pose a significant risk to the species and the Project Area is not expected to constitute important habitat.

8.4.3.5 State listed threatened species

Little Egret, *Egretta garzetta* (FFG, Listed; DELWP, endangered)

The Little Egret's preferred habitats vary widely and include shallow fresh, brackish or saline wetlands that are largely un-vegetated.

This species is known to be present in the Study Area most recently from 2008 (VBA). Suitable habitat occurs in the Project Area, and this species is considered to be an occasional visitor for foraging in wetland habitat located within and immediately adjacent to the Project Area (Biosis, 2019; 2020).

The Project is unlikely to pose a significant risk to the species and the Project Area does not constitute important habitat (Biosis, 2020).

Intermediate Egret, *Ardea intermedia* (FFG, Listed; DELWP, vulnerable)

This species is found in densely vegetated wetlands. It occurs in lakes, wetlands and billabongs.

The species was most recently recorded within the Study Area in 1980 (VBA). The Intermediate Egret is more common in northern Victoria than in southern Victoria and is likely to be an occasional visitor to wetland habitat located within and immediately adjacent to the Project Area (Biosis, 2019; 2020).

The Project is unlikely to pose a significant risk to the species and the Project Area does not constitute important habitat (Biosis, 2020).

Eastern Great Egret, *Ardea modesta* (FFG, Listed; DELWP, vulnerable)

This species prefers shallow water, particularly when flowing, but may be seen on any watered area, including damp and flooded grasslands.

The species was most recently recorded within the Study Area in 2014 (VBA). The Eastern Great Egret is commonly seen around Melbourne and is expected to utilise a range of wetlands within and immediately adjacent to the Project Area (Biosis, 2019; 2020). It is a wide-ranging mobile species that frequently visits a variety of wetland habitats across and beyond Victoria.

The Project is unlikely to pose a significant risk to the species and the Project Area does not constitute important habitat (Biosis, 2020).

Brown Toadlet, *Pseudophryne bibroni* (FFG, Listed; DELWP, endangered)

Toadlets are small (<30 millimetres), 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.

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

Toadlets appear to be most threatened by habitat loss, habitat degradation and a gradual drying out of the landscape as groundwater tables retreat. Their status with respect to the Amphibian Chytrid Fungus is unknown.

The Brown Toadlet was last recorded in the Study Area in 2010. It is considered possible that the species is now extinct in the Greater Melbourne area, as the species has not been recorded for many years, despite targeted surveys at sites where it formerly occurs (Biosis, 2020).

Red-chested Button Quail *Turnix pyrrhothorax* (FFG, Listed; DELWP, endangered)

This species occupies grassland on black-soil plains and other flat, heavy soil country, grassy woodland and crops. The species was last recorded within the Study Area in 2010 (VBA) near Donnybrook. Red-chested Button Quail may potentially utilise grassland habitats throughout the Project Area, however the species is infrequently recorded in southern Victoria.

The Project is unlikely to pose a significant risk to the species. If present within the Project Area, this species may be detected while undertaking surveys for other grassland species such as Golden Sun Moth and Striped Legless Lizard. The species was not detected during the field assessments.

Whilst this species may be present in low numbers across the Project Area in suitable habitat, given the paucity of records and the species' ability to move from harm's way if present; the Project is unlikely to pose a significant risk to the species and the Project Area does not constitute important habitat.

Lewin's Rail, *Rallus pectoralis* (FFG, Listed; DELWP, vulnerable); **and**

Baillon's Crake, *Porzana pusilla* (FFG, Listed; DELWP, vulnerable)

These two species are secretive species that prefer densely vegetated wetlands, and are rarely seen or reported. These species potentially occur within the Project Area in any wetland supporting dense, fringing, emergent long or tussock-grass, reeds and rushes including well vegetated large farm dams. The Project Area contains suitable habitat for these species, particularly along the main waterway corridors.

Whilst no specific targeted surveys for these species were undertaken, if present they may have been detected whilst undertaking other species specific targeted surveys across the Project Area, such as during the wetland and waterway habitat assessments and targeted surveys for Growling Grass Frog (Biosis, 2020). Neither of these species was detected during assessments.

The largest areas of suitable habitat for these species in the Project Area are at the two main waterways that are to be open trench construction (Jacksons and Merri Creeks) and there is potential for minor temporary disturbance to these species if present.

Black Falcon, *Falco subniger* (FFG, Listed; DELWP, vulnerable)

Whilst the Black Falcon occurs across much of Australia, its stronghold and breeding region is interior Queensland and north western Victoria, where its core habitat is semi-arid and arid woodlands. It uses tree-lined water-courses, isolated stands of trees, hunts over low vegetation of surrounding plains, grasslands, saltbush and blue-bush. It also often hunts over wetlands (Morcombe, 2004).

This species is likely to be an occasional visitor to the Project Area, but no part of the Project Area is expected to constitute critical habitat.

Common Bent-wing Bat (eastern ssp.), *Miniopterus schreibersii oceanensis* (FFG, Listed; DELWP, vulnerable)

The Common Bent-wing Bat is a cave-roosting and cave-breeding species, but also uses manmade structures such as abandoned mines and road culverts (Churchill, 2008). Populations are centred on maternity caves, and individuals disperse to other caves during the non-breeding season. It is considered to be a mostly uncommon bat, particularly in the Melbourne suburban area.

This species forages above the canopy, and is likely to forage occasionally in the airspace of the Project Area, particularly along the waterways and in larger patches of vegetation. It is unlikely that any maternity caves occur within or immediately adjacent to the Project Area (Biosis, 2020). Targeted surveys for this species were not undertaken.

The Project is unlikely to pose a significant risk to the species and the Project Area does not constitute important habitat.

Freckled Duck, *Stictonetta naevosa* (FFG, Listed; DELWP, endangered)

Australasian Shoveler, *Anas rhynchotis* (DELWP, vulnerable)

Hardhead, *Aythya australis* (DELWP, vulnerable)

Blue-billed Duck, *Oxyura australis* (FFG, Listed; DELWP, endangered)

Musk Duck, *Biziura lobata* (DELWP, vulnerable)

These five duck species use a wide range of habitats and occupy a large distributional range. The Shoveler and Freckled Duck are filter-feeding ducks and use well vegetated larger wetlands, dams and lakes. The Blue-billed and Musk Ducks are diving ducks that tend to prefer deep open water in wetlands, dams, lakes and slow-flowing rivers. The Hardhead is also a diving duck, but has the least habitat specificity of these species. It uses deep permanent wetlands, dams, lakes, slow-flowing rivers, as well as brackish wetlands and water storage ponds, and occasionally estuarine and littoral habitats such as saltpans, coastal lagoons and sheltered inshore waters.

There is potential wetland habitat within and immediately adjacent to the Project Area. The Project is unlikely to pose a significant risk to the species and the habitats within the Project Area do not constitute important habitat.

Tussock Skink *Pseudemoia pagenstecheri* (DELWP, vulnerable)

Tussock Skinks are associated with tussock grasslands with few or no trees (Wilson and Swan, 2003), they are known to occur in the Project Area and were most recently recorded in 2012 (VBA) (Biosis, 2020).

This species was detected incidentally during the Striped Legless Lizard tile grid surveys. The species was recorded from 10 of the 20 grids a total of 93 times (Biosis, 2020) (NB this does not necessarily represent 93 individuals as grids were checked up to 15 times over the survey period). Two of the grids were within the MSA approved area and eight were outside the MSA area. Two-thirds of the records (64) came from a single grid; grid 5, outside the MSA area (Table 43).

This species has the potential to be present in habitat dominated by native or introduced tussock grasses throughout the Project Area (Biosis, 2020) and not just limited to the parcels where they were incidentally observed during tile surveys. They are unlikely to occur in previously cultivated areas (Biosis, 2020).

Table 43 Summary of Tussock Skinks recorded within the Project Area (adapted from Biosis 2020)

Parcel identifier	Grid	Number of records
2LP130336 (within MSA)	11	9
2LP67181 (within MSA)	15	1
2LP119116	3	2
2PS343496	4	1
2LP90878	5	64
12LP92520	6	6
	7	3
1TP333383	9	1

	10	5
B7PP2258	18	1
Total	**10**	**93**

8.4.3.6 Threatened ecological communities (fauna) within the Project Area

EPBC Act-listed and FFG Act listed communities

No fauna communities listed as threatened under the EPBC Act or FFG Act were recorded or are expected to occur within the Project Area.

8.4.3.7 Non-native and pest animals

There are records of 24 non-native terrestrial fauna species in the Project Area, including 14 birds, nine mammals, and one invertebrate (no non-native reptiles or frogs are recorded from the Project Area). These are listed in Table 44. These species vary in their abundance and in their environmental impact. Not all are considered pest species. Species considered to be most detrimental to the natural ecology of the area are identified as having a high level of ecological impact (current).

No CaLP Act listed pest animals have previously been recorded from the Project Area however European Rabbit, European Hare and Red Fox were found to be established across the Project Area (Biosis, 2020). Additionally the non-native House Mouse and Common Starling were also observed during site assessments (Biosis, 2020).

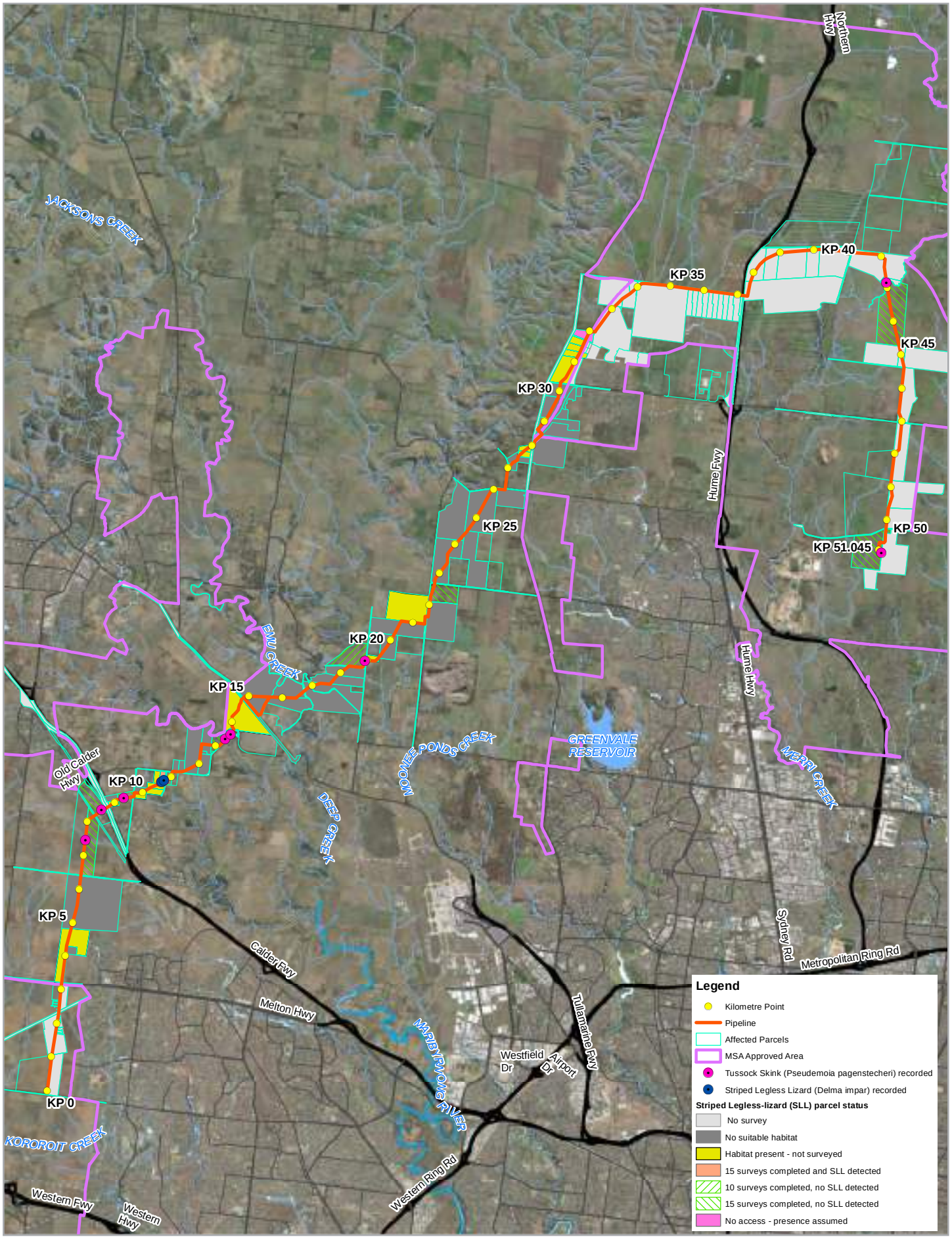
Table 44 Non-native terrestrial fauna identified for the Project Area, with an evaluation of their status as environmental pests

Common name	Scientific name	Level of ecological impact in Project Area (current)
Mammals		
Dingo & Dog (feral)	*Canis familiaris*	Low
Black Rat	*Rattus rattus*	Low
House Mouse	*Mus musculus*	High
European Rabbit	*Oryctolagus cuniculus*	High
European Hare	*Lepus capensis*	Low
Goat (feral)	*Capra hircus*	Low
Red Fox	*Canis vulpes*	High
Cat	*Felis catus*	High
Ferret	*Mustela furo*	Low
Birds		
European Skylark	*Alauda arvensis*	Low
Northern Mallard	*Anas platyrhynchos*	Low
Rock Dove	*Columba livia*	Low
European Goldfinch	*Carduelis*	High
European Greenfinch	*Carduelis chloris*	Low
Common Blackbird	*Turdus merula*	Low
Song Thrush	*Turdus philomelos*	Low
Eurasian Tree Sparrow	*Passer montanus*	Low
House Sparrow	*Passer domesticus*	Low

Common name	Scientific name	Level of ecological impact in Project Area (current)
Spotted Dove	*Spilopelia chinensis*	Low
Pacific Black Duck/Mallard Hybrid	*Anas superciliosa X Anas platyrhynchos*	Low
Red-whiskered Bulbul	*Pycnonotus jocosus*	Low
Common Myna	*Acridotheres tristis*	High
Common Starling	*Sturnus vulgaris*	High
Invertebrate		
Black Portuguese Millipede	*Ommatoiulus moreleti*	Low

8.4.3.8 Likelihood of fauna-related pathogens

One known pathogen that affects fauna in the Project Area is the Amphibian Chytrid Fungus, which causes the disease chytridiomycosis, which can result in high mortality of frogs. *Chytridiomycosis* due to the amphibian chytrid fungus is a listed Key Threatening Processes under the EPBC Act. The Amphibian Chytrid Fungus is known to have been in Australia since 1978 and in Victoria since 1998 (Murray et al., 2010) (although frog population declines suggest it arrived in Victoria before then) and is likely to be widespread throughout frog habitats within the Project Area already (Brannelly et al., 2018). Consideration of this pathogen is required in and around waterbodies and waterways.



Paper Size ISO A4

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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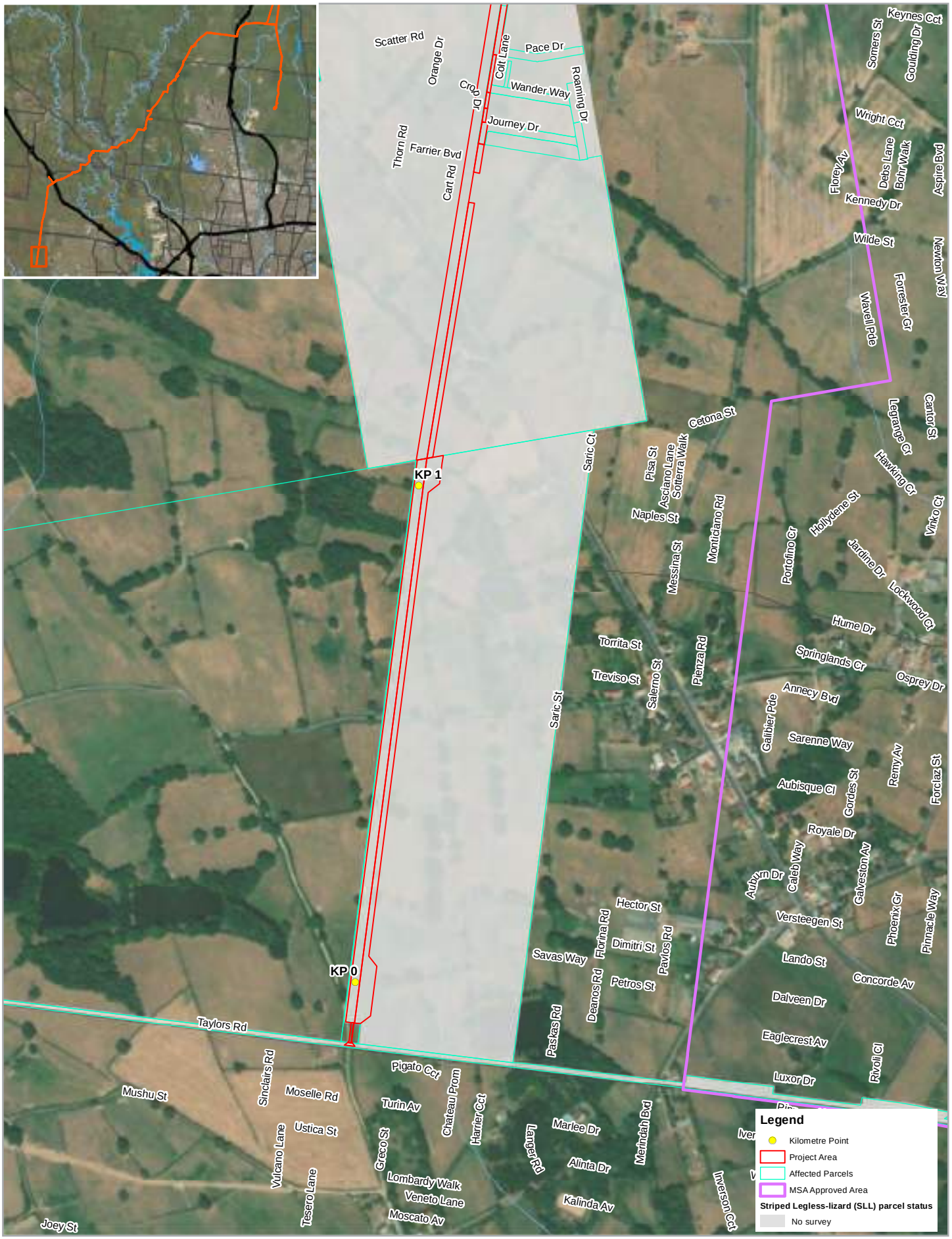
Survey results for
Striped Legless Lizard

Project No. 12529997
Revision No. D
Date 20/01/2021

FIGURE 9

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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Survey results for
Striped Legless Lizard

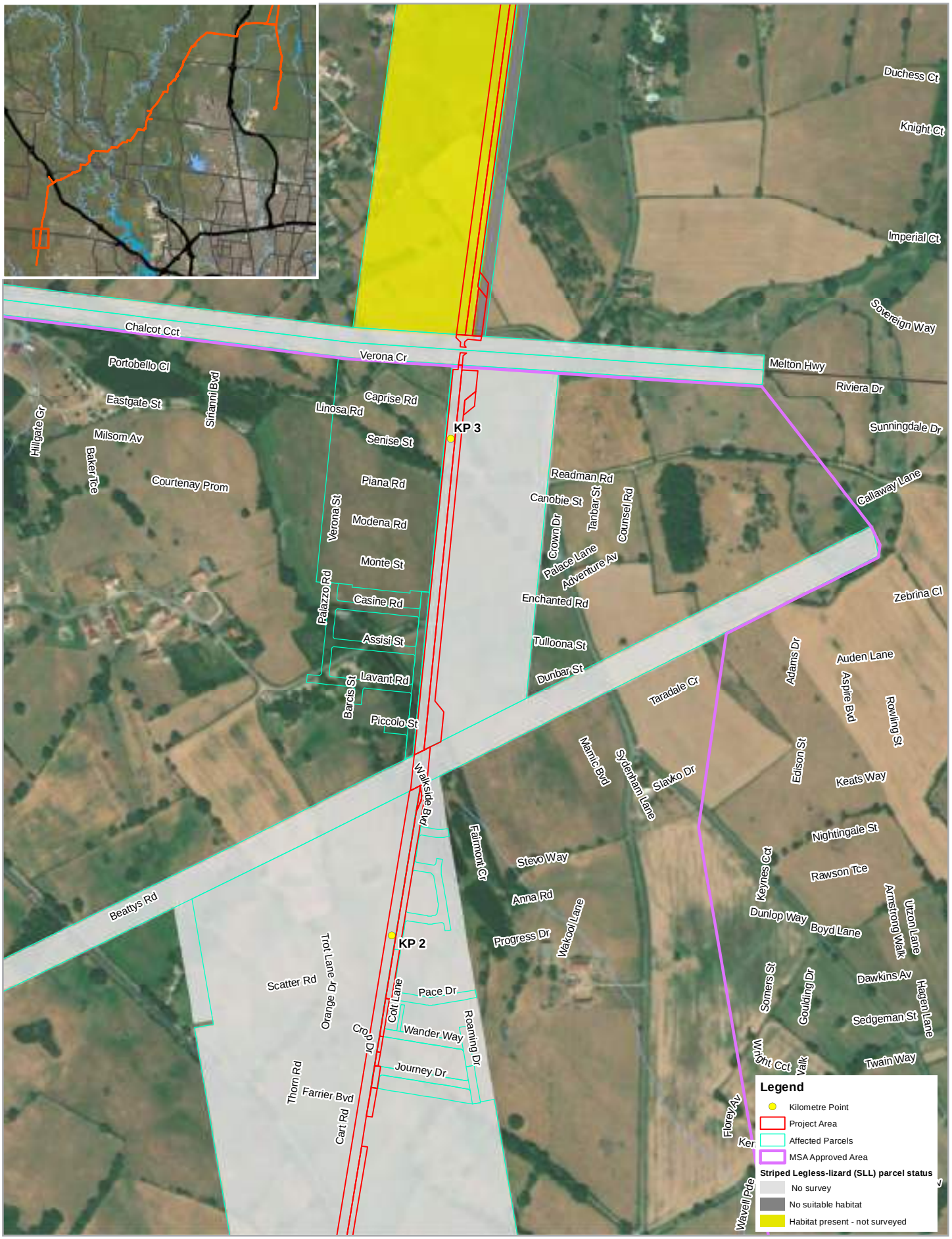
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FIGURE 9.1

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Meters

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 55

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Survey results for
Striped Legless Lizard

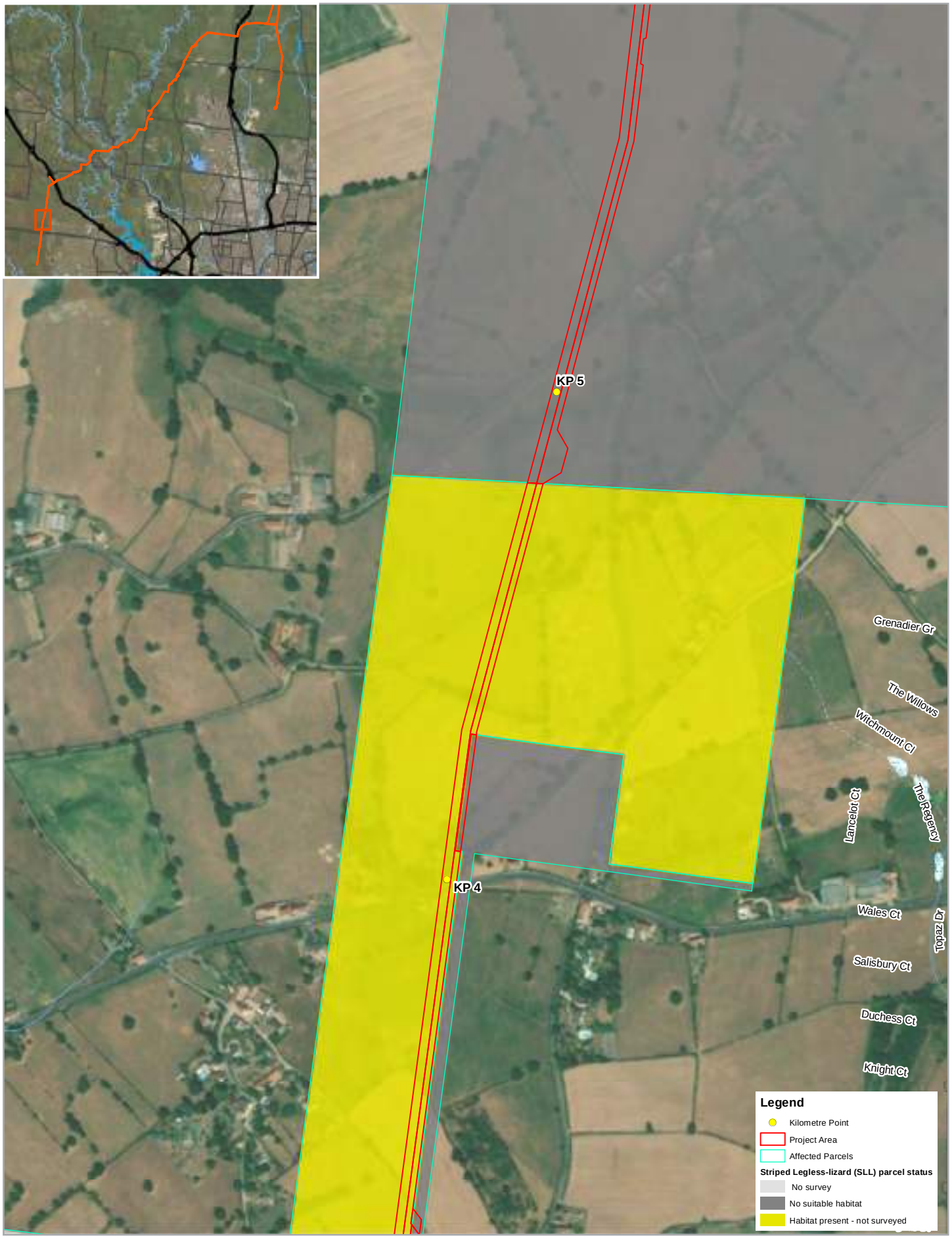
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FIGURE 9.2

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Meters

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 55

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Survey results for
Striped Legless Lizard

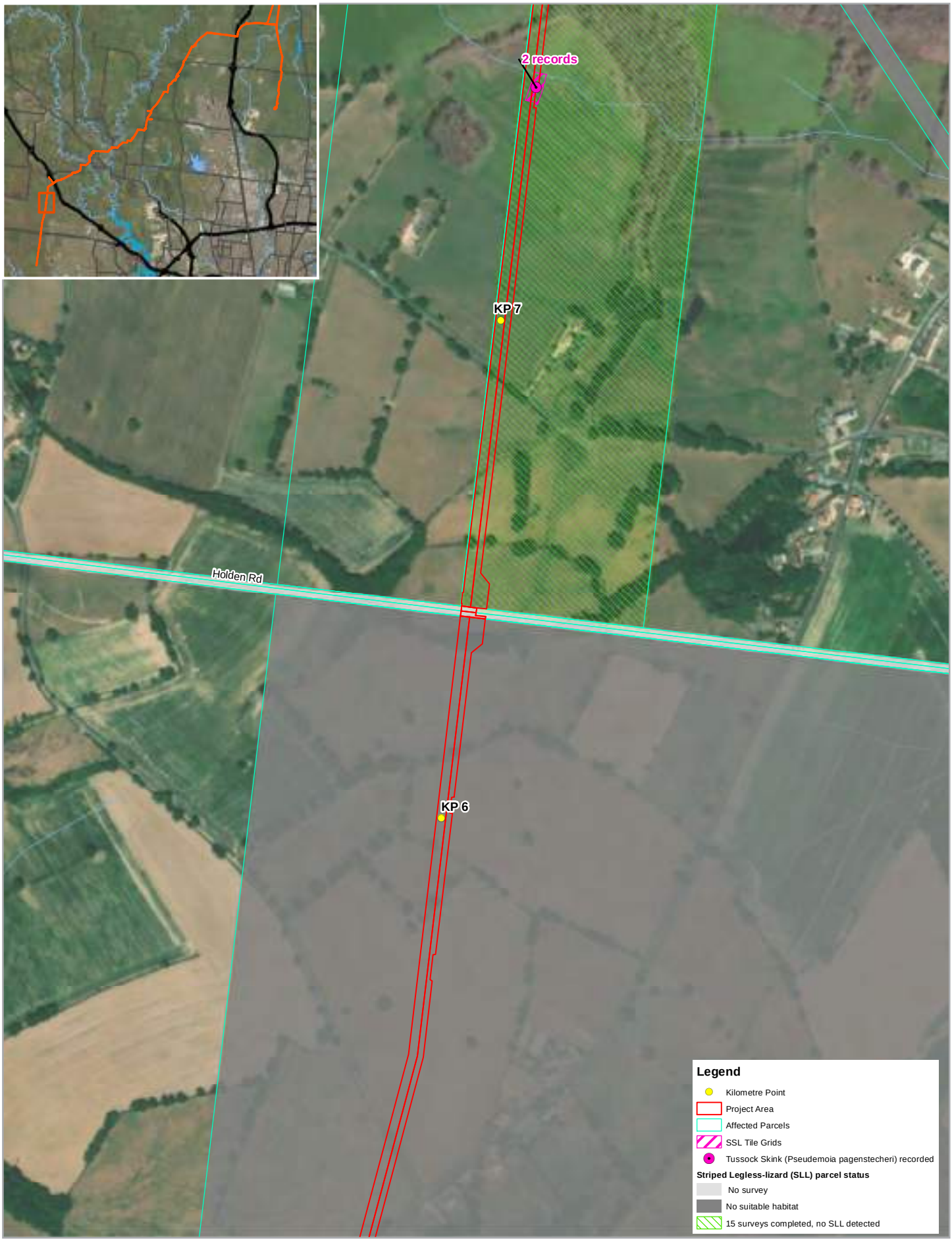
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FIGURE 9.3

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Meters

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Survey results for
Striped Legless Lizard

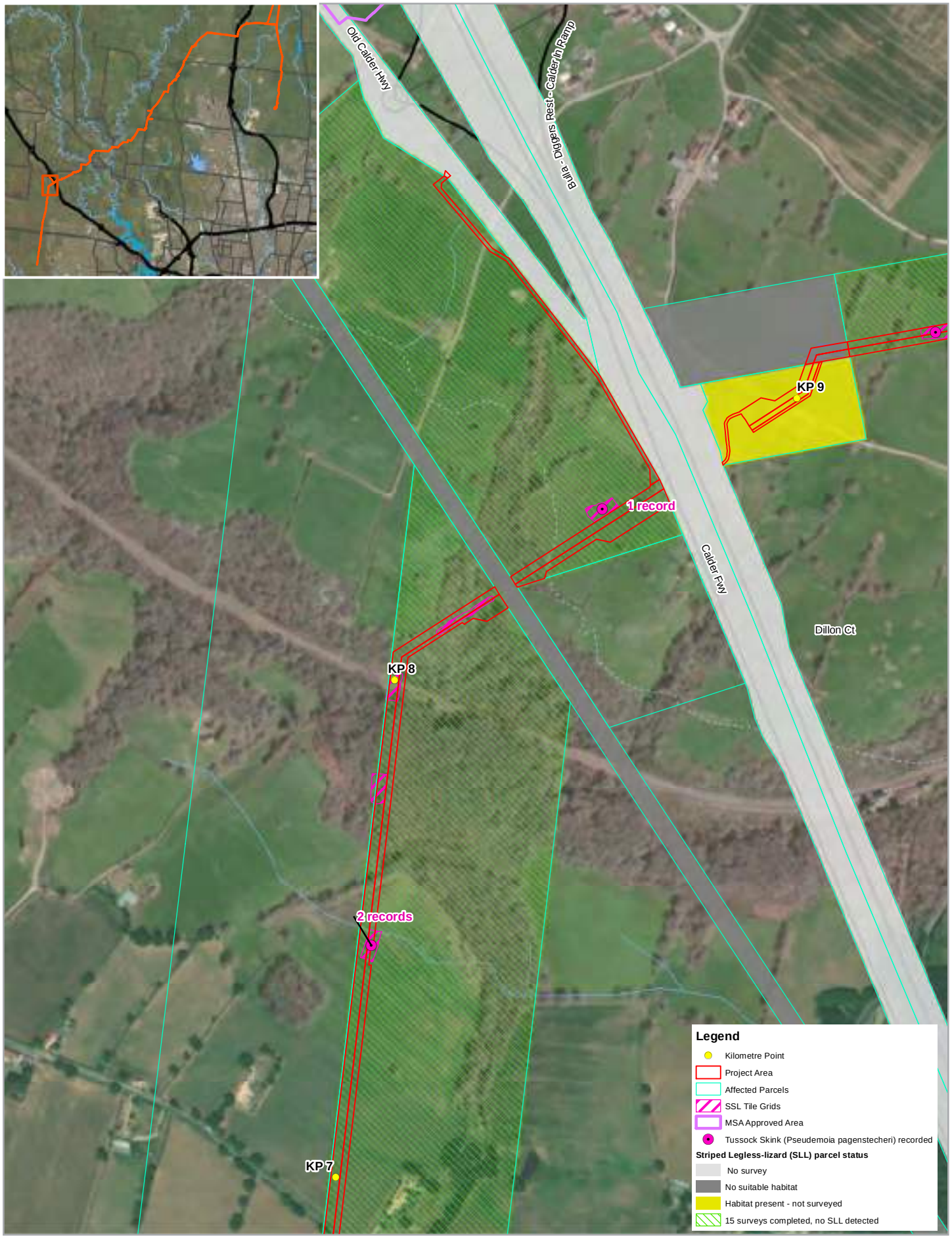
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FIGURE 9.4

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Meters

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Survey results for
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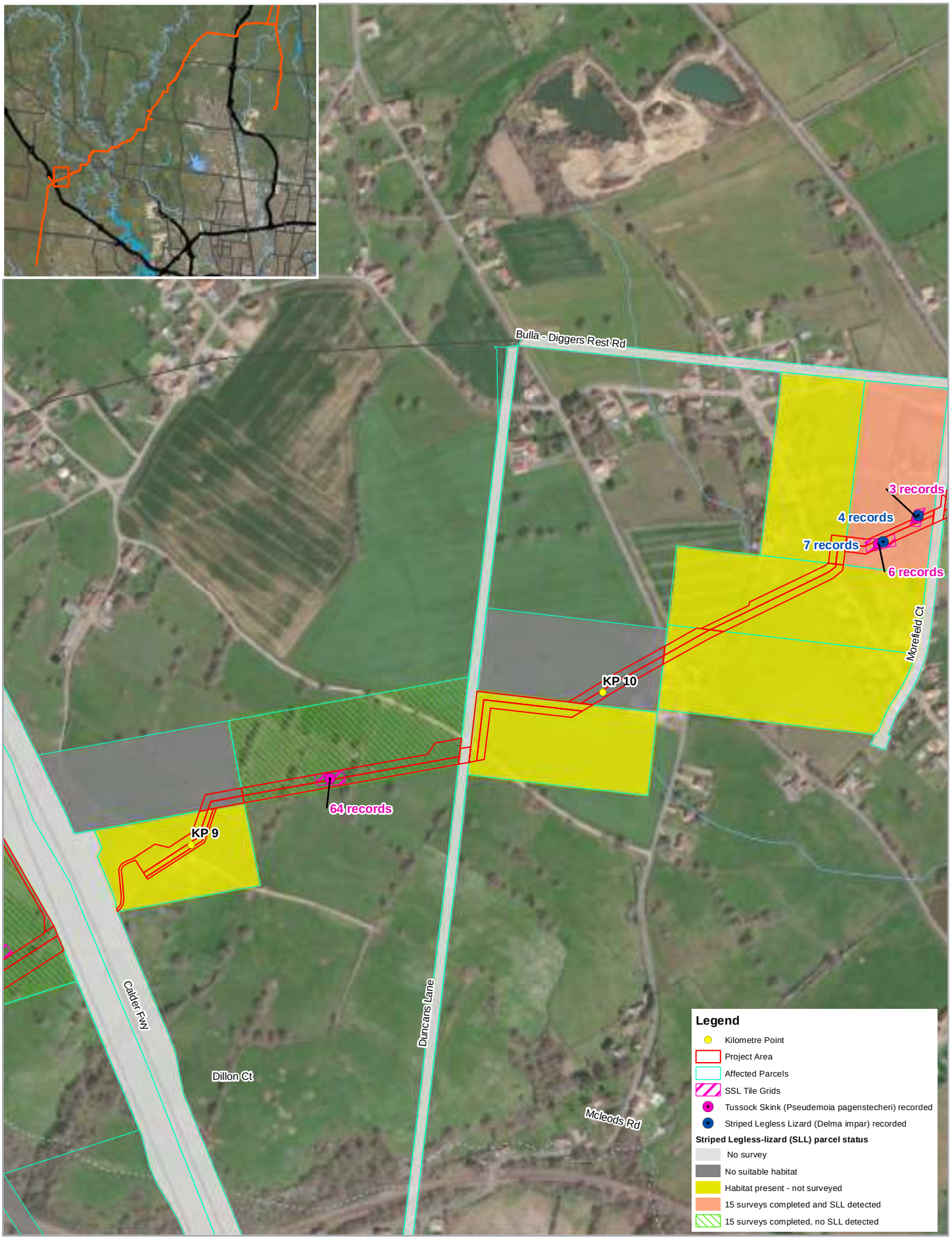
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Date 09/03/2021

FIGURE 9.5

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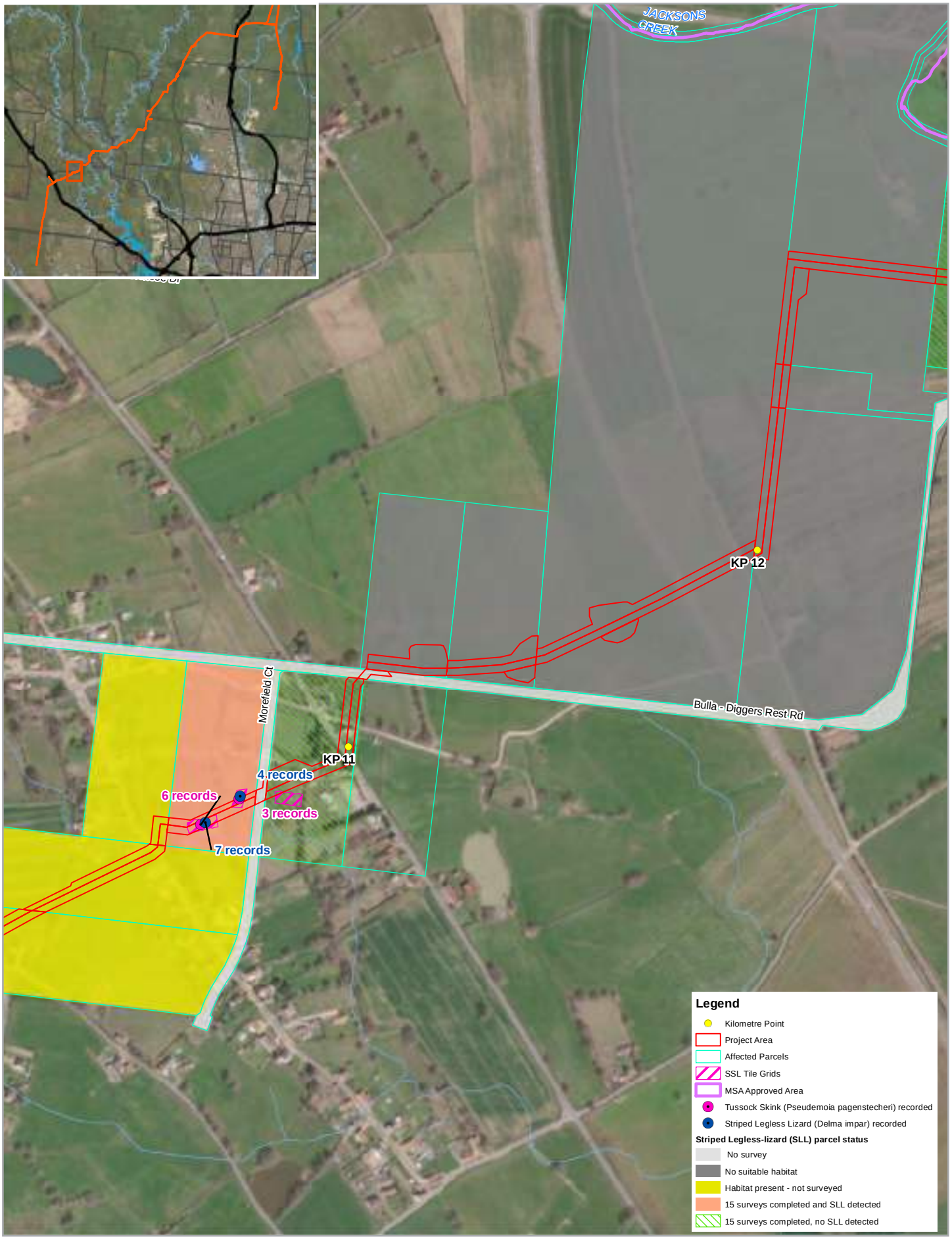
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FIGURE 9.6

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Meters

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Survey results for
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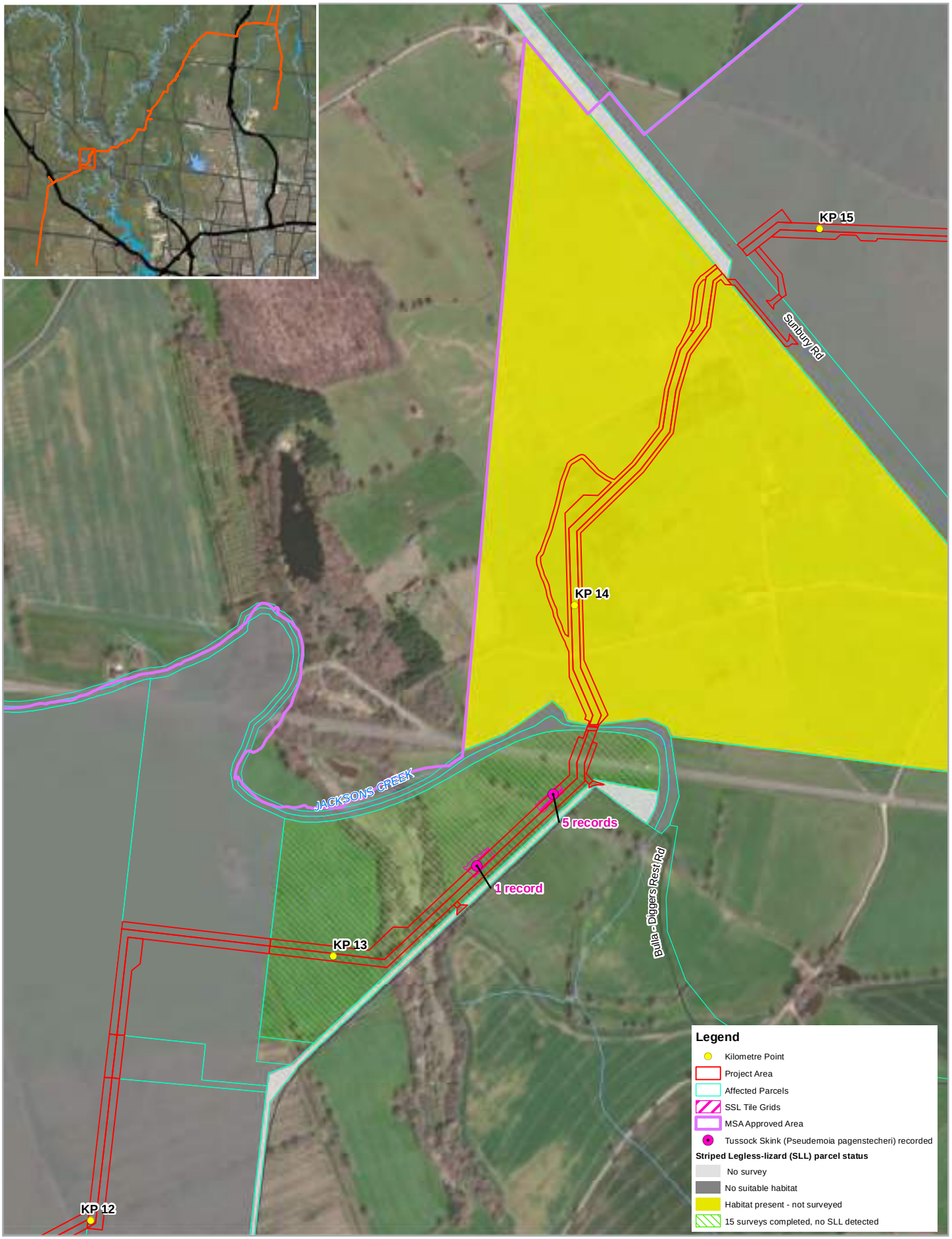
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FIGURE 9.7

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Meters

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Survey results for
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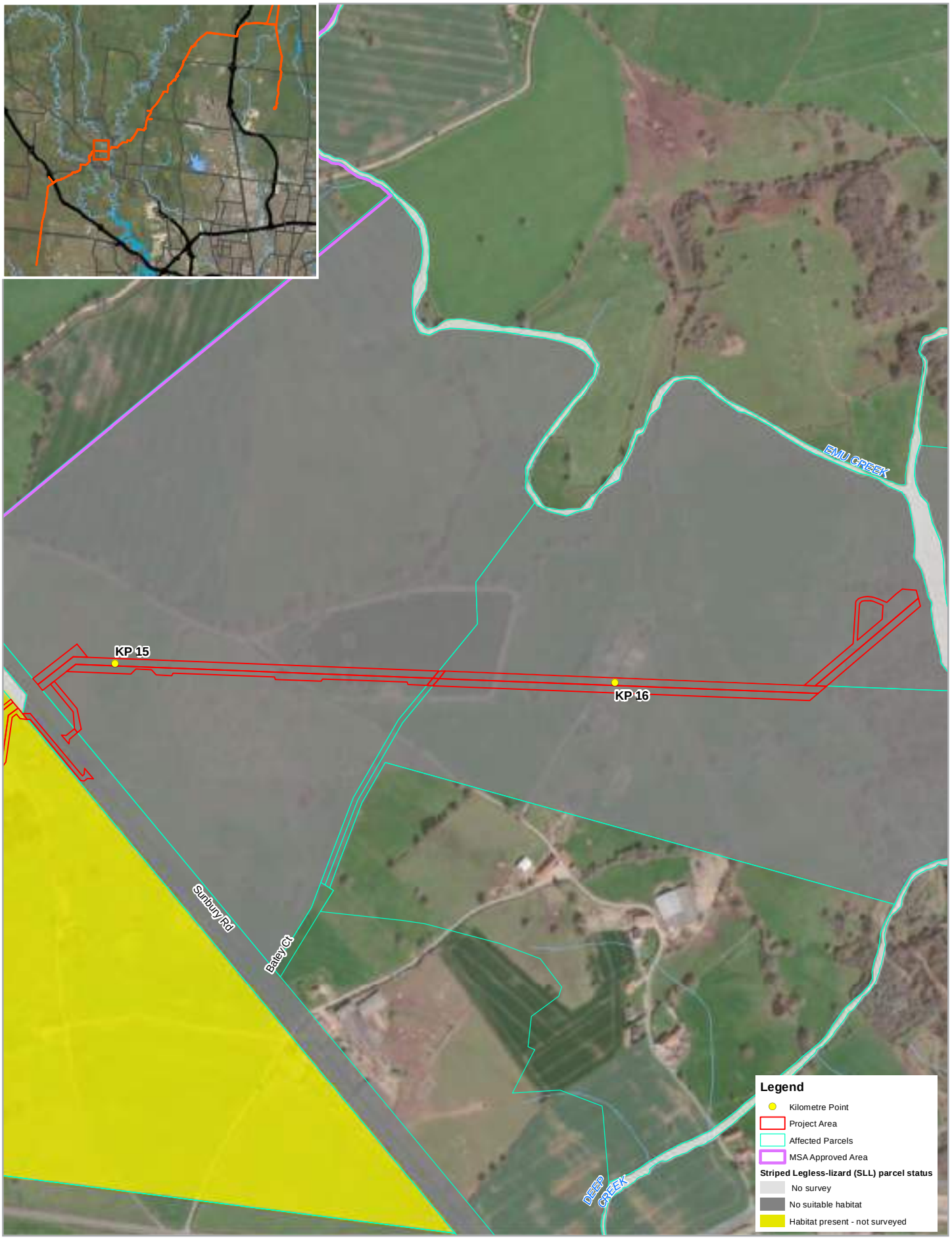
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Revision No. F
Date 09/03/2021

FIGURE 9.8

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Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 55

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Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

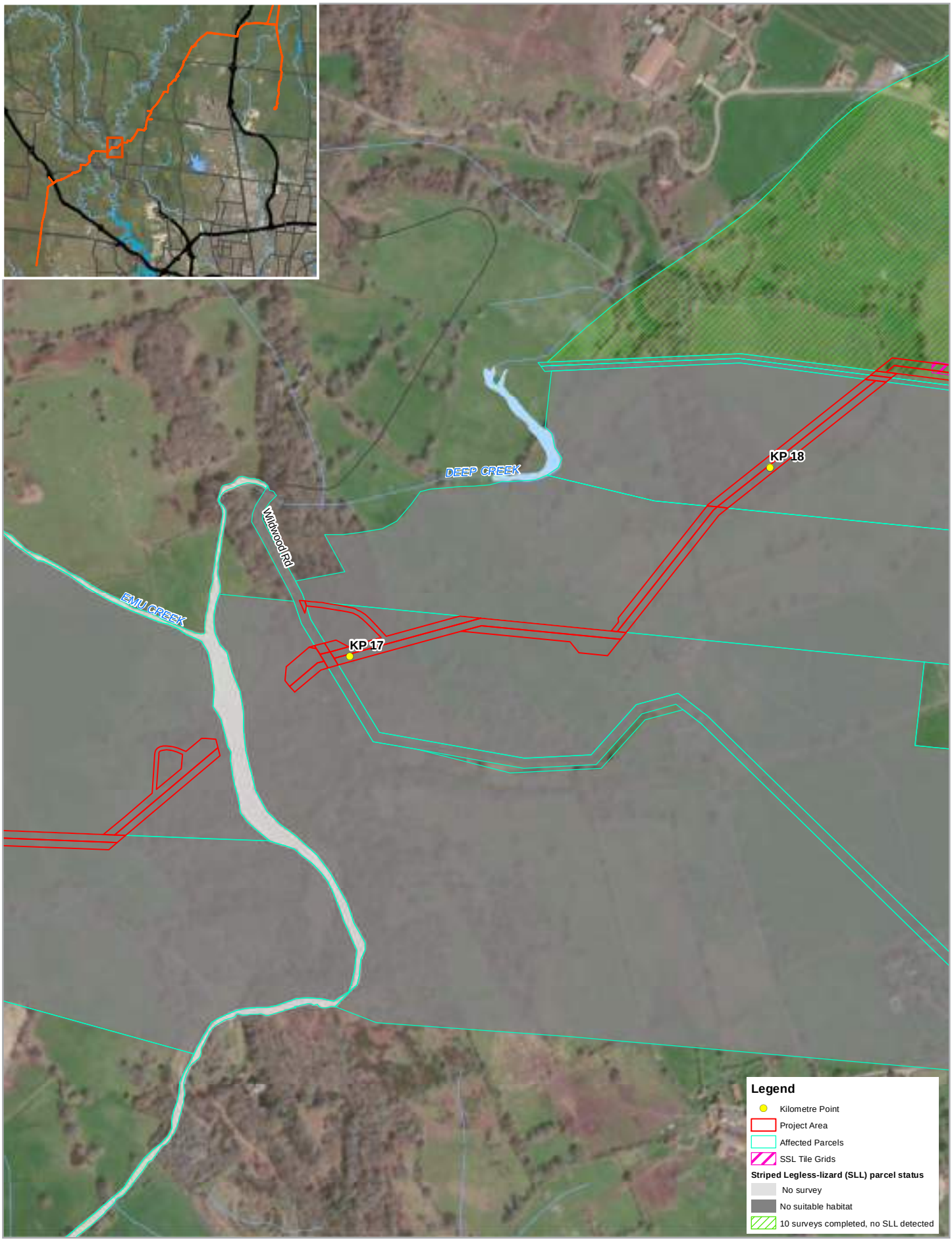
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Revision No. F
Date 09/03/2021

FIGURE 9.9

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
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Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

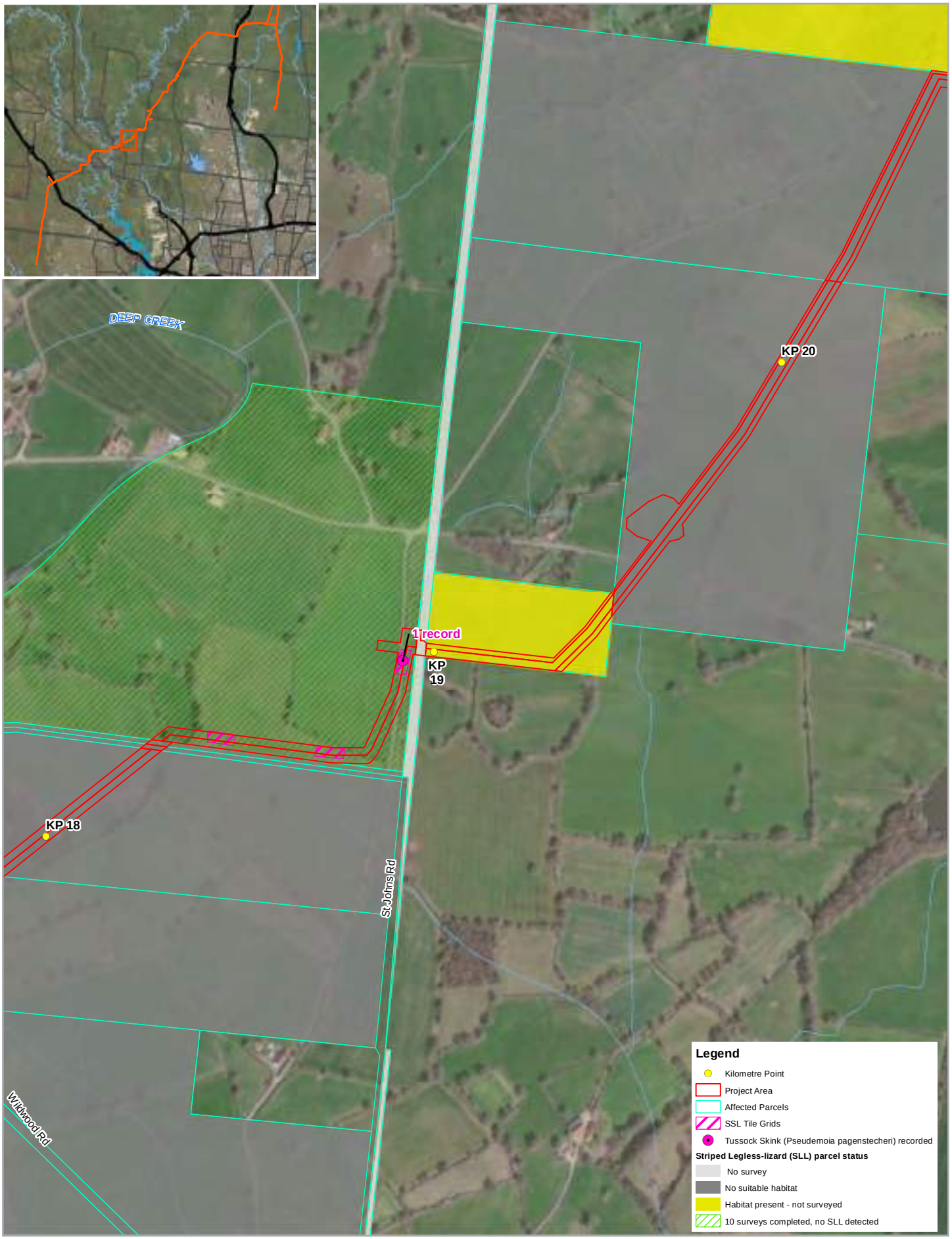
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FIGURE 9.10

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Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 55

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APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

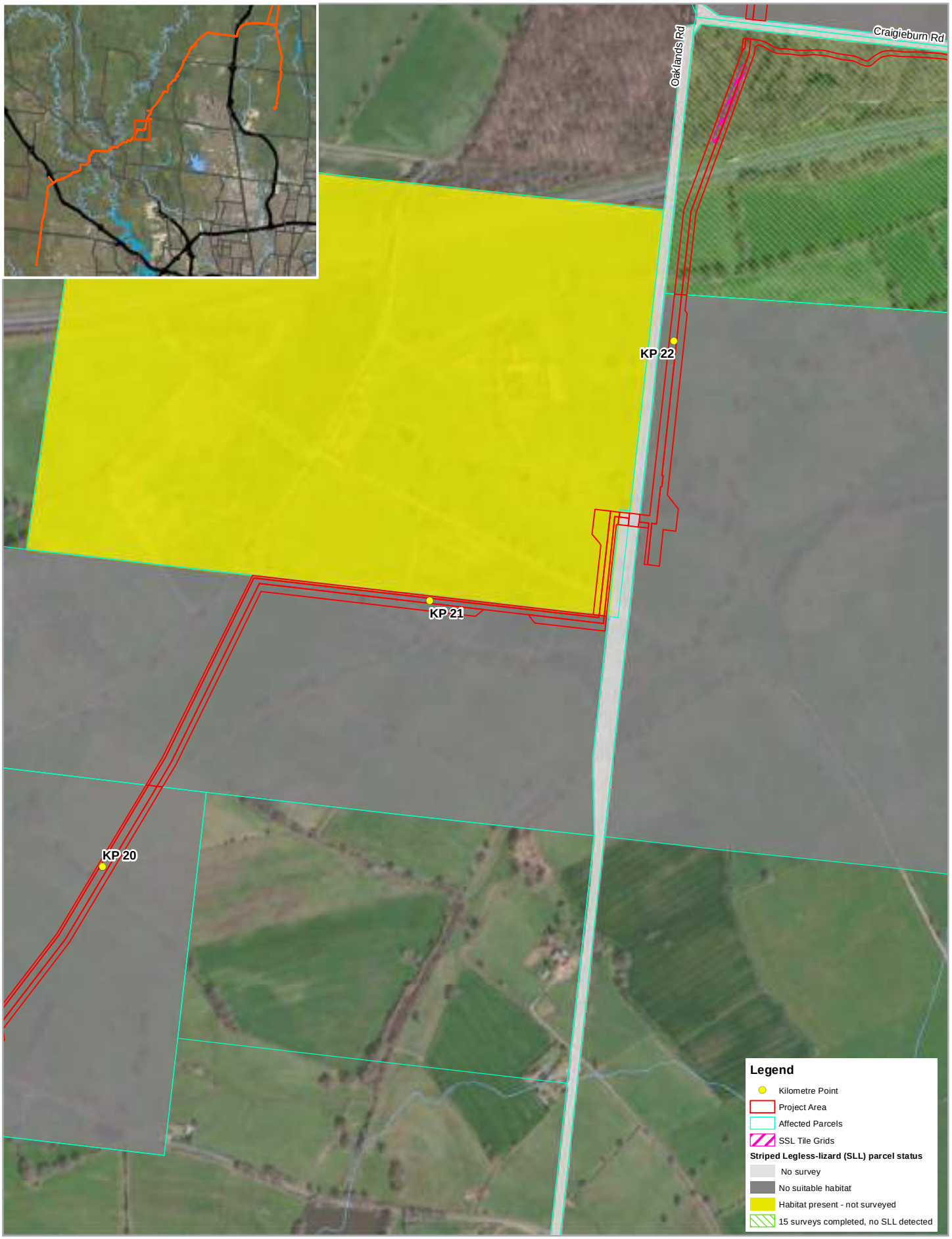
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Revision No. F
Date 09/03/2021

FIGURE 9.11

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Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Survey results for
Striped Legless Lizard

Project No. 12529997
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Date 09/03/2021

FIGURE 9.12

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

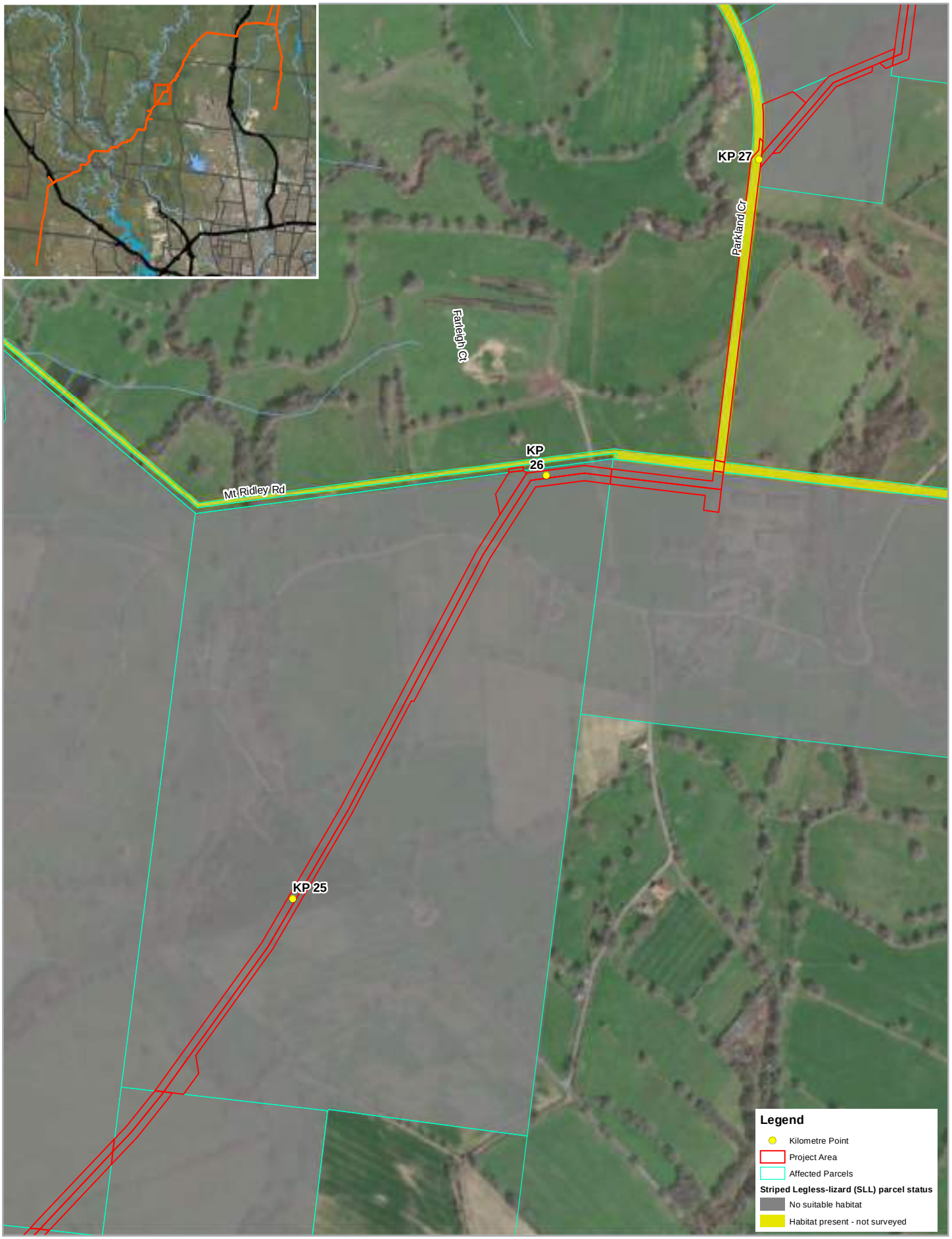
Project No. 12529997
Revision No. F
Date 09/03/2021

FIGURE 9.13

\\ghdnet\ghd\AU\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\006_12529997_Striped_Legless_Lizard_MB_A4P_RevE_rev8_EES.mxd
Print date: 09 Mar 2021 - 16:56

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

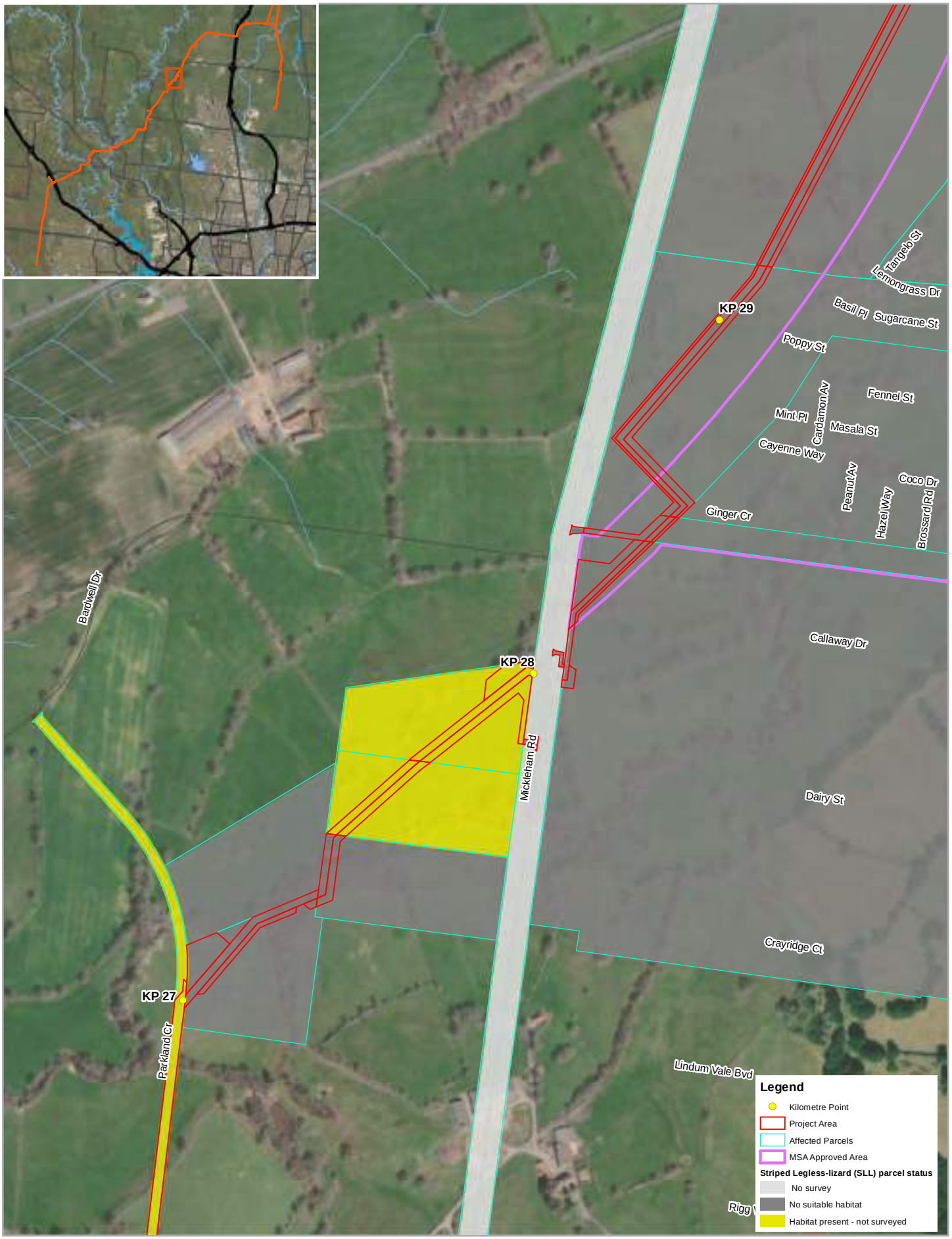
Project No. 12529997
Revision No. F
Date 09/03/2021

FIGURE 9.14

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Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

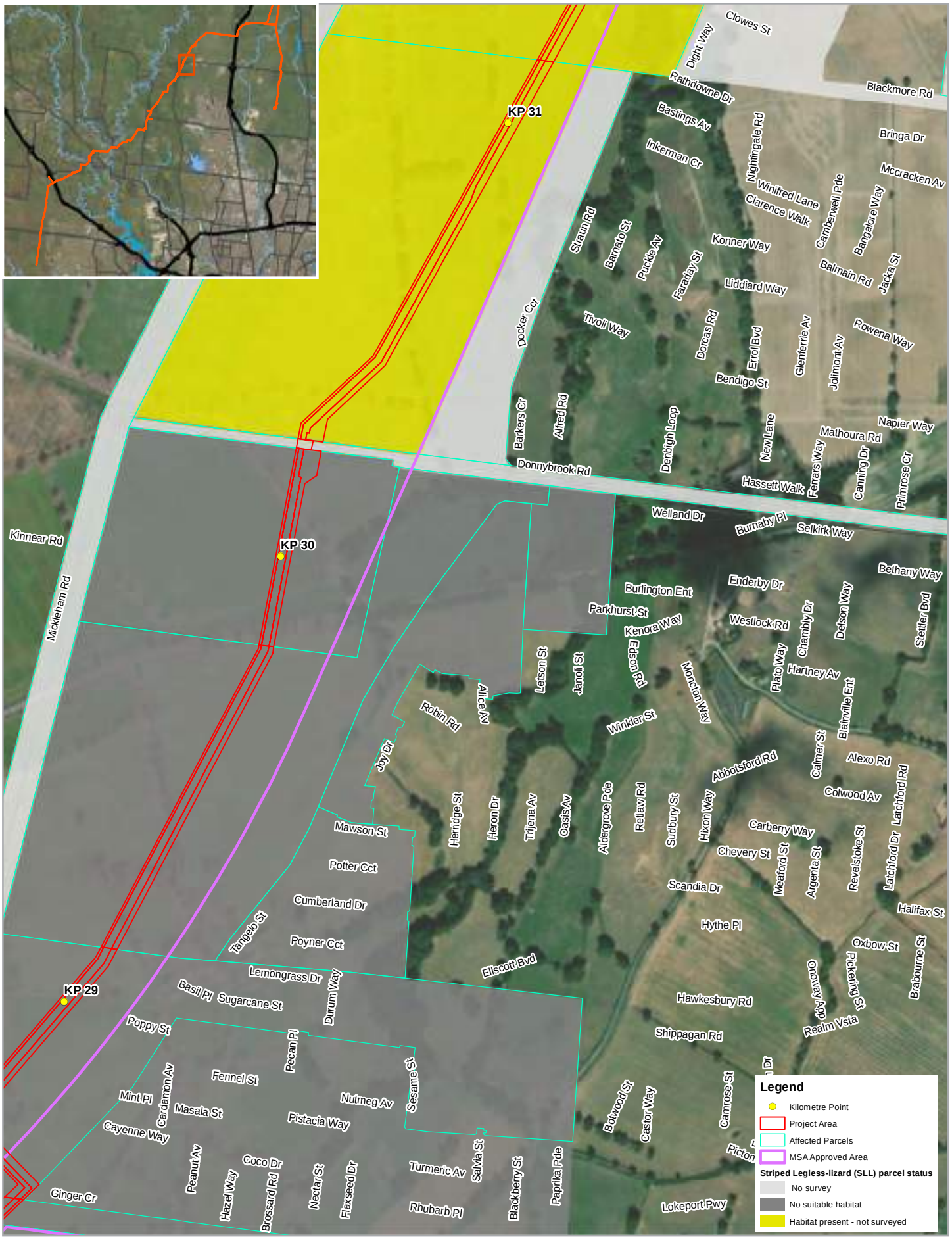
Project No. 12529997
Revision No. F
Date 09/03/2021

FIGURE 9.15

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Print date: 09 Mar 2021 - 16:56

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

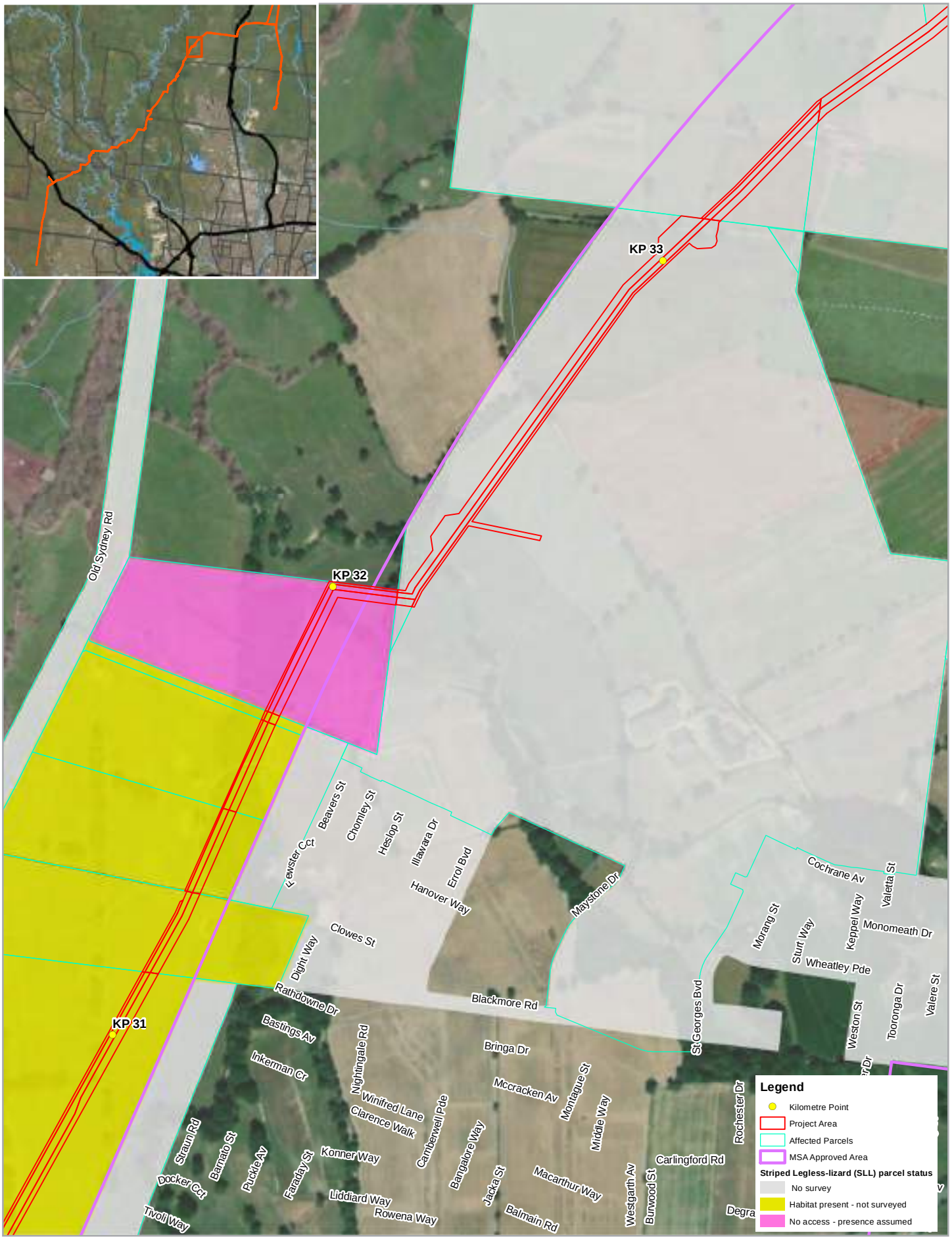
Project No. 12529997
Revision No. F
Date 09/03/2021

FIGURE 9.16

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Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

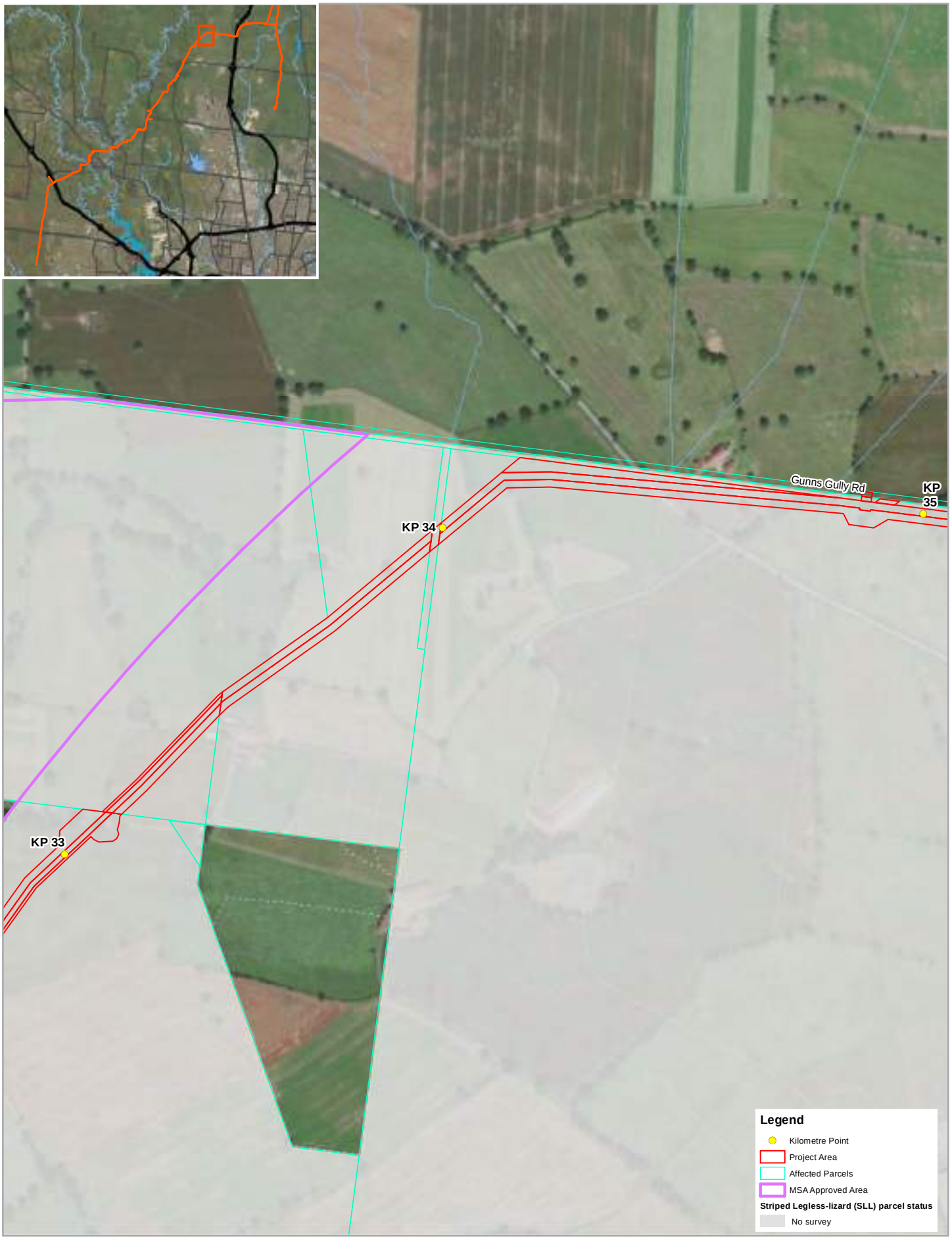
Project No. 12529997
Revision No. F
Date 09/03/2021

FIGURE 9.17

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

Project No. 12529997
Revision No. F
Date 09/03/2021

FIGURE **9**.18

\\ghdnet\ghd\A\U\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\006_12529997_Striped_Legless_Lizard_MB_A4P_RevE_rev8_EES.mxd
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Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

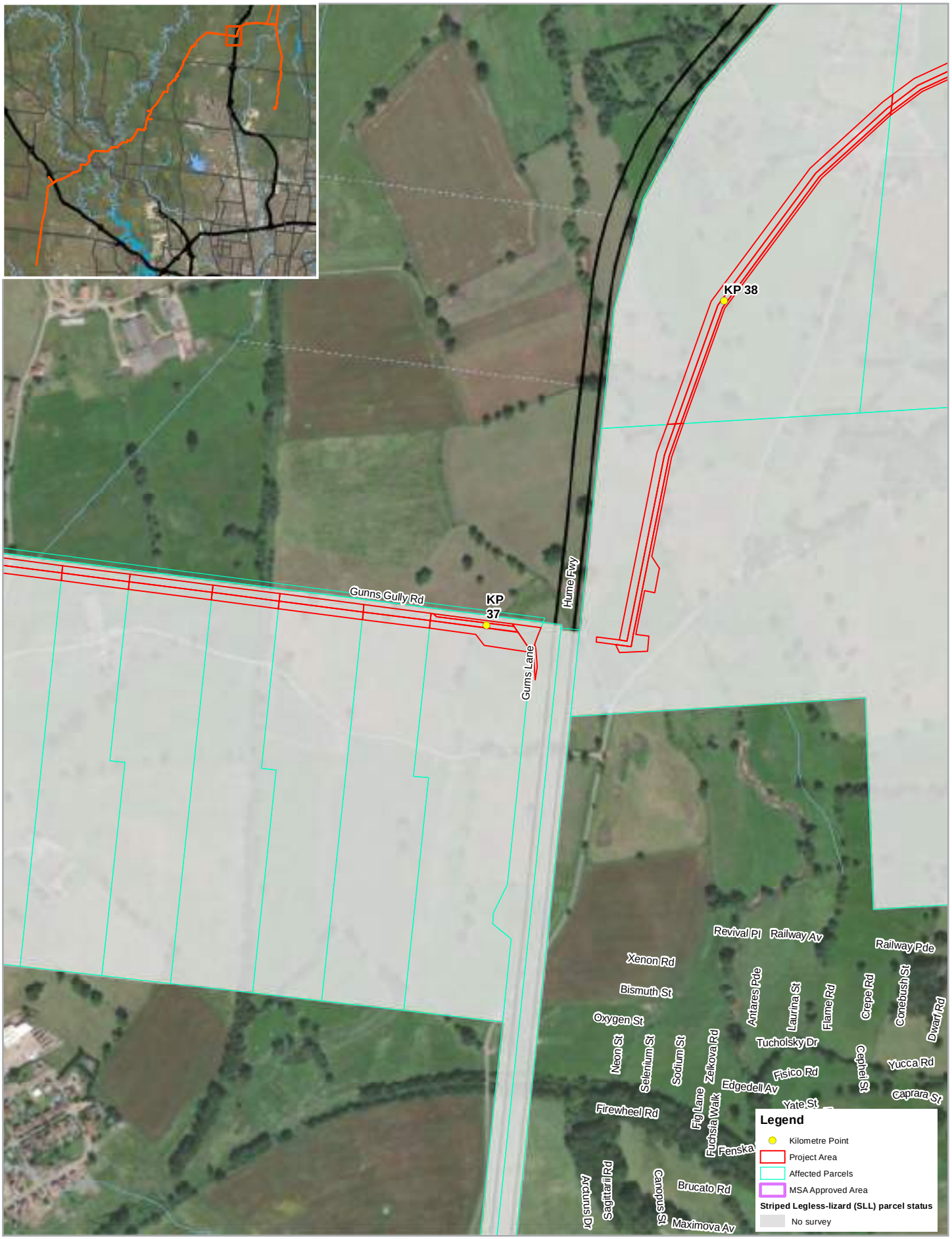
Project No. 12529997
Revision No. F
Date 09/03/2021

FIGURE **9**.19

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

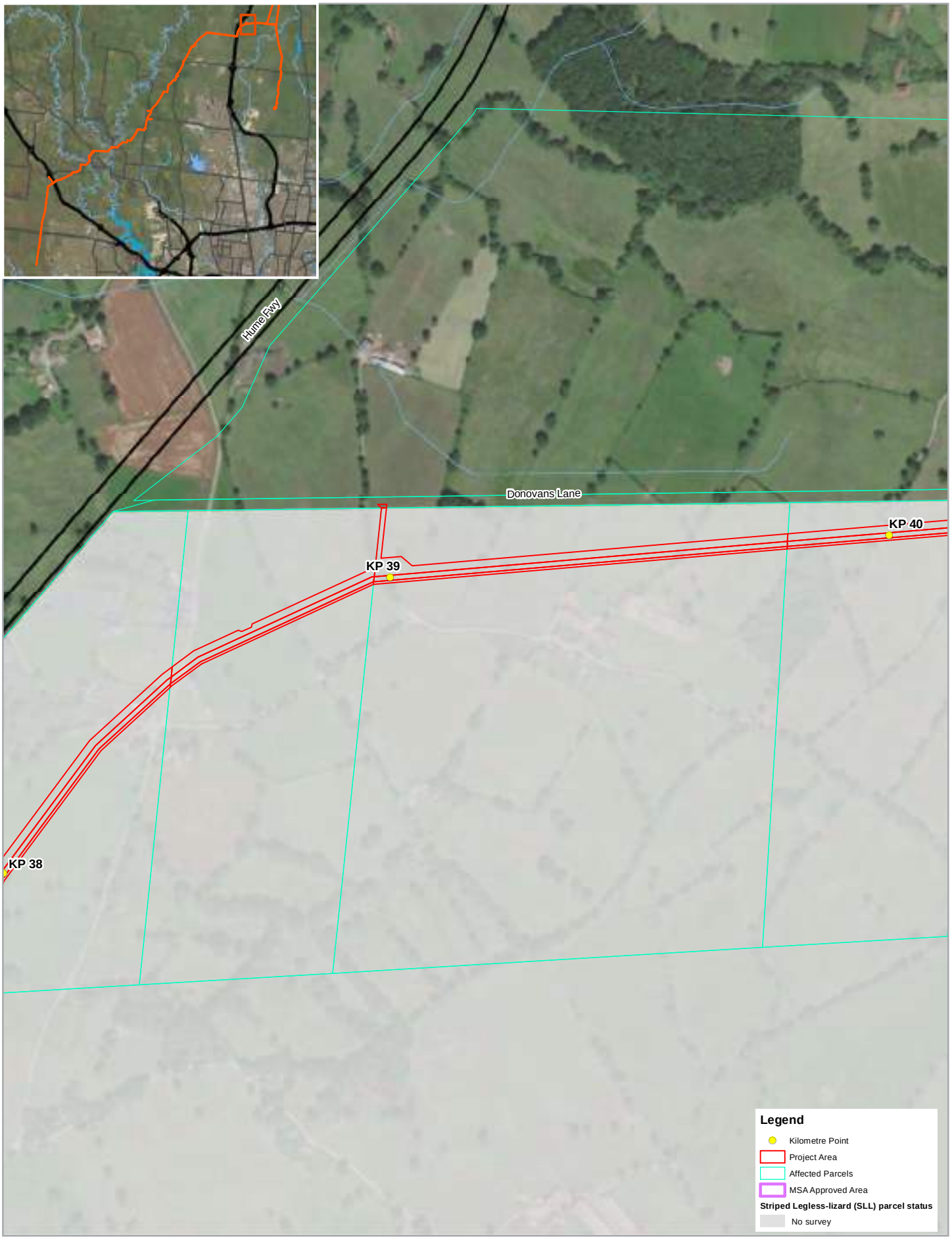
Project No. 12529997
Revision No. F
Date 09/03/2021

FIGURE **9**.20

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Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

Project No. 12529997
Revision No. F
Date 09/03/2021

FIGURE **9**.21

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Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

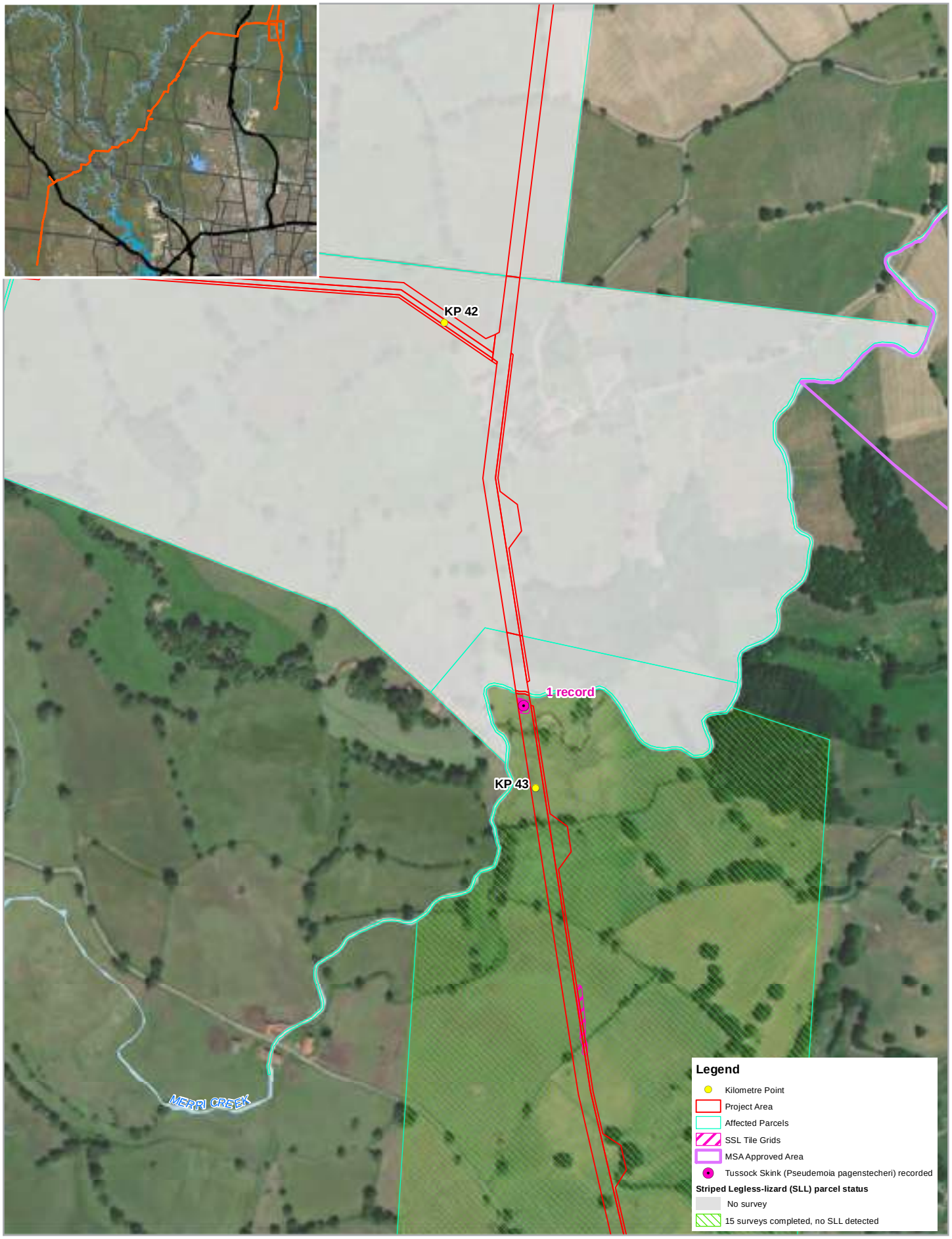
Project No. 12529997
Revision No. F
Date 09/03/2021

FIGURE **9**.22

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Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

Project No. 12529997
Revision No. F
Date 09/03/2021

FIGURE **9**.23

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

Project No. 12529997
Revision No. F
Date 09/03/2021

FIGURE **9**.24

\\ghdnet\ghd\A U\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\006_12529997_Striped_Legless_Lizard_MB_A4P_RevE_rev8_EES.mxd
Print date: 09 Mar 2021 - 16:59

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

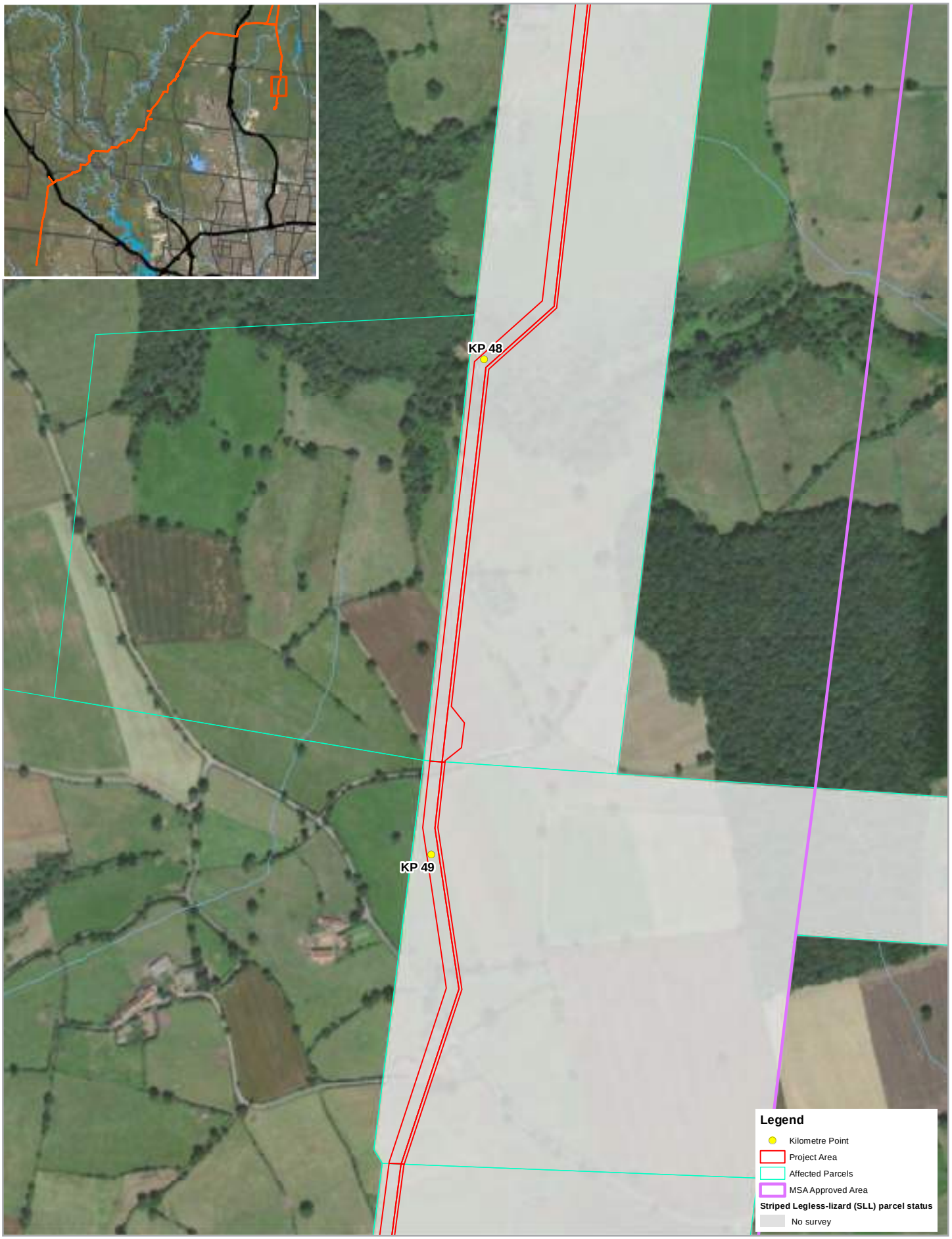
Project No. 12529997
Revision No. F
Date 09/03/2021

FIGURE 9.25

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Print date: 09 Mar 2021 - 16:59

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

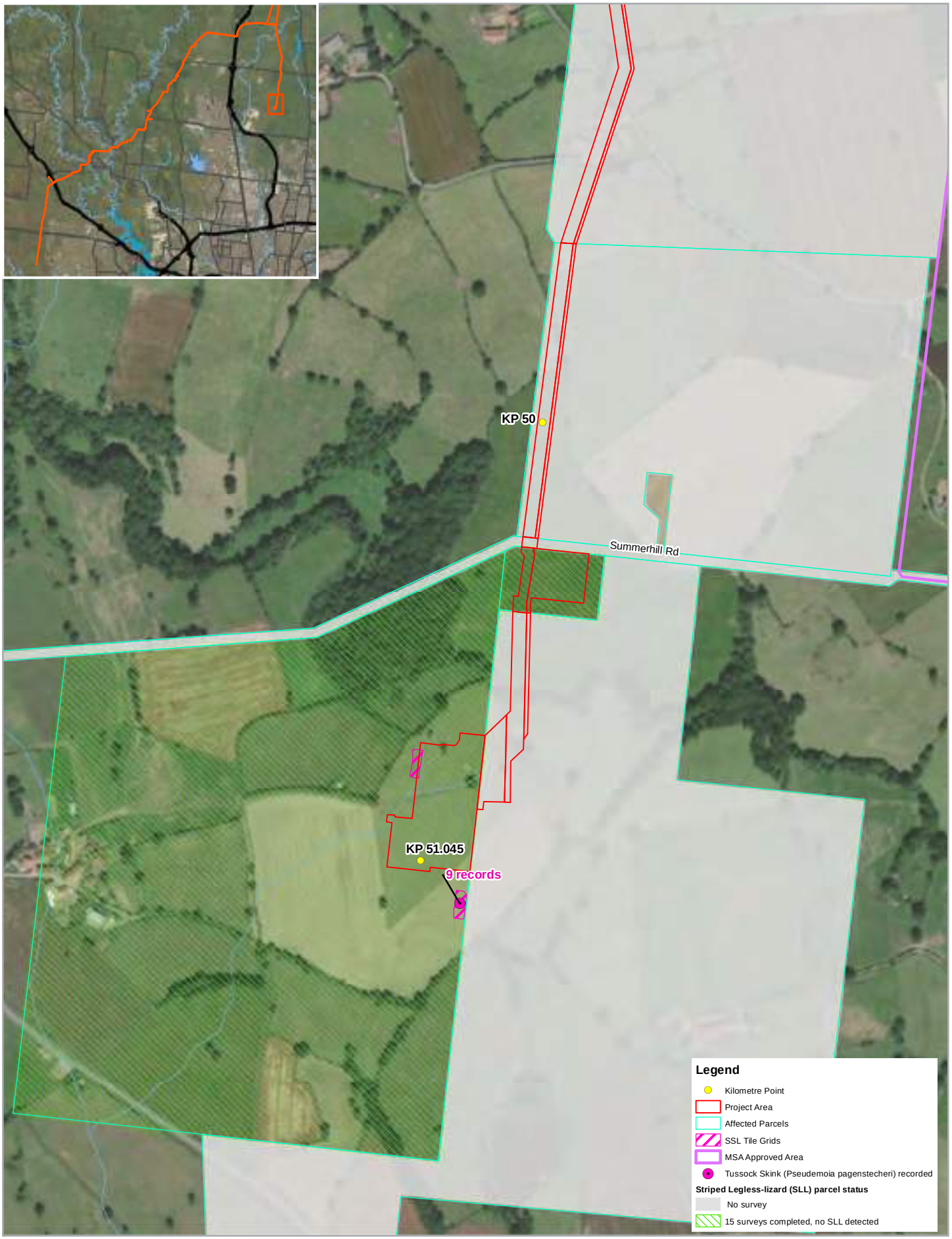
Project No. 12529997
Revision No. F
Date 09/03/2021

FIGURE **9**.26

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Print date: 09 Mar 2021 - 16:59

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Survey results for
Striped Legless Lizard

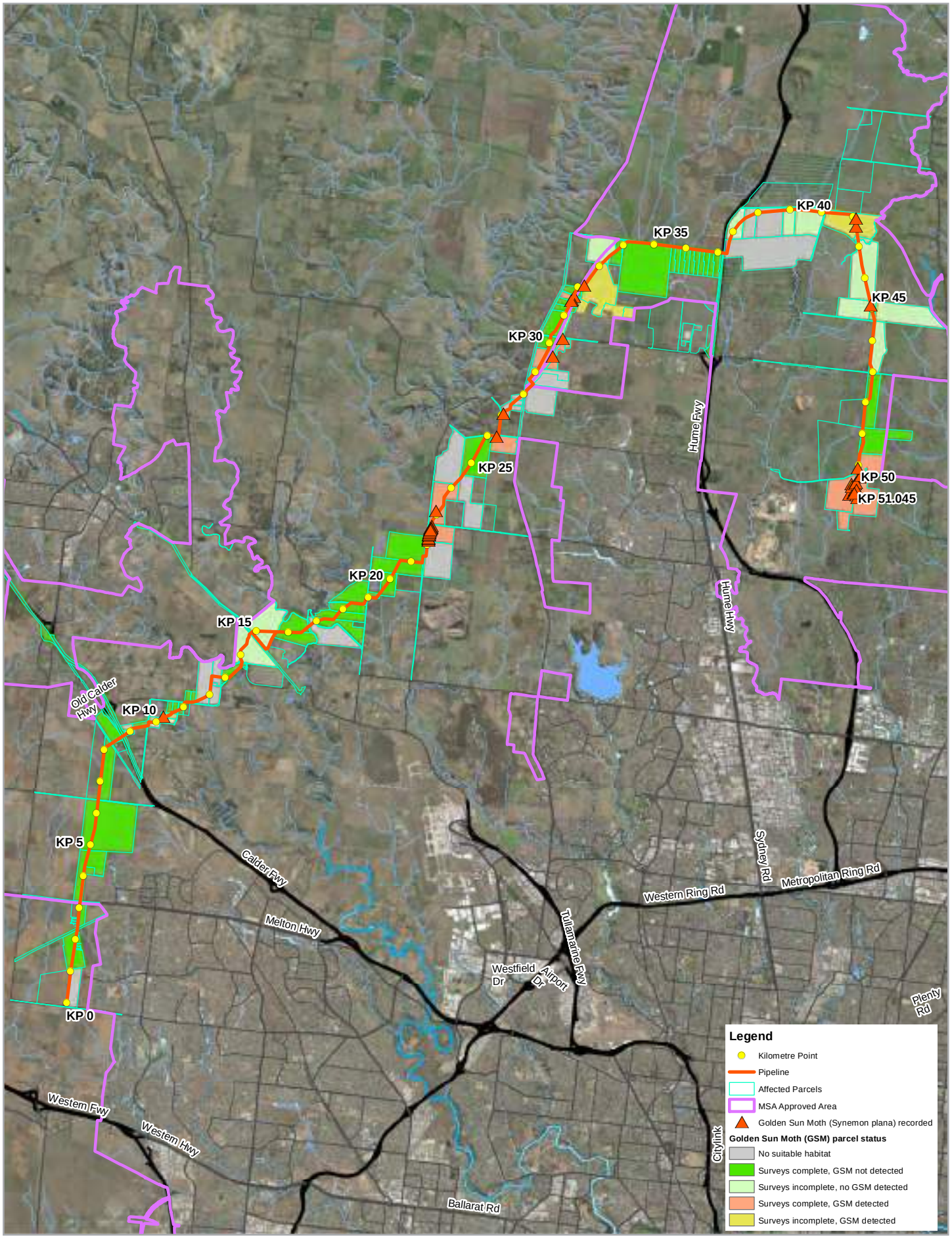
Project No. 12529997
Revision No. F
Date 09/03/2021

FIGURE 9.27

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Print date: 09 Mar 2021 - 16:59

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 2,000 4,000

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

Australian Pipeline Limited
Western Outer Ring Main Gas Project

Survey results for
Golden Sun Moth - Overview

Project No. 12529997
Revision No. C
Date 21/01/2021

FIGURE 10

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

N

Australian Pipeline Limited
Western Outer Ring Main Gas Project

Survey results for
Golden Sun Moth

Project No. 12529997
Revision No. C
Date 02/03/2021

FIGURE 10.1

\\ghdnet\ghd\A U\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\007_12529997_GoldenSunMoth_MB_A4P_RevC_rev8_EES.mxd
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Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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GHD

Australian Pipeline Limited
Western Outer Ring Main Gas Project

Survey results for
Golden Sun Moth

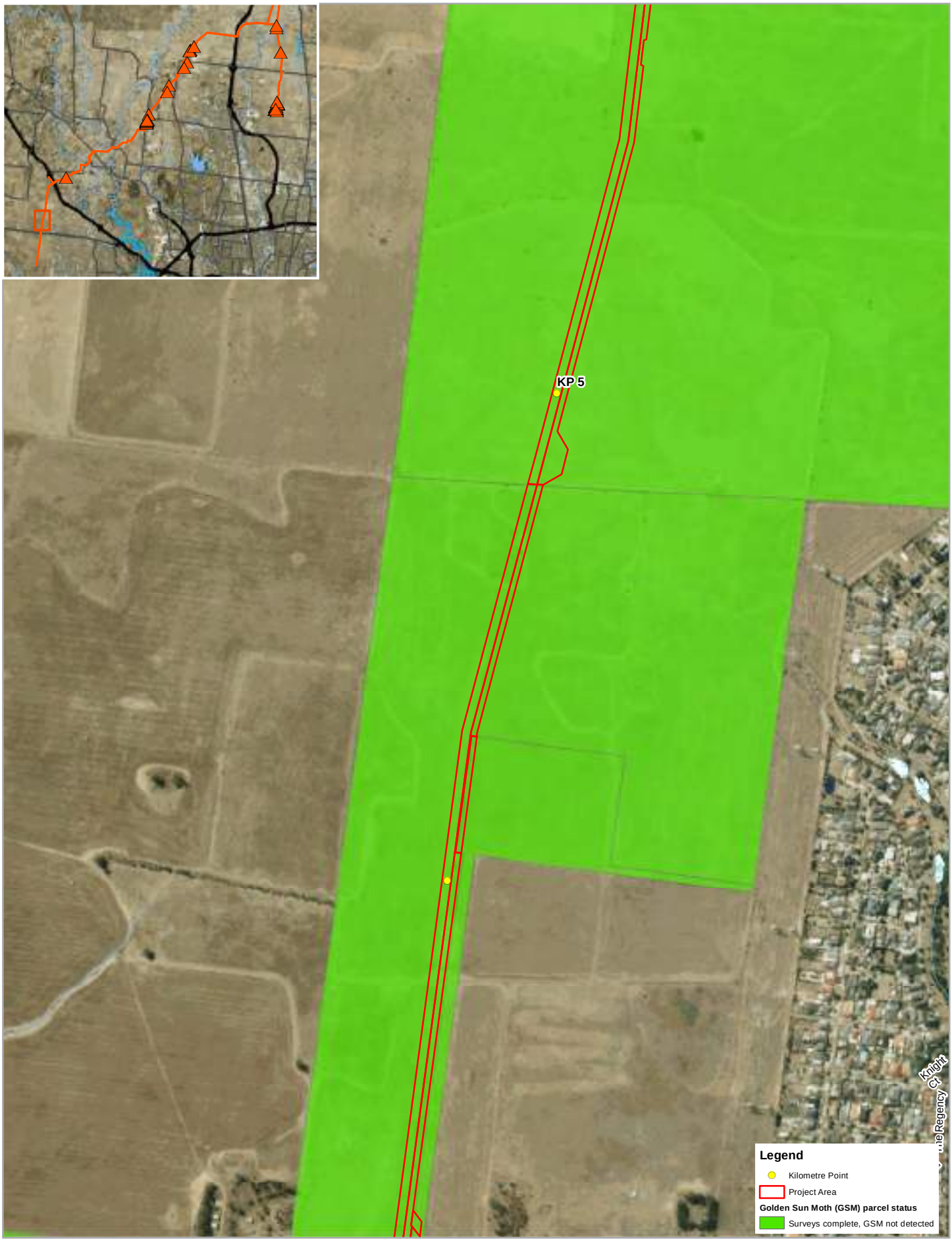
Project No. 12529997
Revision No. C
Date 02/03/2021

FIGURE 10.2

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

N

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Survey results for
Golden Sun Moth

Project No. 12529997
Revision No. C
Date 02/03/2021

FIGURE 10.3

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

N

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Project No. 12529997
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FIGURE 10.4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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Survey results for
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Project No. 12529997
Revision No. C
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FIGURE 10.5

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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Survey results for
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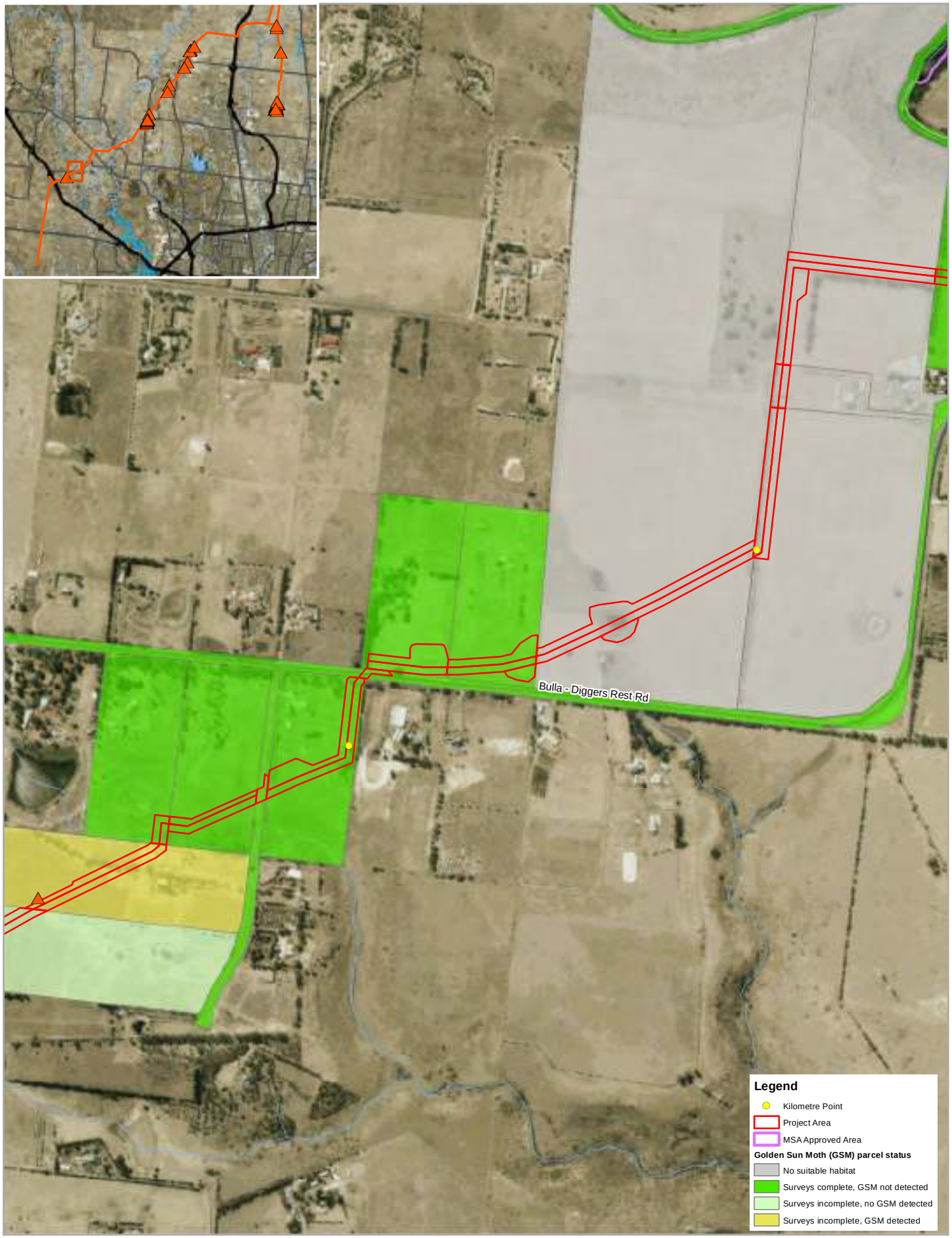
Project No. 12529997
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FIGURE 10.6

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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Survey results for
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Project No. 12529997
Revision No. C
Date 02/03/2021

FIGURE 10.7

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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Survey results for
Golden Sun Moth

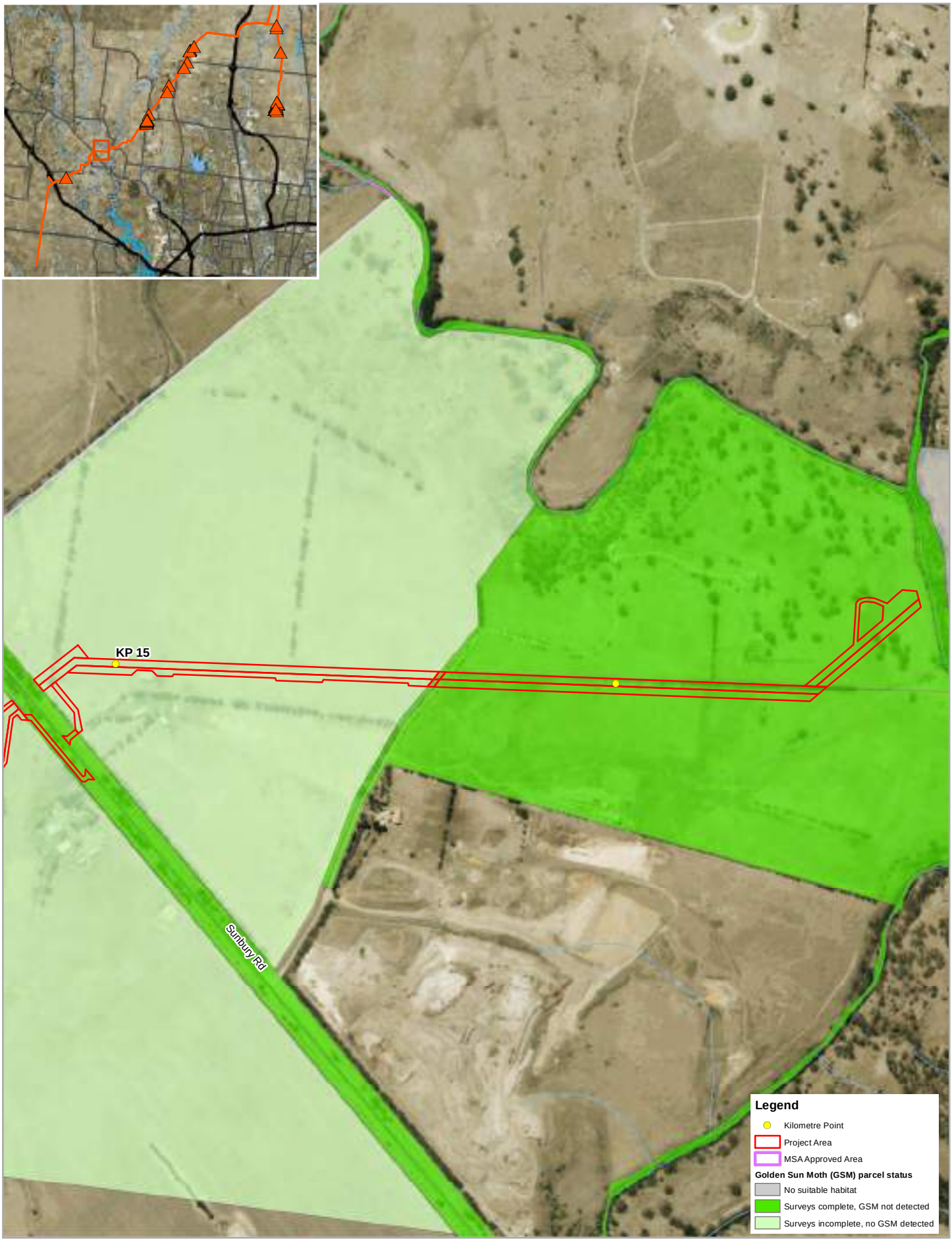
Project No. 12529997
Revision No. C
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FIGURE 10.8

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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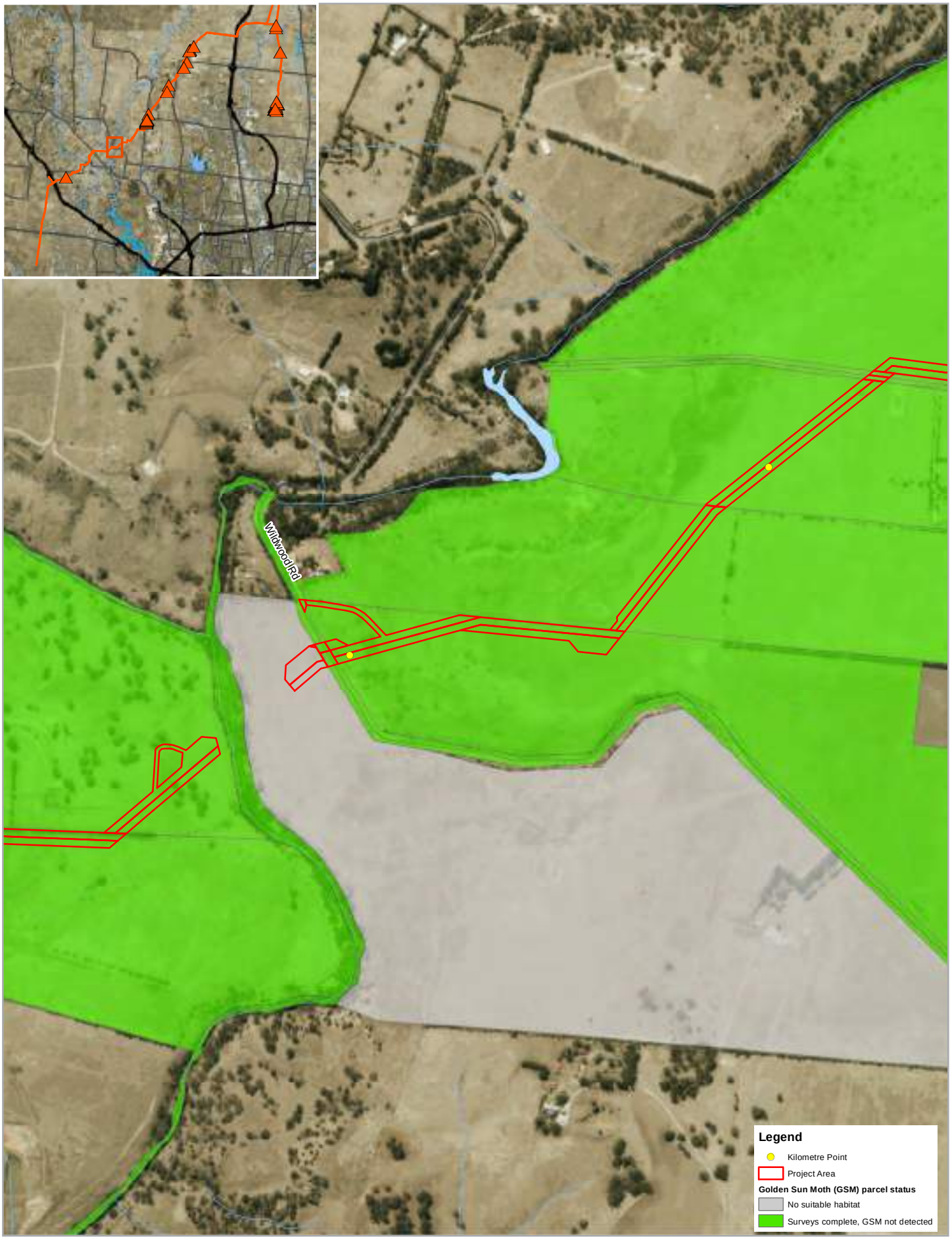
Project No. 12529997
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FIGURE 10.9

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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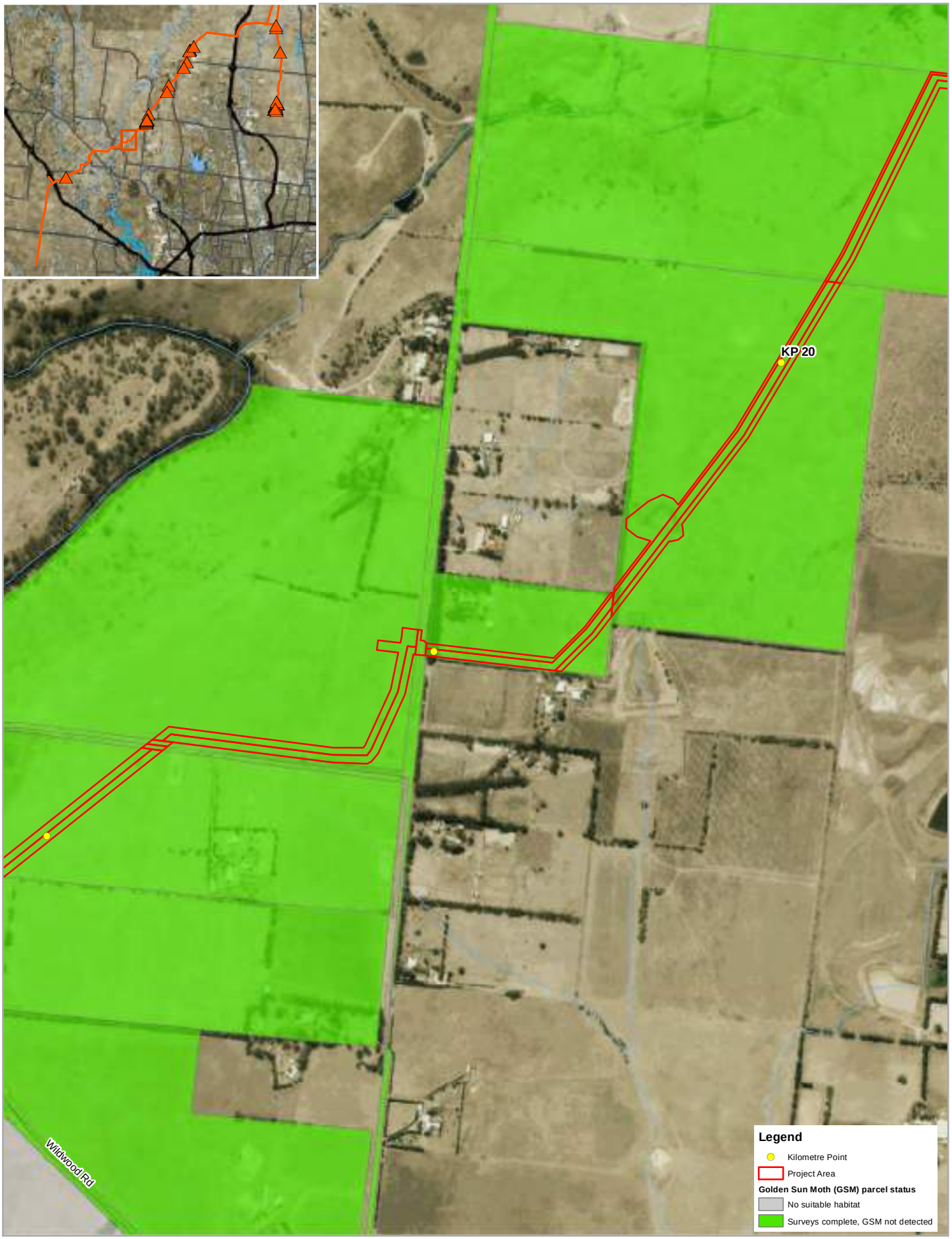
Project No. 12529997
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FIGURE **10**.10

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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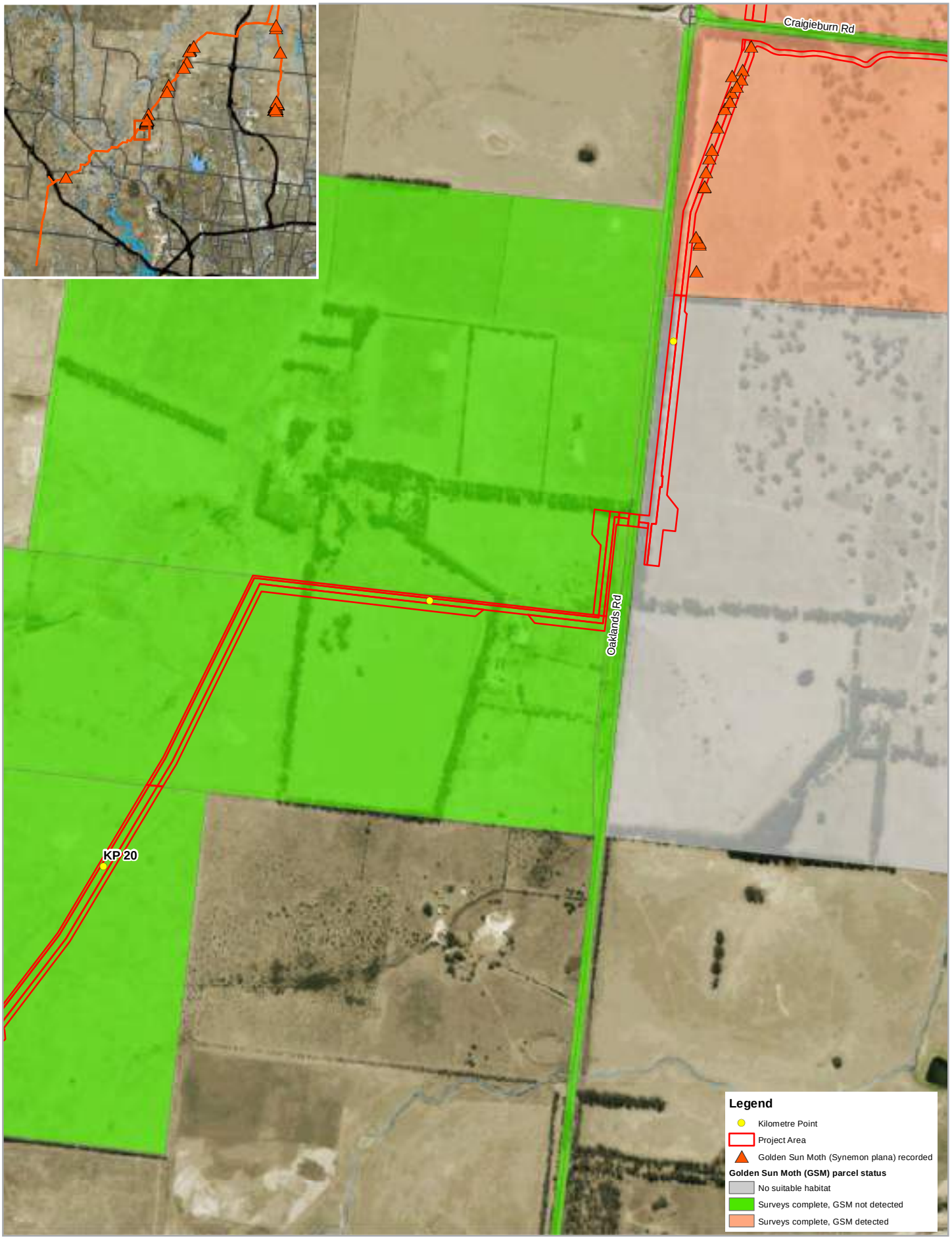
Project No. 12529997
Revision No. C
Date 02/03/2021

FIGURE 10.11

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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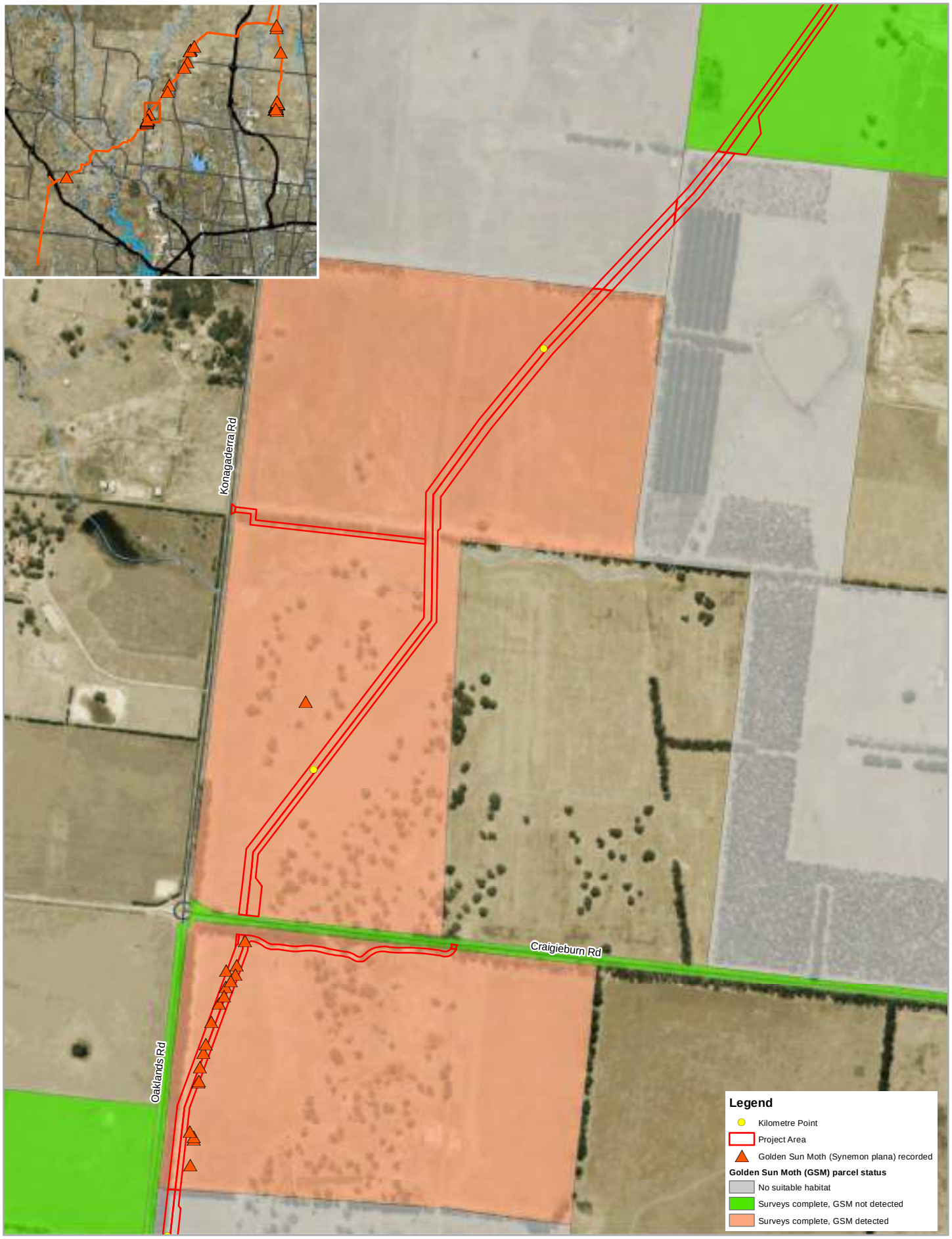
Project No. 12529997
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FIGURE 10.12

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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Survey results for
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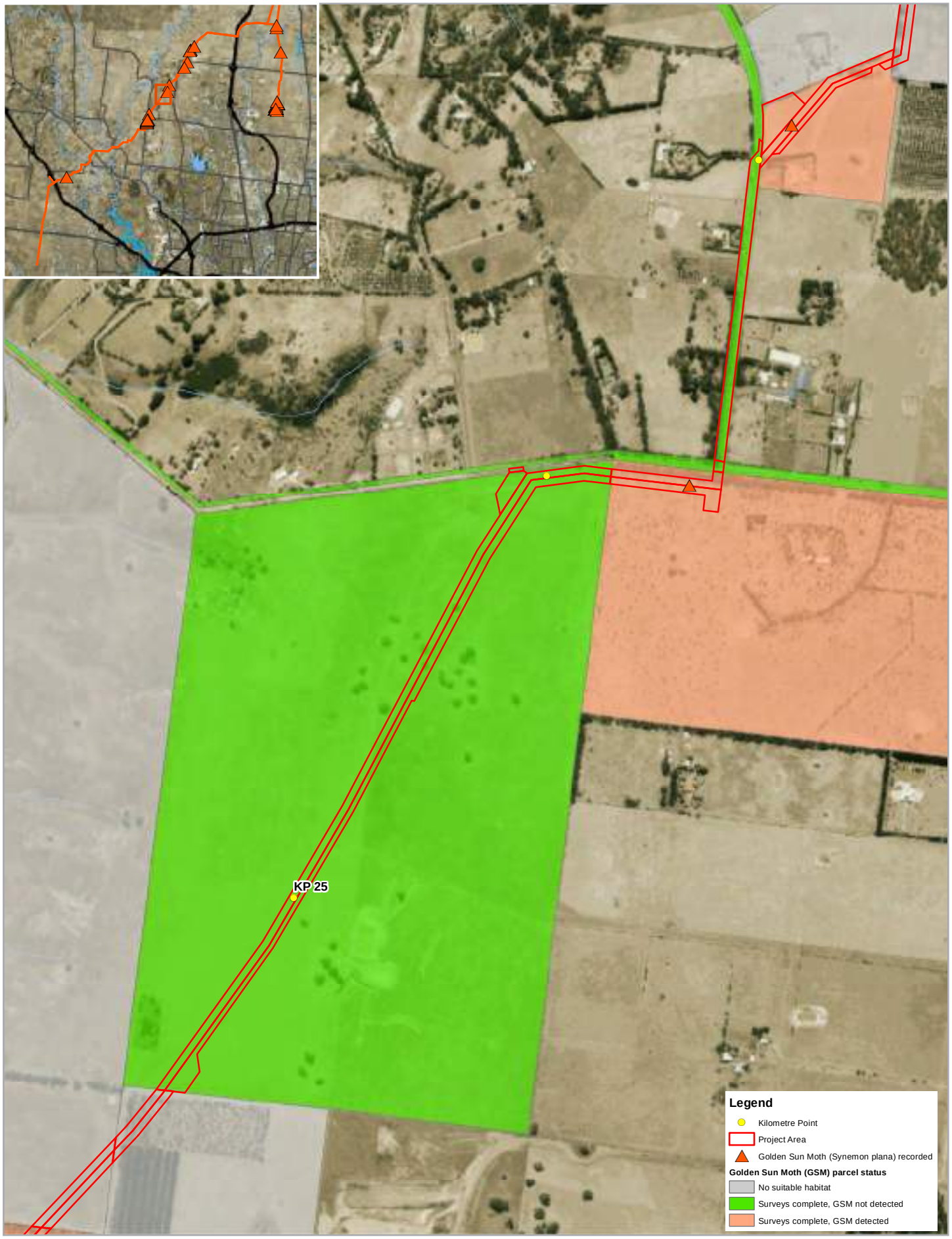
Project No. 12529997
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FIGURE 10.13

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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Survey results for
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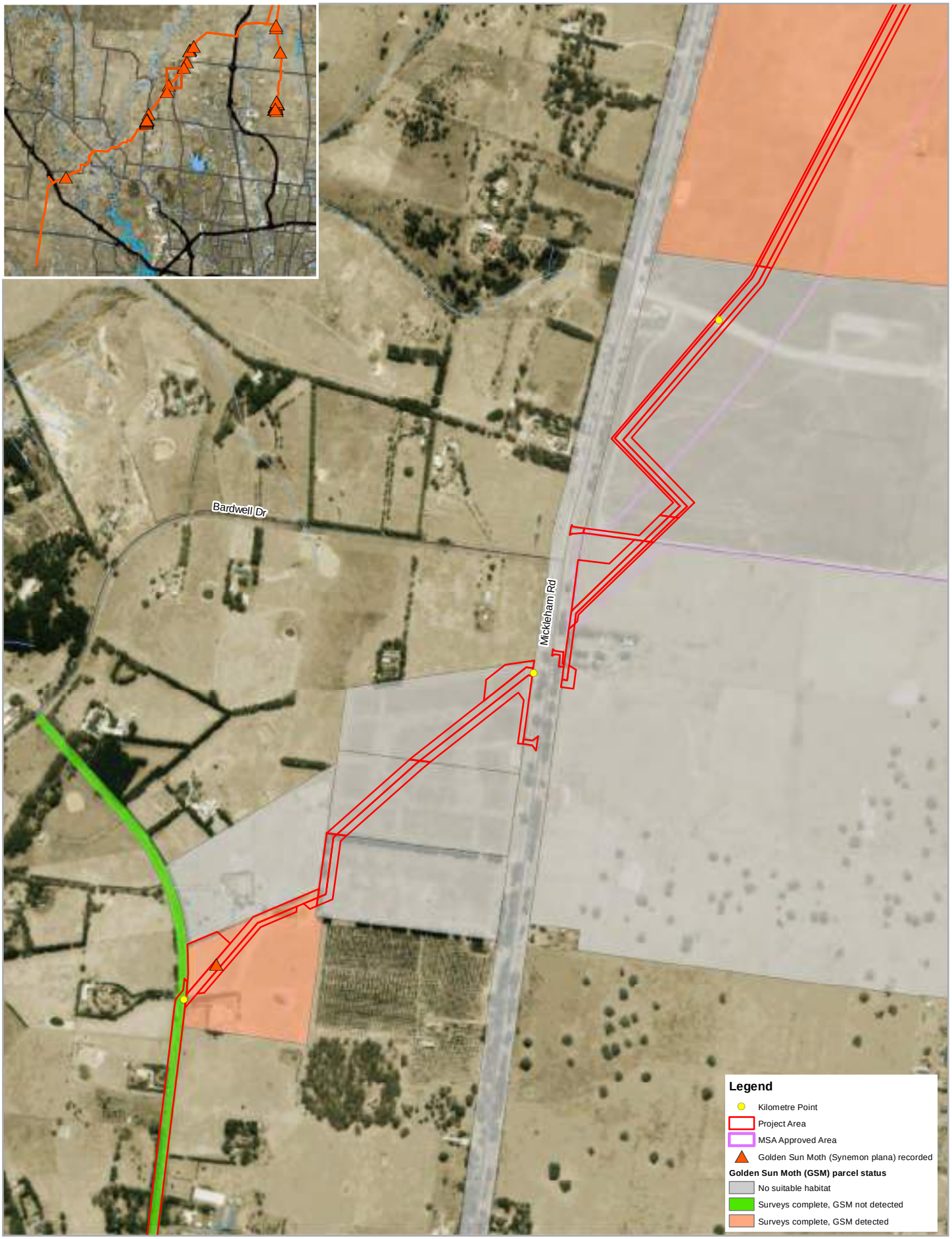
Project No. 12529997
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FIGURE 10.14

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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Survey results for
Golden Sun Moth

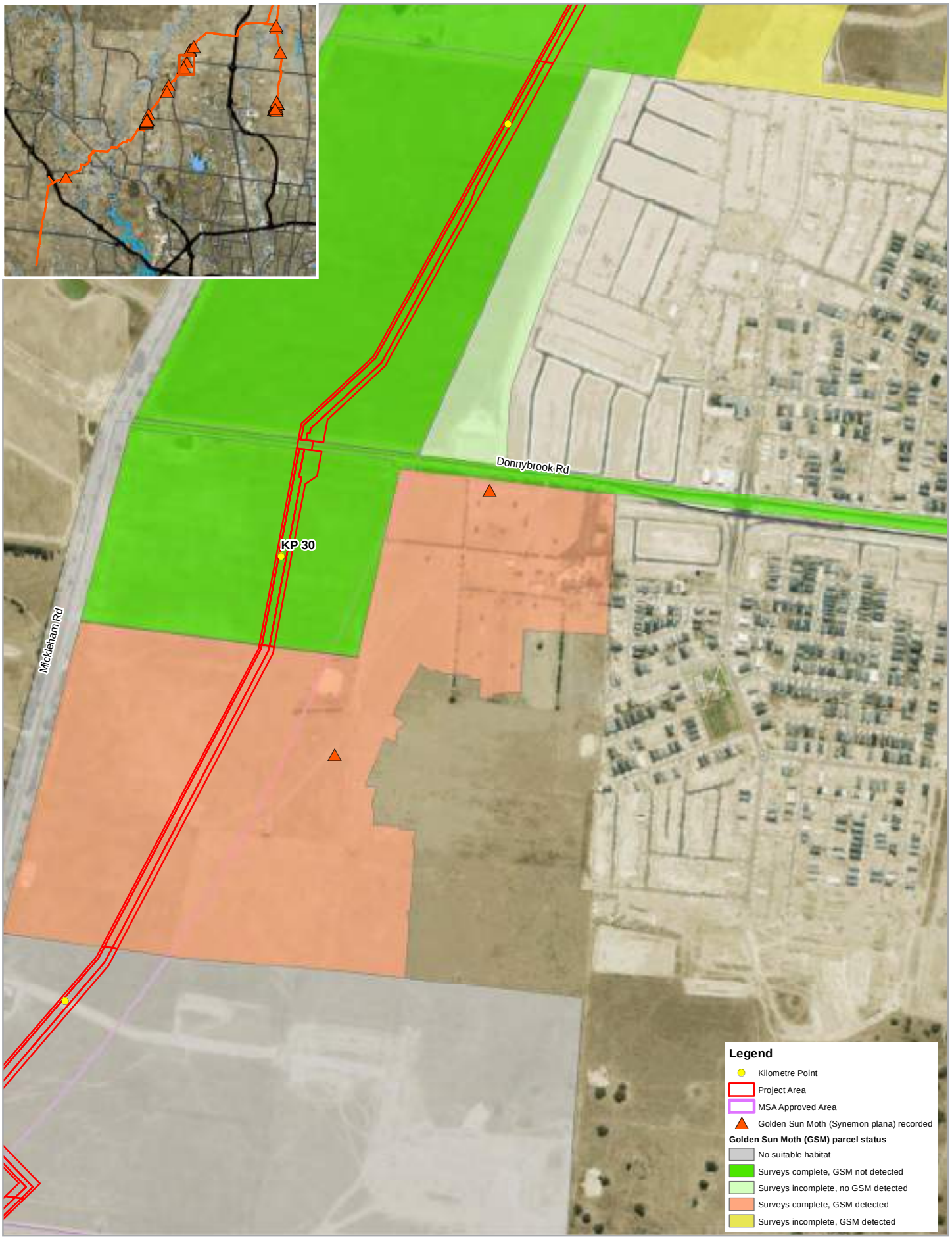
Project No. 12529997
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FIGURE 10.15

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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Survey results for
Golden Sun Moth

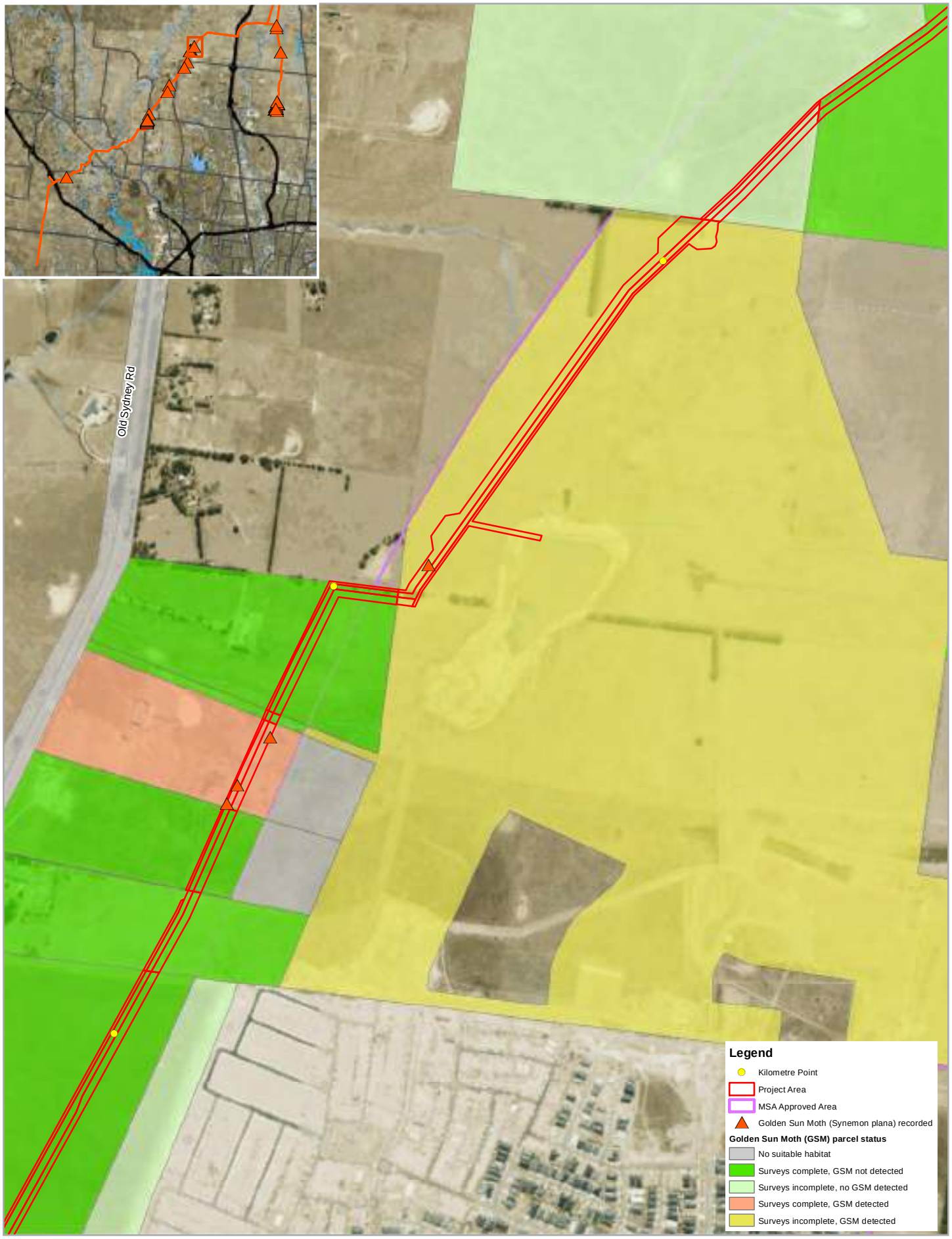
Project No. 12529997
Revision No. C
Date 02/03/2021

FIGURE 10.16

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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Survey results for
Golden Sun Moth

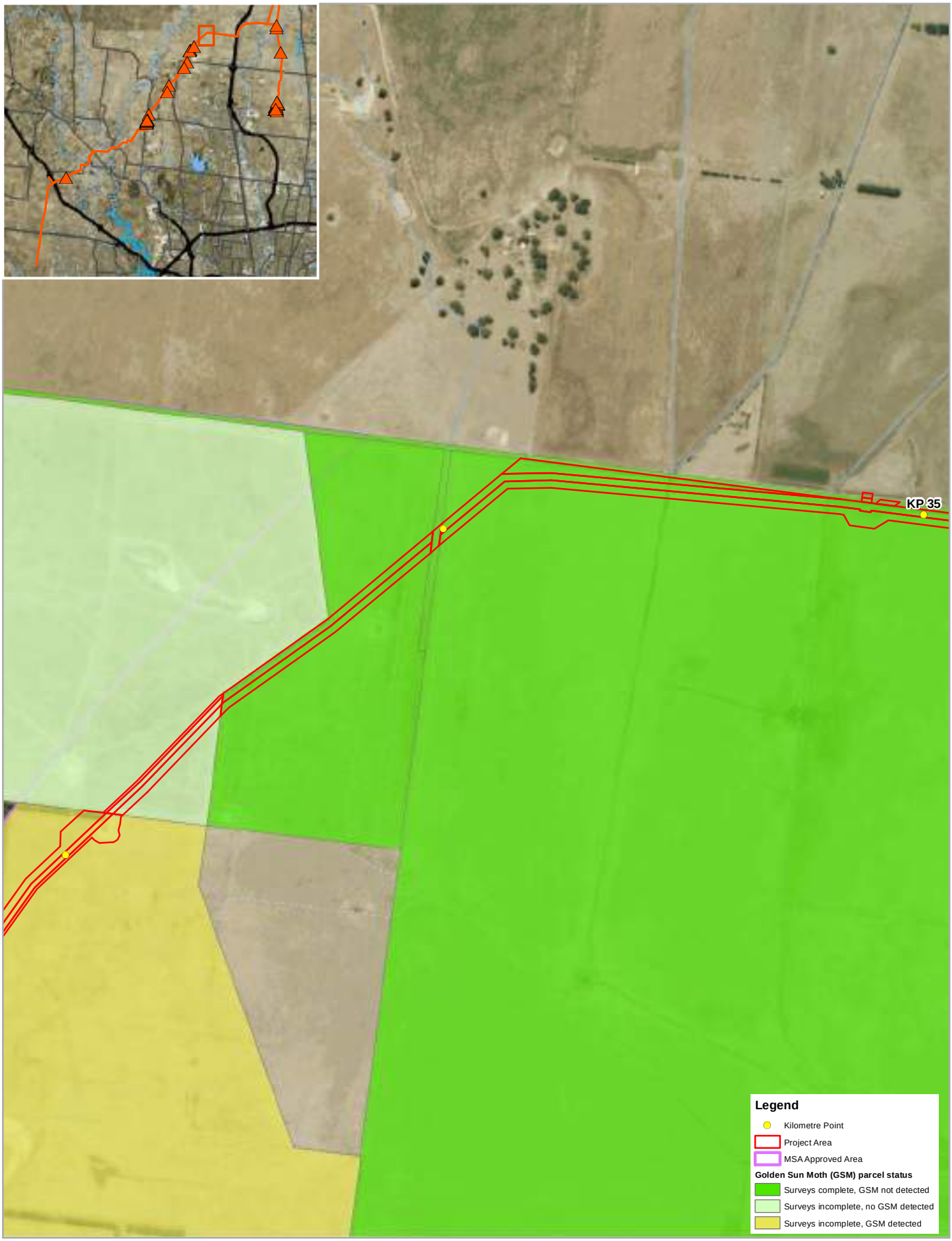
Project No. 12529997
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FIGURE 10.17

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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Survey results for
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Project No. 12529997
Revision No. C
Date 02/03/2021

FIGURE 10.18

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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Survey results for
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Project No. 12529997
Revision No. C
Date 02/03/2021

FIGURE 10.19

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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Project No. 12529997
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Date 02/03/2021

FIGURE 10.20

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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Project No. 12529997
Revision No. C
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FIGURE **10**.21

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

N

Australian Pipeline Limited
Western Outer Ring Main Gas Project

Survey results for
Golden Sun Moth

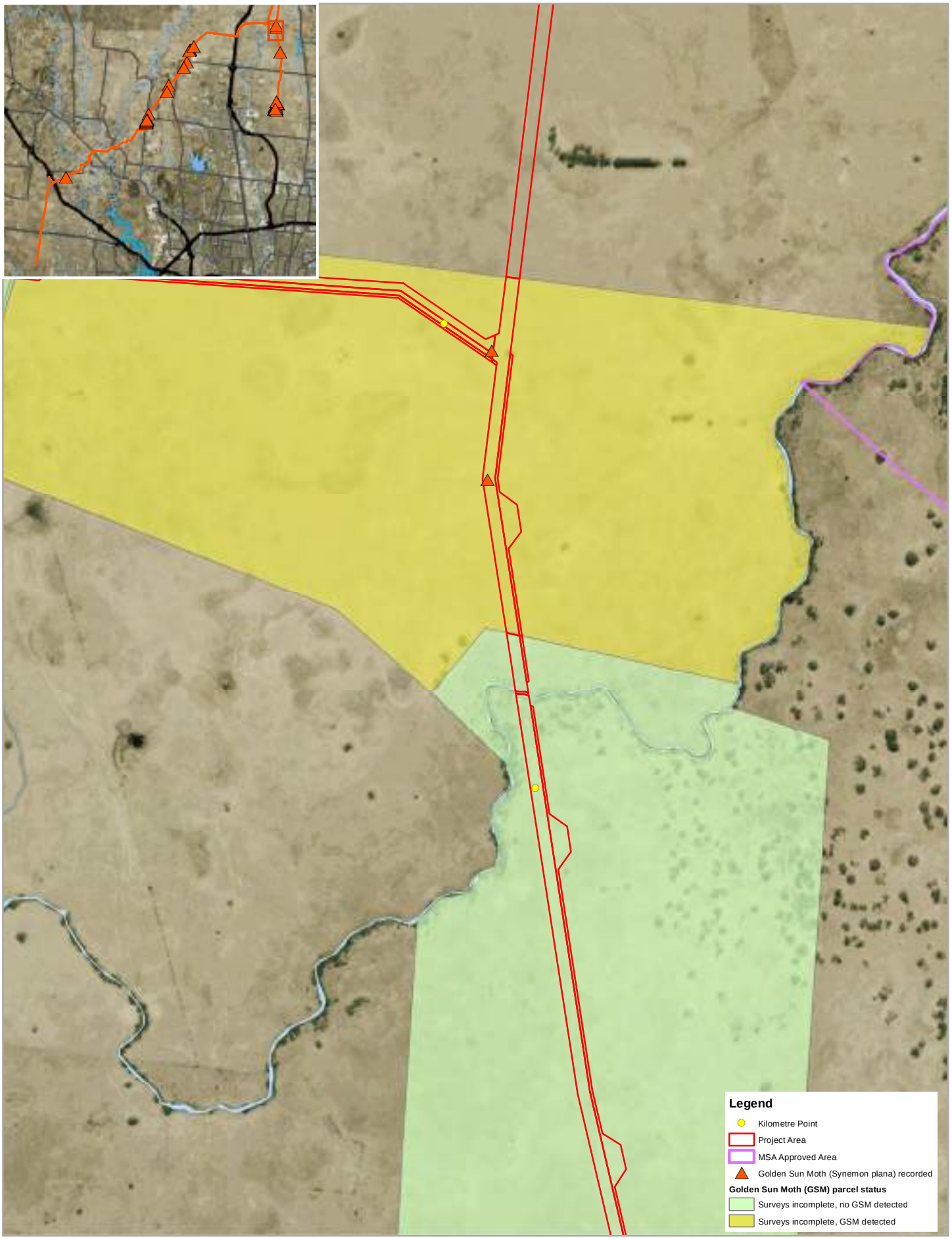
Project No. 12529997
Revision No. C
Date 02/03/2021

FIGURE 10.22

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Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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GHD

Australian Pipeline Limited
Western Outer Ring Main Gas Project

Survey results for
Golden Sun Moth

Project No. 12529997
Revision No. C
Date 02/03/2021

FIGURE **10**.23

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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Australian Pipeline Limited
Western Outer Ring Main Gas Project

Survey results for
Golden Sun Moth

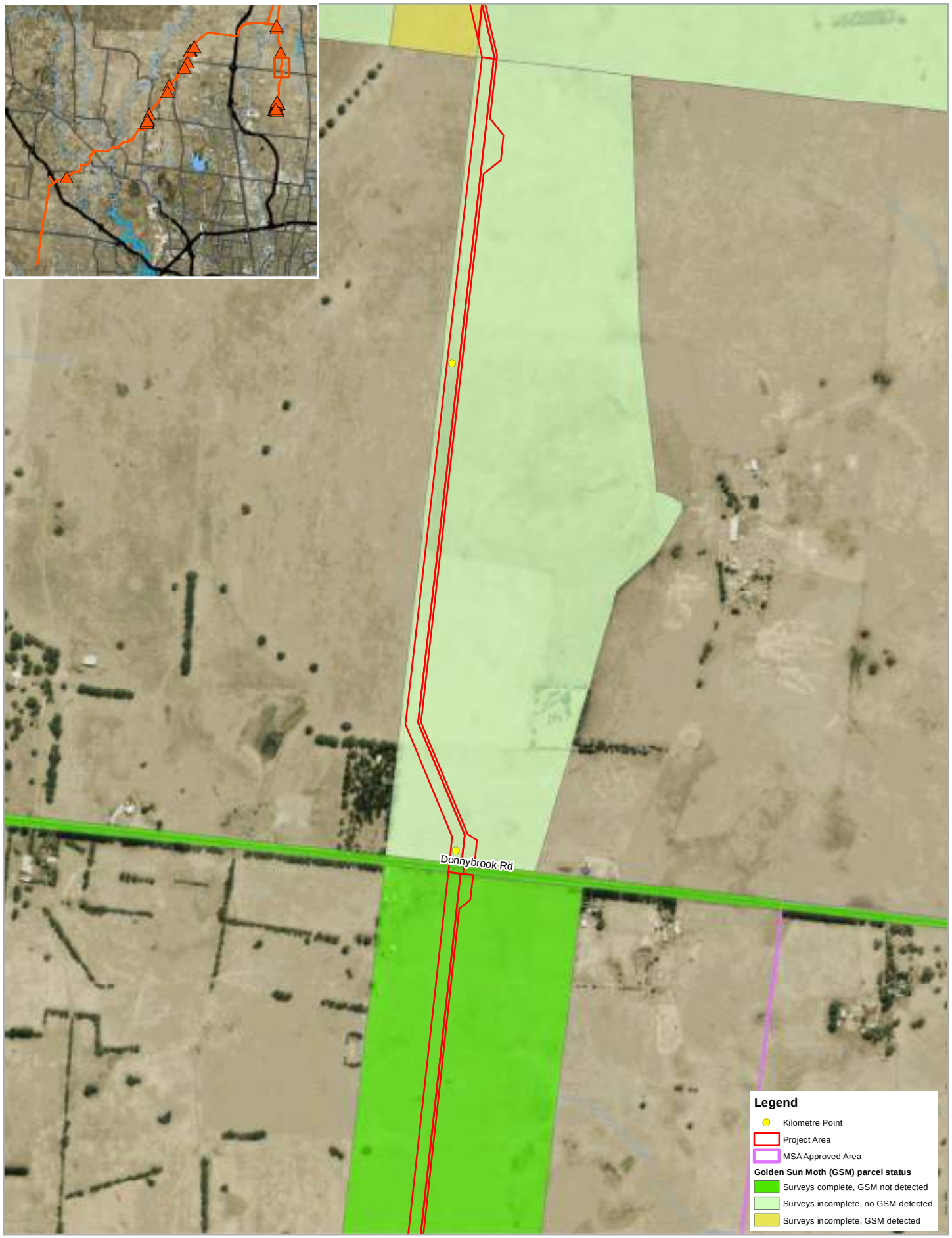
Project No. 12529997
Revision No. C
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FIGURE 10.24

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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Australian Pipeline Limited
Western Outer Ring Main Gas Project

Survey results for
Golden Sun Moth

Project No. 12529997
Revision No. C
Date 02/03/2021

FIGURE 10.25

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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Australian Pipeline Limited
Western Outer Ring Main Gas Project

Survey results for
Golden Sun Moth

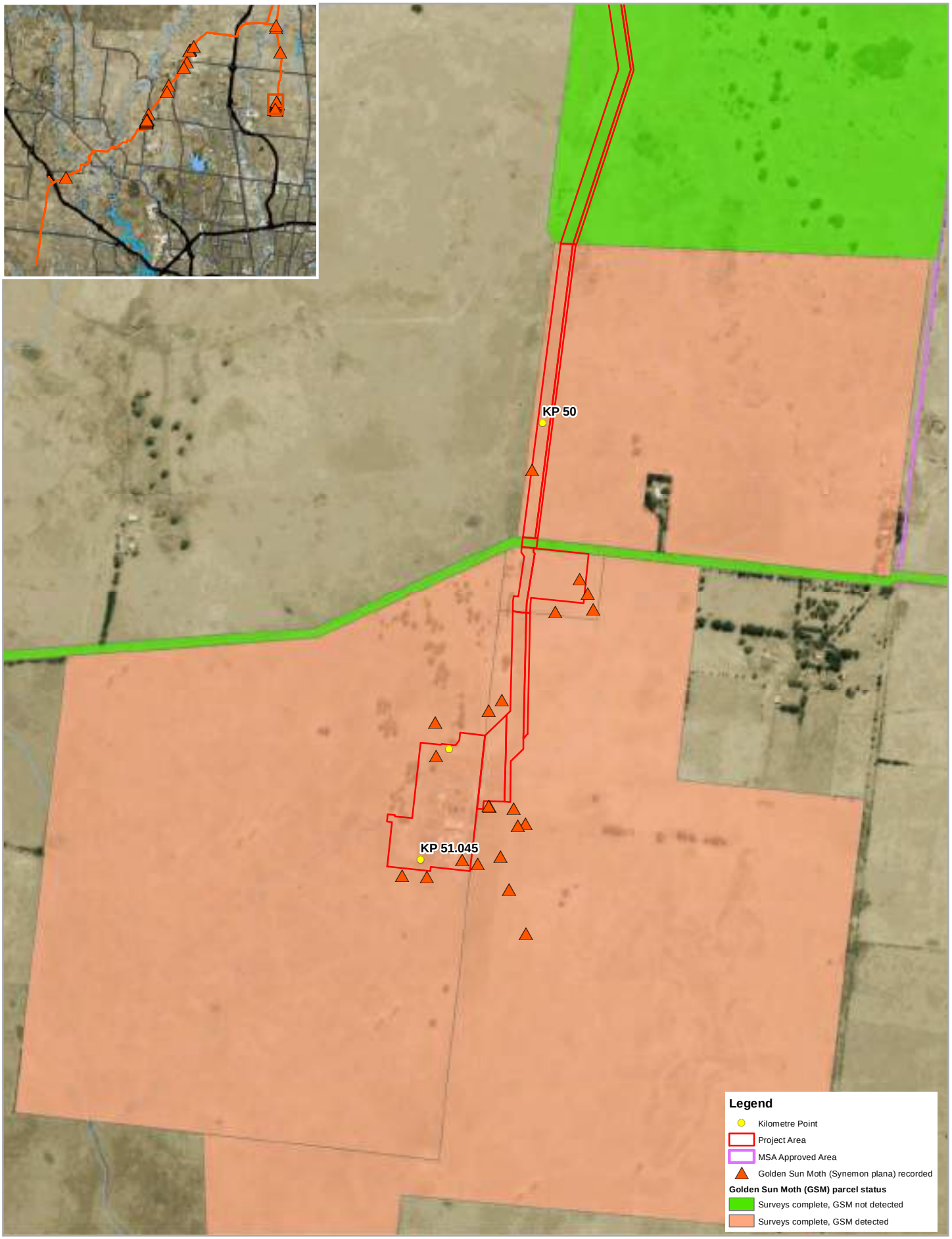
Project No. 12529997
Revision No. C
Date 02/03/2021

FIGURE **10**.26

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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Australian Pipeline Limited
Western Outer Ring Main Gas Project

Survey results for Golden Sun Moth

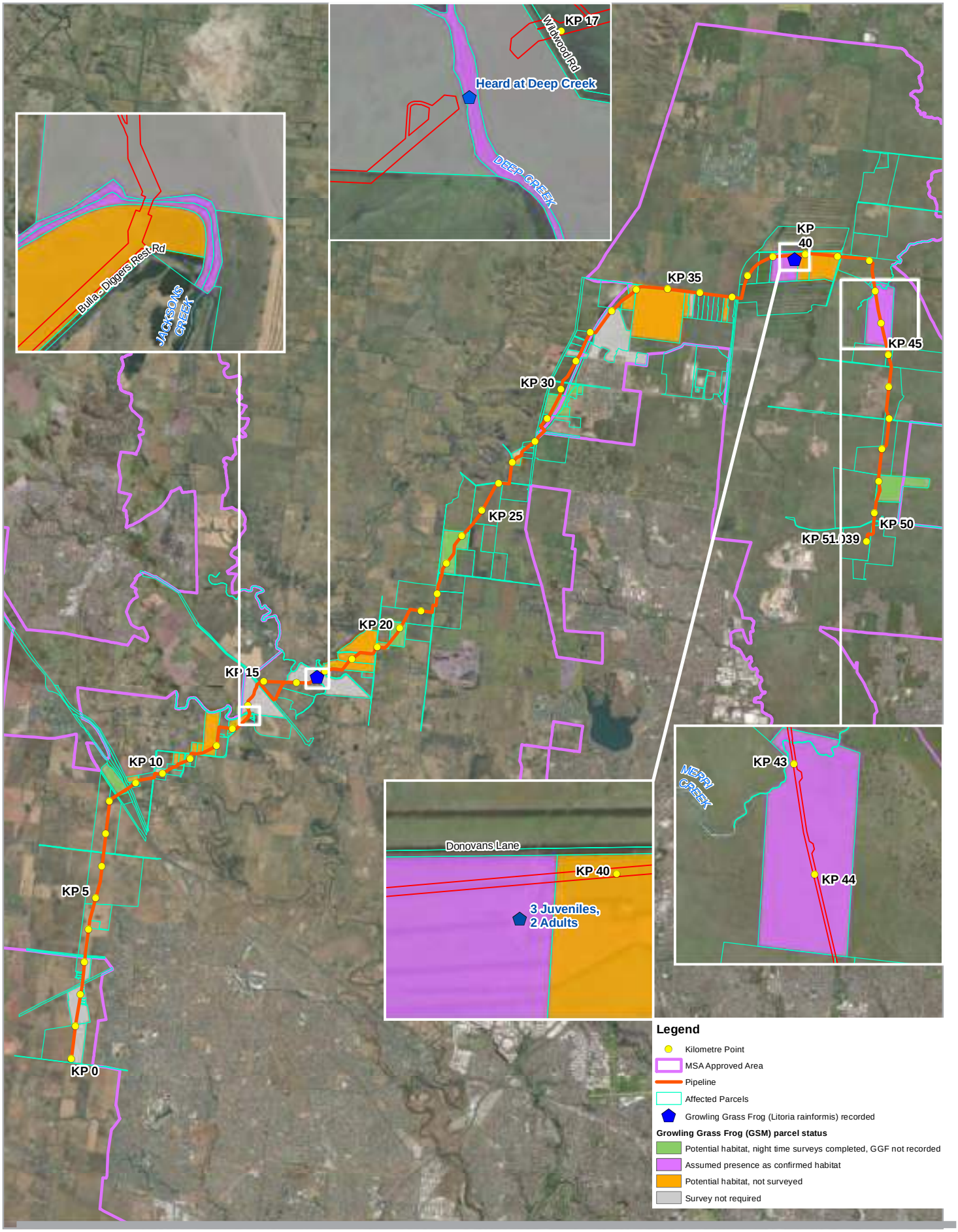
Project No. 12529997
Revision No. C
Date 02/03/2021

FIGURE 10.27

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Print date: 04 Mar 2021 - 14:51

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 1 2 3

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Australian Pipeline Limited
Western Outer Ring Main Gas Project

Survey results for
Growling Grass Frog

Project No. 12529997
Revision No. F
Date 04/03/2021

FIGURE 11

\\ghdnet\ghd\A\U\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\008_12529997_GrowlingGrassFrog_Overview_A4P_RevF_rev8.mxd
Print date: 04 Mar 2021 - 14:54

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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8.5 Aquatic ecology

8.5.1 Summary

The Project Area is within the Werribee River, Yarra River and Maribyrnong River catchments although no waterways are crossed by the alignment in the Werribee catchment. Technical report B – Surface water determined there are 23 waterways crossed by the alignment (Table 45). Of these waterways, five are named:

- Yarra catchment – Merri Creek and Kalkallo Creek
- Maribyrnong catchment – Jacksons Creek, Deep Creek and the Tame Street Drain

Table 45 Watercourse crossing points

	Name	Waterway Status	Location (KP)	Crossing Alignment	Stream Type Classification
01	Unnamed	Minor gully tributary to Kororoit Creek	1	Longitudinal	Laterally unconfined, headwater channel
02	Unnamed Tributary	Minor gully tributary to Tame St Drain	7.5	Perpendicular	Confined headwater channel
03	Tame Street Drain	MWC Main Drain channel	8.36	Skewed	Confined headwater channel
04	Unnamed	Minor gully tributary to Jacksons Creek	9.74	Perpendicular	Laterally unconfined, headwater channel
05	Unnamed	Minor gully tributary to Jacksons Creek	10.6	Perpendicular	Confined headwater channel
06	Unnamed	Minor gully tributary to Jacksons Creek (farm dam at crossing)	11.7	Perpendicular	Confined headwater channel
07	Jacksons Creek	“Complex” Waterway	13.7	Perpendicular	Confined valley with bedrock-controlled discontinuous floodplain
08	Unnamed	Gully tributary to Jacksons Creek	13.9	Skewed	Low sinuosity, confined gully
09	Deep Creek	“Complex” Waterway	16.7	Perpendicular	Confined valley with bedrock-controlled discontinuous floodplain
10	Unnamed	Upper gully tributary to Moonee Ponds Creek	19.47	Skewed	Confined headwater channel
11	Unnamed	Minor gully tributary to Deep Creek (farm dam at crossing)	23.4	Perpendicular	Laterally unconfined, headwater channel
12	Unnamed	Minor tributary to Kalkallo Creek	31.5-31.7	Skewed	Discontinuous channel
13	Unnamed	Minor tributary to Kalkallo Creek	32.6	Skewed	Discontinuous channel
14	Unnamed	Minor tributary to Kalkallo Creek	33.5	Perpendicular	Discontinuous channel
15	Unnamed	Tributary constructed drains (x3) to Kalkallo Creek	33.8-34	Skewed	Straightened channelised

	Name	Waterway Status	Location (KP)	Crossing Alignment	Stream Type Classification
16	Kalkallo Creek	Channelised Creek	34.5	Perpendicular	Straightened channelised
17	Unnamed	Tributary constructed drain to Kalkallo Creek	34.8	Perpendicular	Straightened channelised
18	Unnamed	Tributary constructed drain to Kalkallo Creek	35.5	Perpendicular	Straightened channelised
19	Unnamed	Tributary constructed drain to Kalkallo Creek	36.2	Perpendicular	Straightened channelised
20	Tributary of Merri Creek	Tributary to Merri Creek	40.8	Perpendicular	Intact valley fill
21	Merri Creek	“Complex” Waterway	42.9	Perpendicular	Bedrock-controlled sinuous valley with discontinuous floodplain
22	Seasonal wetlands	Seasonal freshwater marsh or meadow (Palustrine wetland)	44.8	n/a	Seasonal wetland (offline)
23	Unnamed	Tributary to Curl Sedge Creek (Tributary to Merri Creek)	50.8	Both	Intact valley fill

Based on aerial imagery and likely aquatic fauna distribution and habitat preferences, focus was placed on waterways with the highest likelihood of supporting threatened fish with the potential to be present in the Project Area. To that end, Merri Creek, Jacksons Creek and Deep Creek were selected for field assessment. All other minor drains and waterways intersected by the pipeline were deemed highly unlikely to support EPBC Act or FFG Act-listed species based on a desktop assessment. The existing conditions of the aquatic ecosystem assets, values and uses being considered throughout this assessment are described in the following sections.

The desktop assessment determined there were seven nationally or state listed threatened species or their habitat with the potential to occur within the Project Area. However, the desktop assessment and targeted surveys determined that most are considered to have a low likelihood of occurrence with Australian Grayling the only species with a medium likelihood (Table 46). Further details of the likelihood assessment are included in Appendix R.

Table 46 Likelihood assessment of aquatic values

Common name	Scientific name	Conservation status			Source^	Likely of occurrence
		EPBC	FFG	DELWP		
Australian Grayling	*Prototroctes maraena*	VU	L	v	2015 PMST	Medium
Dwarf Galaxias	*Galaxiella pusilla*	VU	L	e	PMST	Low
Murray Cod	*Maccullochella peelii*	VU	L	v	2012 PMST	Low
Macquarie Perch	*Macquaria australasica*	EN	L	e	2015	Low
Australian Mudfish	*Neochanna cleaveri*		L	c	1991	Low
Silver Perch	*Bidyanus bidyanus*	CR	L	v	1981	Low
Murray River Turtle	*Emydura macquarii*			v	2019	Low

^ Most recent record from VBA

8.5.2 Desktop assessment

8.5.2.1 Matters of national environmental significance EPBC Act

A five-kilometre buffered search of the PMST and VBA indicates that three nationally significant threatened species or their habitat have the potential to occur within the Project Area. These are Dwarf Galaxias (*Galaxias pusilla*), Australian Grayling (*Prototroctes maraena*) and Macquarie Perch (*Macquaria australasica*). The broader PMST and VBA searches down to the confluence with the Yarra River determined that Murray Cod (*Maccullochella peelii*) and Silver Perch (*Bidyanus bidyanus*) or their habitat also have the potential to occur. However, of these species only Australian Grayling has a medium likelihood of occurring in Deep Creek with all others considered low (see Appendix R).

Australian Grayling are the largest native salmoniform fish in Australia and the last surviving member of the family Prototroctidae (Ingram et al., 1990; Department of Environment, 2018b). The species occur in coastal rivers and streams in south-eastern Australia from the Shoalhaven River in New South Wales through to the Hopkins River in Victoria (Backhouse et al., 2008). They usually prefer cool, clear waters with a gravel substrate and alternating pool and riffle habitats (Bishop & Bell, 1978; Berra, 1982) but can also occur in turbid water (Jackson & Keohn, 1988). They may form large schools, especially before spawning periods (Gomon & Bray, 2011). Adults prefer moderate to fast-flowing water, usually below altitudes of 200 metres, although in Victoria they have also been recorded above 1,000 metres (Gomon & Bray, 2011).

8.5.2.2 FFG Act listed fauna

The five nationally listed species discussed above are also state listed under the FFG Act. In addition to these species, the broader VBA search identified that Australian Mudfish (*Neochanna cleaver*) have also been recorded in the Yarra River near Dights Falls, approximately 35 kilometres south of the Project Area. However, it has a low likelihood of occurring within the Project Area (see Appendix R).

8.5.2.3 DELWP Advisory Listed fauna

All EPBC Act and FFG Act listed fish species are also included in the DELWP Advisory List. The only additional species on the Advisory List that is not nationally or state listed in the Murray River Turtle (*Emydura macquarii*), which has a low likelihood of occurring within the Project Area based on habitat preferences and known distribution (see Appendix R).

8.5.2.4 Platypus

A search of the ALA determined that Platypus are present in Jacksons Creek but have a low likelihood in Deep Creek and Merri Creeks (see Sections 8.5.2.5 and 8.5.2.6, Appendix R).

Platypus (*Ornithorhynchus anatinus*) are endemic to eastern mainland Australia, Tasmania and King Island, with a small introduced population on Kangaroo Island. Although not listed under the national EPBC Act or the DELWP Advisory List, in 2016 the IUCN Red Listing for Platypus was elevated to 'Near Threatened.' On 10 January 2021, the Victorian Government announced that Platypus are now officially a threatened species and listed as vulnerable in under the FFG Act in Victoria. They are also considered a key environmental value and a unique and iconic aquatic mammal in the Study Area (Melbourne Water, 2018b).

Platypus are widely distributed in creeks, rivers, shallow lakes, wetlands, and their riparian margins, in agricultural land, urban areas, and natural environments (Bino et al., 2019). In eastern Australian rivers, the mid and lower reaches are generally more favoured than upper reaches (Serena et al., 2001; Turnbull 1998; Rohweder and Baverstock 1999; Koch et al. 2006; Macgregor 2015). Their preferred habitat tends to include consolidated earth banks with a riparian zone composed of large trees, fringing vegetation that overhangs the stream channel, wide streams with depths 1 to 3 metres containing pools with organic matter, coarse woody debris and coarse substrates (Rohweder 1992; Bryant 1993; Ellem et al. 1998; Serena et al. 2001; Milione and Harding 2009).

Platypus are predominately nocturnal although some foraging occurs during daylight, particularly in winter or when females are lactating (Bino et al., 2019). In rivers, most adults maintain a reasonably stable home ranges but these can vary between 0.5 and 15 km (Serena 1994; Gardner and Serena 1995; Bino et al. 2018). Although individuals typically use only a portion (e.g. mean 24–70%) of their home range in a 24 hour period (Serena 1994), adult males and females have, respectively, been documented to travel up to 10.4 km and 4.0 km overnight (Serena et al. 1998).

The breeding period, including the onset of courtship followed by nesting behaviour by females, begins around August and continues until young emerge from nesting burrows the following late January to early March (Bino et al., 2019). Two types of burrows are built and used by Platypus – camping or resting burrows and nesting burrows (Burrell 1927). Camping burrows are used by males and females year round and are usually simple in structure with no nesting material or specialised features (Burrell 1927). These burrows may be used by different individuals, and each individual may use multiple burrows (Serena 1994). In contrast, a nesting burrow is complex in design and used by a single female and her offspring (Burrell 1927). Females are entirely dependent on nesting burrows to successfully rear their young as they lack pouches to carry offspring and burrow provides a place for incubation and protection of eggs (Thomas et al., 2017).

8.5.2.5 Merri Creek condition

The Merri Creek catchment covers an area of 396 km^2 and is largely cleared of native vegetation (MCMC, 2009). Merri Creek originates in the foothills of the Great Dividing Range near Heathcote Junction before joining its western arm north of Wallan. It flows for around 60 kilometre south and joins the Yarra River at Digits Falls near Abbotsford. Merri Creek is managed as two sections – the lower section classified as 'urban' and the section upstream from Craigieburn classified as 'rural and forested'. The study falls within the upper section, where waterway health is impacted by urbanisation, agriculture and water diversions. River health monitoring reports from Melbourne Water suggest key challenges for waterways this section are altered physical form and water quality (Melbourne Water, 2018b).

Within the Project Area, Merri Creek is mainly an intermittent waterway that flows in winter-spring and after summer rains (MCMC, 2009). However, it is reported to provide drought refuges to aquatic flora and fauna, likely due to groundwater baseflow (Alluvium, 2019).

The water quality of Merri Creek is consistently poor to very poor due to high turbidity, salinity and nutrients (Alluvium, 2019). Like many other tributaries of the Yarra River, Merri Creek contributes significant sediment, nutrients and litter loads (MCMC, 2009). The Third Benchmark of Victorian Index of Stream Condition included an assessment of a reach within the alignment for Merri Creek (DEPI, 2010). The waterway was considered in poor condition, primarily due to low values for physical form (bank and bed conditions, physical habitat), streamside zone (riparian vegetation) and aquatic life (macroinvertebrates).

Melbourne Water currently considers the condition of Platypus and macroinvertebrate communities as low in the area, primarily due to urban development (Melbourne Water 2018a). The Atlas of Living Australia (2020) only has two records of Platypus within a 5 km radius of the Project Area and these were both near Craigieburn, the most recent in 2012. Native fish are in a moderate condition although since the 1990s, the variety and proportion of native fish species has declined and introduced species are relatively abundant (Melbourne Water 2018a).

The VBA indicates 11 native and three exotic fish species are known to occur, or likely to occur in the Merri Creek Project Area. There were no platypus or turtles known or predicted to occur within the Project Area.

The native species with a moderate or high likelihood of occurring in the Project Area, all of which are not nationally or state threatened species, are:

- Common Galaxias (*Galaxias maculatus*)
- Flatheaded Gudgeon (*Philypnodon grandiceps*)
- River Blackfish (*Gadopsis marmoratus*)
- Southern Shortfin Eel (*Anguilla australis*)
- Australian Smelt (*Retropinna semoni*)

The additional native species with a low likelihood to occur are Spotted Galaxias (*Galaxias truttaceus*), Climbing Galaxias (*Galaxias brevipinnis*), Australian Grayling (*Prototroctes maraena*), Pouched Lamprey (*Geotria australis*), Shorthead Lamprey (*Mordacia mordax*) and Tupong (*Pseudaphritis urvillii*). The three exotic species are Eastern Gambusia (*Gambusia holbrooki*), Goldfish (*Carassius auratus*) and Redfin (*Perca fluviatillis*). Note the ALA search did not identify any additional species not included in the VBA.

8.5.2.6 Deep Creek and Jacksons Creek condition

The Maribyrnong catchment covers an area of 1,408 km^2 of which 10% is natural vegetation, 80% used for agriculture and 10% for urban development (Melbourne Water, 2018a). Water is primarily harvested from waterways for domestic purposes, although some is also used for agriculture (Alluvium, 2019). River health monitoring reports from Melbourne Water suggest waterways in the catchment tend to be deeply incised with limited riparian and aquatic habitat. Flow is highly variable, including extended periods of low flow.

Jacksons Creek and Deep Creek are the major tributaries of the upper Maribyrnong River and are impacted by both urban and agricultural land use pressure. The water quality of these two waterways is generally poor due to high turbidity, salinity and nutrients and low dissolved oxygen (Alluvium, 2019). The Third Benchmark of Victorian Index of Stream Condition included an assessment of reaches within the alignment for both waterways (DEPI, 2010). Both were considered in poor condition, primarily due to low values for physical form (bank and bed conditions, physical habitat) and streamside zone (riparian vegetation). However, riparian corridors do provide important habitat networks for fauna movement (Biosis, 2019).

Melbourne Water currently considers the condition of Platypus as moderate and native fish as low in the Maribyrnong catchment (Melbourne Water 2018a). The Atlas of Living Australia (2020) has a Platypus (*Ornithorhynchus anatinus*) sighting as recently as 2019 in Jacksons Creek and this was around 200 metres downstream of the Project Area. The last record of Platypus in Deep Creek within 5 km of the Project Area was in 2007. Although fish populations have been relatively diverse and stable since the 1990s, only a small proportion are native species. Macroinvertebrate communities in a moderate condition although this is a reflection of healthier conditions in forested areas (Melbourne Water 2018a).

The VBA indicates that a total of 11 native and eight exotic fish species are known to occur, or likely to occur in the Jacksons Creek and Deep Creek Project Areas. The Eastern Snake-necked Turtle (*Chelodina longicollis*) and the DELWP Advisory Listed Murray River Turtle (*Emydura macquarii*) were last recorded in 2019. River Blackfish (*Gadopsis marmoratus*) also have a moderate likelihood to occur when consideration was given to diadromous and mobile fish species in the Maribyrnong River. Overall, the native species with a moderate or high likelihood of occurring in the Project Area are:

- Australian Smelt (*Retropinna semoni*)
- Common Galaxias (*Galaxias maculatus*)
- Ornate Galaxias (*Galaxias ornatus*)
- Flatheaded Gudgeon (*Philypnodon grandiceps*)
- Southern Pygmy Perch (*Nannoperca australis*)
- River Blackfish (*Gadopsis marmoratus*)
- Southern Shortfin Eel (*Anguilla australis*)
- Australian Grayling (*Prototroctes maraena*)

The additional native species with a low likelihood to occur are Spotted Galaxias (*Galaxias truttaceus*), Shorthead Lamprey (*Mordacia mordax*) and Tupong (*Pseudaphritis urvillii*). The eight exotic species are Eastern Gambusia (*Gambusia holbrooki*), Goldfish (*Carassius auratus*), Redfin (*Perca fluviatilis*), Brown Trout (*Salmo trutta*), European Carp (*Cyprinus carpio*), Roach (*Rutilus rutilus*), Oriental Weatherloach (*Misgurnus anguillicaudatus*) and Tench (*Tinca tinca*). Note the ALA search did not identify any additional species not included in the VBA.

8.5.3 Field assessment

This section details the aquatic ecological values observed in the Project Area during the August 2020 surveys. Field assessments were completed at Merri Creek, Deep Creek and Jacksons Creek.

8.5.3.1 Merri Creek

In the vicinity of the proposed waterway crossing Merri Creek is flanked by scattered native shrub and tree species (Tea tree *Leptospermum* species and *Eucalyptus* species). In-stream habitat varied throughout the surveyed reach. The reach selected for the fish survey, based on the best fish habitat observed during the site visit, included large boulder habitat and submerged aquatic macrophytes such as Water Ribbons *Triglochin* sp. The substrate was covered by a silt layer, likely lowering the quality of habitat present. Water depths ranged from 10 to 50 cm and width of the waterway in the survey location ranged from 2-3 m. Small sections of riffle (i.e. moving water) habitat were observed but the majority of the reach surveyed was slow-flowing pool habitat (Plate 3, left image).

In-stream habitat in the vicinity of the pipeline crossing the habitat was of poorer quality – with the stream choked by Bulrush *Typha sp.* This constriction of the waterway also meant that the substrate was covered with a thick layer of silt – lowering the diversity of habitat available for aquatic fauna (Plate 3, right image).

The existing VNIE pipeline easement also crosses Merri Creek at the same location. As such, the waterway has previously been disturbed due to pipeline construction and subsequently rehabilitated.

Table 47 summarises the fish survey carried out on site. No threatened fish species were collected during the surveys. Two common native species were detected - Common Galaxias and Short-Finned Eel. The eDNA analyses did not detect the presence of Australian Grayling in the Project Area or at those sites upstream and downstream where samples were collected.

Based on habitat observed on site, results of the fish survey and a lack of previous records in the catchment it is considered highly unlikely that Dwarf Galaxias, Australian Grayling, Macquarie Perch, Murray Cod, Silver Perch, Australian Mudfish or the Murray River Turtle are present in Merri Creek Project Area.



Plate 3 Representative photos of aquatic habitat within the Project Area – Merri Creek

8.5.3.2 Jacksons Creek

In the vicinity of the proposed waterway crossing Jacksons Creek was flanked by scattered native shrub and tree species (*Eucalyptus* species) on the western side of the waterway. The eastern side of the waterway had been cleared of native vegetation. In-stream habitat included cobble and large boulder habitat. The substrate was covered by a silt layer, likely lowering the quality of habitat present. Water depths ranged from 10 to 100 cm and width of the waterway in the survey location ranged from 3-6 m. Small sections of riffle habitat were present and surveyed upstream from pool habitat (Plate 4, left image). Large beds of Common Reed *Phragmites australis* were observed on the left hand side of the waterway along with scattered *Juncus* reeds.

Table 47 summarises the fish survey carried out on site. No threatened fish species were collected during the surveys. Four common native species were detected – Australian Smelt, Flatheaded Gudgeon, Ornate Galaxias and Short-Finned Eel and two exotic species (Eastern Gambusia and Redfin). The eDNA analyses did not detect the presence of Australian Grayling in the Project Area or at those sites upstream and downstream where samples were collected.

Based on habitat observed on site, results of the fish survey and a lack of previous records in the catchment it is considered highly unlikely that Dwarf Galaxias, Australian Grayling, Macquarie Perch, Murray Cod, Silver Perch, Australian Mudfish or the Murray River Turtle are present in the Jacksons Creek Project Area.



Plate 4 Representative photos of aquatic habitats within the Project Area – Jacksons Creek

8.5.3.3 Deep Creek

In the vicinity of the proposed waterway crossing Deep Creek was flanked by scattered native shrub and tree species (*Eucalyptus* species) on both sides of the waterway. In-stream habitat included cobble and large boulder habitat with some pebble and gravel sections. Water depths ranged from 30 to 90 cm and width of the waterway in the survey location ranged from 4-6 m. Riffle habitat was present and surveyed downstream the open pool habitat (Plate 5).

Table 47 summarises the fish survey carried out on site. No threatened fish species were collected during the surveys. Three common native species were detected – Flatheaded Gudgeon, Ornate Galaxias and Short-Finned Eel and two exotic species (Eastern Gambusia and Redfin). The eDNA analyses did not detect the presence of Australian Grayling in the Project Area or at those sites upstream and downstream where samples were collected.



Plate 5 Representative photos of aquatic habitats within the Project Area – Deep Creek

Table 47 Summary of results of fish surveys – August 2020

Site	Common name	Species name
Deep Creek at proposed pipeline crossing	Short-finned Eel	*Anguilla australis*
	Flatheaded Gudgeon	*Philypnodon grandiceps*
	Ornate Galaxias	*Galaxias ornatus*
Jacksons Creek at proposed pipeline crossing	Shortfinned Eel	*Anguilla australis*
	Ornate Galaxias	*Galaxias ornatus*
	Australian smelt	*Retropinna victoriae*
	Flatheaded Gudgeon	*Philypnodon grandiceps*
	Eastern Gambusia	*Gambusia holbrooki*
	Redfin Perch	*Perca fluviatilis*
Merri Creek at proposed pipeline crossing	Shortfinned Eel	*Anguilla australis*
	Common Galaxias	*Galaxias maculatus*

Based on habitat observed on site, results of the fish survey and a lack of previous records in the catchment it is considered highly unlikely that Dwarf Galaxias, Macquarie Perch, Murray Cod, Silver Perch, Australian Mudfish or the Murray River Turtle are present in Deep Creek Project Area. Although no Australian Grayling were detected during the targeted surveys, this does not preclude the chance that they would migrate through the Project Area during spawning periods and they have been assigned a medium likelihood of occurrence. Dawson and Koster (2018) demonstrated that during non-migratory periods Australian Grayling typically occupy restricted areas of a stream (i.e. tens to hundreds of metres). Therefore, the findings of the targeted surveys suggest that there are no resident individuals within the Project Area but that they may still migrate through during adult spawning periods. The spawning of adult Australian Grayling is triggered by increases in flow and although there is some uncertainty about specific timing, it is thought to occur from around April to July (Amtstaetter, *et al*., 2016; Koster and Dawson, 2010).

8.6 Wetlands

8.6.1 Wetlands of International Importance (Ramsar)

The Convention's List of Wetlands of International Importance, which are known as Ramsar sites, are rare or unique wetlands, or wetlands that are important for conserving biological diversity.

A PMST search did not identify Ramsar sites occurring within five kilometres of the Project Area. The nearest Ramsar site is the *Port Phillip Bay (western shoreline) and Bellarine Peninsula*, the nearest part of which is approximately 20 kilometres downstream of the Project Area. Given the distance of the Ramsar site from the Project Area, direct and indirect impacts are not expected to occur from the proposed Project.

8.7 Conservation areas

The BCS identifies 36 areas within the MSA area which are to be protected as conservation areas.

Part of the Project Area traverses areas approved under Part 10 of the EPBC Act (DELWP, 2020a). The conservation areas are protected by the conditions of the Commonwealth approvals for urban development in Melbourne growth corridors including the requirements of the BCS and zoning and planning controls which apply under the relevant planning schemes.

The Project area traverses two BCS conservation areas (Figure 12, Figure 13, Table 48):

- Conservation Area 34a - Northern Growth Corridor: Growling Grass Frog Corridor (between KP42 and KP44). This area has been classified as a Growling Grass Frog conservation, floodplain and open space area in the BCS. The key rationale for protection of this area is that it protects important populations of Growling Grass Frog and ensures connectivity between populations within the northern growth corridor. The Project Area follows the existing VNIE pipeline easement within the conservation area.
- Conservation Area 28b - Summerhill Road (East), Wollert (between KP48 and KP50). This area was originally classified as an open space area within the BCS to preserve areas of GEWVVP, NTGVVP and Striped Legless Lizard habitat. This conservation area has since been assigned to a nature conservation following a boundary revision in 2017 (DELWP 2017c). A small area of modelled NTGVVP and GEWVVP is within the Project Area. This is largely within the existing VNIE pipeline easement.

A Works in Conservation Area (WICA) approval will be required for any works proposed in a Conservation Area. WICA applications are submitted for DELWP's consideration, with some applications also requiring Commonwealth approval prior to commencement of the development.

Table 48 Extent of Conservation Areas within the Project Area

Conservation area	Extent of Project Area within conservation area (ha)	Extent of Project Area within conservation area (excluding existing easement) (ha)
Conservation Area 34a - Northern Growth Corridor	2.39	0.58
Conservation Area 28b - Summerhill Road (East)	1.78	0.53

8.7.1 Areas of Strategic Importance

Areas of Strategic Importance (ASI) have been identified to protect existing and potential breeding habitat within Growling Grass Frog Conservation Areas from incompatible uses. The Areas of Strategic Importance mapping aims to help partners and those developing land to avoid and minimise impacts on the most critical parts of Growling Grass Frog Conservation Areas.

Conservation Area 34a – Northern Growth Corridor contains Areas of Strategic Importance for the Growling Grass Frog (Figure 13). Table 49 provides a breakdown of the ASI types intercepted by the Project Area of which only 0.58 ha is outside the existing easement.

Table 49 Extent of Strategic Importance Areas within the Conservation Area 34a

Area of Strategic Importance (ASI) type	Extent of Project Area overlap within conservation area (ha)	Extent of Project Area within conservation area (excluding existing easement) (ha)
Other terrestrial habitat	0.10	0.02
Terrestrial habitat buffer to ASI and waterway	1.23	0.20
Area of Strategic Importance - Indicative new wetland location	0.05	0.05
Area of Strategic Importance - Instream pool	0.01	0.00
Area of Strategic Importance - Buffer around waterbodies	1.01	0.31
Total	**2.39**	**0.58**

8.8 Environment Mitigation Levy

The MSA Levy Act applies to areas declared by the Secretary of the DELWP as a levy area. The levy area covers the four growth corridors within the expanded 2010 Urban Growth Boundary, including the location of the Project Area. The levy to offset the loss or deemed loss of particular listed threatened species' habitat and/or native vegetation also cover State-based offset obligations. The levy does not apply to conservation areas identified in the BCS, which are subject to alternative offsetting arrangements as required by DELWP.

The liability to pay an MSA levy is triggered when a levy event occurs within the levy area, where habitat compensation obligations have not been previously met. The Project has the potential to trigger two levy events:

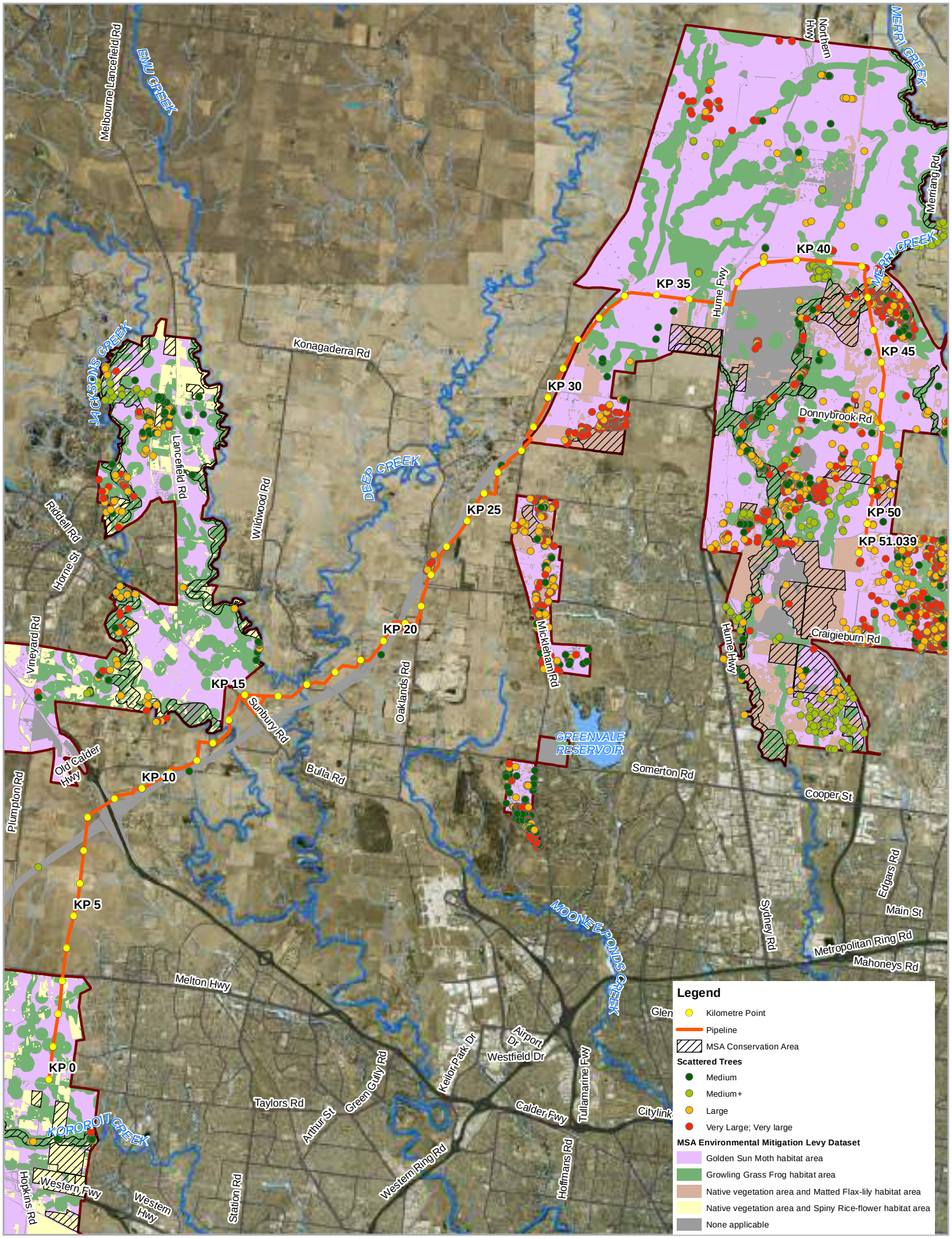
- Issue of a Statement of Compliance for a plan of subdivision (i.e. Subdivision of land)
- Construction of utility infrastructure on Crown land

Table 50 details the extent of levy types within the Project Area, however there is no Crown land within the declared levy area that overlaps Crown land[7]. The only levy event triggered is expected to be where land associated with MLV3 (Gunns Gully Road) will be acquired as a subdivision. This subdivision is expected to result in impacts to 0.01 ha of Golden Sun Moth levy type.

Table 50 Environment Mitigation Levy extent

Levy type	Extent of levy type within Project Area (ha)	Levy triggers	
		Extent of levy type within Project Area that is Crown land (ha)	Extent of levy type within Project Area subject to subdivision (ha)
Golden Sun Moth	48.57	0.00	0.01
Growling Grass Frog	8.74	0.00	0.00
Native vegetation area and Matted Flax-lily habitat area	1.07	0.00	0.00
Native vegetation area and Spiny Rice-flower habitat area	4.06	0.00	0.00
None applicable	1.85	0.00	0.00
Total	**64.29**	**0.00**	**0.01**

[7] There is a small amount of Crown Land in the Project Area though this is within a Conservation Area which is not subject to the Environment Mitigation levy.



Paper Size ISO A4

0 2,000 4,000

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Australian Pipeline Limited
Western Outer Ring Main Gas Project

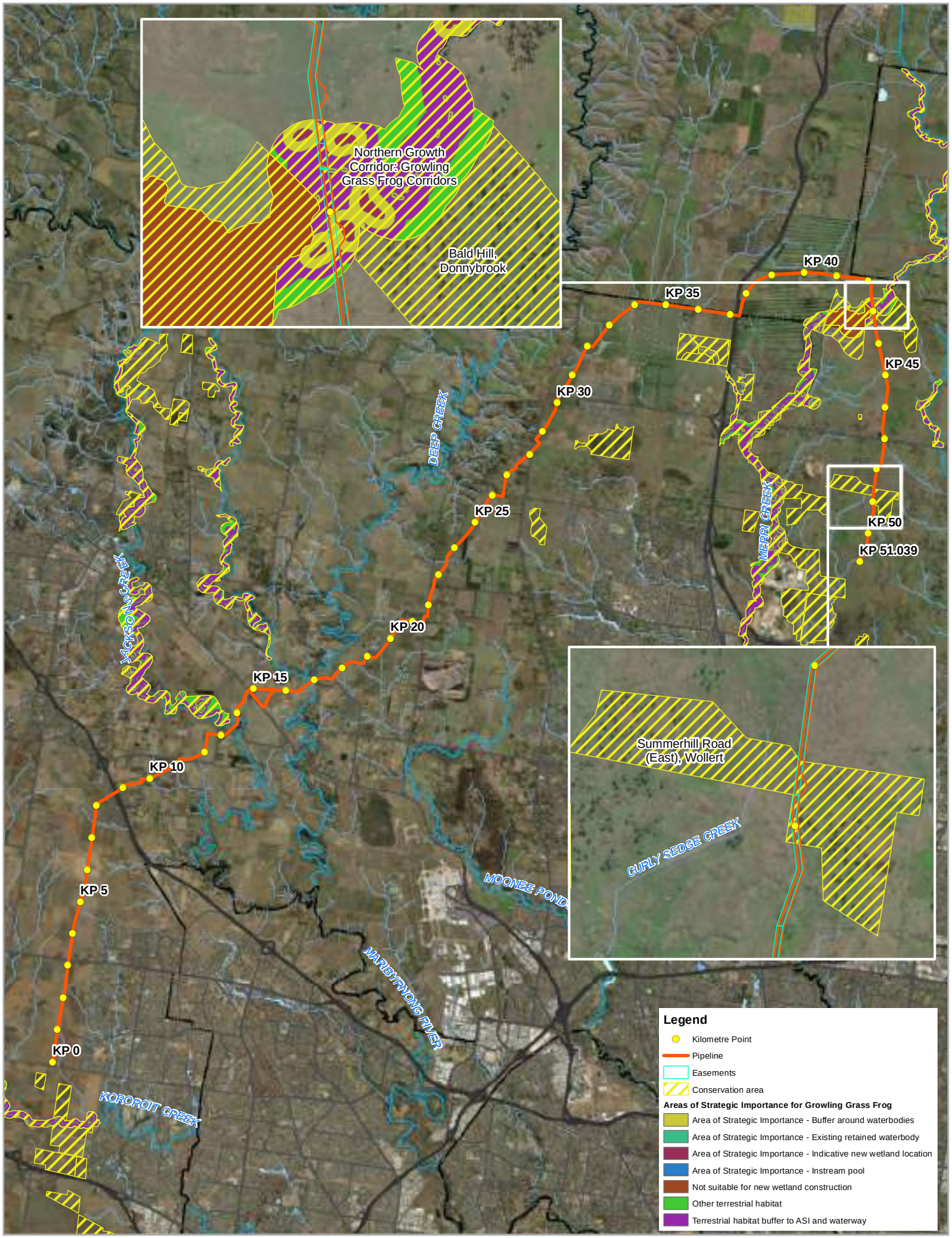
Melbourne Strategic Assessment
Environmental Mitigation Levy Dataset

Project No. 12529997
Revision No. C
Date 12/08/2020

FIGURE 12

Data source: DELWP, VicMap, 2020; GHD, 2020; Biosis, 2020 . Created by: kgardner

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Paper Size ISO A4

0 1 2 3

Kilometers

Map Projection: Lambert Conformal Conic
Horizontal Datum: GDA 1994
Grid: GDA 1994 VICGRID94

N

Australian Pipeline Limited
Western Outer Ring Main Gas Project

Project No. 12529997
Revision No. B
Date 19/10/2020

Conservation Areas

FIGURE 13

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: kgardner

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9. Risk assessment

A risk assessment of Project activities was performed in accordance with the method described in Section 6.3, to guide the impact assessment and identify potential environmental effects from construction and operation of the Project.

As outlined in section 6.3, the purpose of the risk assessment is to screen issues and inform the focus and level of assessment and analysis to be undertaken of potential environmental effects and mitigation. In the case of biodiversity and habitats, some risks are certain to occur since vegetation removal within the Project Area is not entirely avoidable and risk reduction with additional mitigation may not be possible when the likelihood of the risk occurring cannot be changed. However, in accordance with the mitigation hierarchy, residual impacts on flora and habitats will be offset to comply with relevant Commonwealth and State guidelines. This context is important in considering the relevance of the risk assessment results for this study.

Thirty-two construction risks and four operation risks were identified and assessed. Risks with a higher initial risk were given more focus in the impact assessment and directly impact biodiversity in the Project Area.

One risk had a residual risk rating of medium and two risks had a residual risk rating of very high.

The register of risk pathways and results of the risk assessment is provided in Table 51. The consequence criteria, likelihood approach and the risk matrix are provided in Appendix A.

Table 51 Risk assessment results

Risk ID	Risk pathway	Construction/ operation	Pipeline/ MLV/ compressor/All	Initial mitigation measure	Initial risk rating			Additional mitigation measure	Residual rating		
					Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating
B1	**Land clearing during construction impacting EPBC Act and FFG threatened flora** Removal of EPBC Act and FFG Act threatened flora Matted Flax lily and Tough Scurf-pea during construction.	Construction	All	Impacts to the Matted Flax-lily plant will be avoided by using HDD during construction. Pipeline re-alignment has avoided Tough Scurf-pea. EMM B1 - Vegetation management EMM B3 - Contractor awareness EMM B8 – Topsoil management	Minor	Rare	Negligible	No additional EMM required	Minor	Rare	Negligible
B2	**Removal of threatened ecological communities during construction** Removal of EPBC Act and FFG Act threatened communities *Grassy Eucalypt Woodland of the Victorian Volcanic Plain*; *Natural Temperate Grassland of the Victorian Volcanic Plain*; Western (Basalt) Plains Grasslands Community; Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland)	Construction	All	Direct losses of threatened ecological communities through land clearing cannot be entirely avoided within the construction corridor owing to terrain constraints and construction cost. Pipeline re-alignment at one location will avoid 1 ha of grassy woodland TECs including 10 large trees, and 1.6 ha of grassland TECs. Recommended EMMs will minimise impacts to adjoining vegetation and trees, manage soil and surface run-off, and will require contractor inductions that include awareness of biodiversity issues. EMM B1 - Vegetation management EMM B2 (initial) - Invasive weeds, pathogens, pests and waste (construction) EMM B3 - Contractor awareness EMM B7 - Site rehabilitation EMM B8 (topsoil management) EMM B13 – Pest plant/animal/pathogen control - operation). EMM B23 - Develop and implement a Tree Management Plan	Major	Almost certain	Very High	The very high residual risk reflects a loss (10-20 ha) of FFG / EPBC-listed ecological communities cannot be avoided. In one area where fragmentation leads to a loss of conservation status. This can only be partly minimised by environmental management measures. Environmental management measures would provide for reinstatement of vegetation structure and habitat. TEC losses will be offset as per State and Commonwealth legislation EMM B15 - Reinstate native vegetation EMM B18 - Value-specific mitigation	Major	Almost certain	Very High

Risk ID	Risk pathway	Construction/ operation	Pipeline/ MLV/ compressor/All	Initial mitigation measure	Initial risk rating			Additional mitigation measure	Residual rating		
					Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating
B3	**Land clearing during construction impacting threatened flora** Removal of Victorian threatened species Arching Flax-lily *Dianella longifolia var. grandis*	Construction	All	Habitat for one plant of Arching Flax-lily is expected to be removed during construction and is unavoidable owing to construction costs. EMM B1 - Vegetation management EMM B7 - Site rehabilitation EMM B8 - Topsoil management EMM B13 – Pest plant/animal/pathogen control - operation	Minor	Likely	Low	None	Minor	Likely	Low
B4	**Land clearing during construction impacting threatened EVCs** Removal of Victorian endangered Ecological Vegetation Classes Plains Grassland; Riparian Woodland; Plains Grassy Woodland; Plains Grassy Wetland; Stony Knoll Shrubland; Aquatic Herbland during construction.	Construction	All	Direct losses of threatened EVCs through land clearing cannot be entirely avoided within the construction corridor owing to terrain constraints and construction cost. Pipeline re-alignment at one location will avoid grassy woodland including 10 large trees, and 1 ha of Plains Grassy Woodland. Recommended EMMs will avoid impacts to adjoining native vegetation and trees, manage soil and surface run-off, and will require contractor inductions that include awareness of biodiversity issues. EMM B1 - Vegetation management EMM B2 (pest plant/animal/pathogen control) EMM B3 - Contractor awareness EMM B7 - Site rehabilitation EMM B8 - Topsoil management EMM B13 – Pest plant/animal/pathogen control – (operation) EMM B23 - Develop and implement a Tree Management Plan	Major	Almost certain	Very High	The very high residual risk reflects a “loss of any EVC (20-25 ha) within at least 50% of the known number of patches, cannot be avoided and can only be partly minimised through EMMs but can be offset Additional EMMs will provide for reinstatement of vegetation structure and habitat. Additional mitigation measures are not expected to further reduce this risk. Native vegetation will be offset in accordance with *the Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a) No species offsets are triggered. EMM B15 - Reinstate native vegetation EMM B18 Value-specific mitigation	Major	Almost certain	Very High

Risk ID	Risk pathway	Construction/ operation	Pipeline/ MLV/ compressor/All	Initial mitigation measure	Initial risk rating			Additional mitigation measure	Residual rating		
					Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating
B5	**Land clearing during construction impacting non-threatened flora** Removal of non-threatened native flora during construction.	Construction	All	All threatened vegetation communities in the construction corridor are comprised of non-threatened flora. Direct losses cannot be entirely avoided within the construction corridor owing to terrain constraints and construction costs. Recommended EMMs will avoid impacts to adjoining native vegetation and trees, manage soil and surface run-off, and will require contractor inductions that include awareness of biodiversity issues. EMM B1 - Vegetation management EMM B2 (pest plant/animal/pathogen control) EMM B3 - Contractor awareness EMM B7 - Site rehabilitation EMM B8 - Topsoil management EMM B13 – Pest plant/animal/pathogen control – (operation) EMM B23 - Develop and implement a Tree Management Plan	Minor	Almost certain	Medium	The low residual risk reflects a localised or temporary reduction of populations of any common species since the majority of these are expected to regenerate post-construction during reinstatement. An additional EMM to assist with preservation of genetic exchange has been developed. Non-threatened flora losses will be incorporated within offsetting (as above) prior to the clearing commencing. EMM B15 - Reinstate native vegetation	Insignificant	Almost certain	Low
B6	**Land clearing (non-threatened EVCs)** Removal of non-threatened Ecological Vegetation Classes during construction.	Construction	All	None recorded in the Project Area	Insignificant	Rare	Negligible	None required	Insignificant	Rare	Negligible
B7	**Erosion / sedimentation, dust, litter or release of contaminants leading to loss or degradation of threatened flora and ecological communities** Impacts to EPBC Act and FFG Act threatened flora Matted Flax lily, Tough Scurf-pea and Arching Flax-lily; EPBC Act/FFG Act-listed threatened ecological communities and threatened EVCs	Construction	All	Any impacts are expected to be minor and temporary and will be minimised through EMM B1 - Vegetation management EMM B7 - Site rehabilitation EMM B8 - Topsoil management EMM B10 - Surface water sedimentation and runoff impacts to ecological values	Insignificant	Remote	Negligible	None required	Insignificant	Remote	Negligible

Risk ID	Risk pathway	Construction/ operation	Pipeline/ MLV/ compressor/All	Initial mitigation measure	Initial risk rating			Additional mitigation measure	Residual rating		
					Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating
B8	**Erosion / sedimentation, dust, litter or release of contaminants leading to loss or degradation of non-threatened flora** Impacts to non-threatened flora	Construction	All	Any impacts are expected to be minor and temporary and will be minimised through EMM B1 - Vegetation management EMM B7 - Site rehabilitation EMM B8 - Topsoil management EMM B10 - Surface water sedimentation and runoff impacts to ecological values	Minor	Likely	Low	None required	Insignificant	Remote	Negligible
B9	**Spread of weeds / pest animals/pathogens during construction** Introduction or spread of weeds, pest species or pathogens that leads to the reduction of ecological value.	Construction	All	The Project Area and surrounding landscape has generally very high levels of weed infestation and weed control will be incorporated into an CEMP, to minimise weed spread through: EMM B2 - pest plant/animal/pathogen control - construction Waste is to be managed in accordance with Contamination EMM C7	Minor	Likely	Low	None required	Minor	Likely	Low
B10	**Dewatering (terrestrial GDEs)** Dewatering of groundwater during construction resulting in changes to terrestrial groundwater dependent ecosystems.	Construction	All	Dewatering drawdown is likely to be temporary, minor and localised and will be minimised through: EMM B4 GDE mitigation	Minor	Unlikely	Low	None required	Minor	Unlikely	Low
B11	**Noise, vibration, lighting (threatened fauna)** Construction noise, vibration and / or lighting resulting in elevated disturbance of threatened fauna.	Construction	All	EMM B5 lighting impacts to fauna EMM B6 - noise impacts to fauna	Minor	Likely	Low	EMM B20 - Striped Legless Lizard	Minor	Likely	Low
B12	**Noise, vibration, lighting (non-threatened fauna)** Construction noise, vibration and / or lighting resulting in elevated disturbance of non-threatened fauna.	Construction	All	EMM B5 - lighting impacts to fauna EMM B6 - noise impacts to fauna	Minor	Likely	Low	No additional EMM required	Minor	Likely	Low

Risk ID	Risk pathway	Construction/ operation	Pipeline/ MLV/ compressor/All	Initial mitigation measure	Initial risk rating			Additional mitigation measure	Residual rating		
					Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating
B13	**Loss of habitat (threatened fauna)** Land clearing during construction resulting in the loss or degradation of habitat supporting threatened fauna	Construction	All	Despite the implementation of mitigation measures, loss of habitat cannot be completely avoided. Rehabilitation and topsoil management are considered the most effective means of habitat recovery post construction. Further mitigation measures are not expected to further reduce this risk. EMM B1 - Vegetation management EMM B3 Contractor awareness EMM B7 - Site rehabilitation EMM B8 - Topsoil management EMM B9 - Fauna management EMM B10 - Surface water sedimentation and runoff EMM B23 Tree Management Plan	Minor	Almost certain	Medium	The medium residual risk reflects an "insignificant change in populations of state or commonwealth listed threatened species" in the consequence criteria which is considered a minor consequence but is expected to occur. EMM B9 - All fauna EMM B9 - Threatened fauna EMM B8 - Topsoil management: "For areas that are Golden Sun Moth and/or Striped Legless Lizard habitat" & "For areas that are Golden Sun Moth habitat". EMM B19 - Golden Sun Moth EMM B20 - Striped Legless Lizard EMM B21 - Growling Grass Frog	Minor	Almost certain	Medium
B14	**Loss of habitat (non-threatened fauna)** Land clearing during construction resulting in the loss or degradation of habitat supporting non-threatened fauna	Construction	All	EMM B1 Vegetation management EMM B3 - Contractor awareness EMM B7 - Site rehabilitation EMM B8 - Topsoil management EMM B10 - Surface water sedimentation and runoff EMM B23 Tree Management Plan	Insignificant	Almost certain	Low	No additional EMM required	Insignificant	Almost certain	Low
B15	**Erosion / sedimentation (terrestrial fauna)** Construction activities resulting in erosion / sedimentation, dust, litter or release of contaminants into wetlands and waterways leading to loss or degradation of terrestrial fauna habitat.	Construction	All	EMM B10 - Surface water sedimentation and runoff impacts to ecological values EMM B11 - Surface water contamination EMM C1 - Disturbance of existing contamination EMM C6 - Leaks or spills	Insignificant	Rare	Negligible	No additional EMM required	Insignificant	Rare	Negligible

Risk ID	Risk pathway	Construction/ operation	Pipeline/ MLV/ compressor/All	Initial mitigation measure	Initial risk rating			Additional mitigation measure	Residual rating		
					Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating
B16	**Death or injury of Striped Legless Lizard** Construction activities resulting in the death or injury of EPBC Act Striped Legless Lizard due to land clearance during construction. Impacts to very few individuals could result in substantial change in population.	Construction	All	EMM B1 - Vegetation management EMM B3 - Contractor awareness EMM B7 - Site rehabilitation EMM B8 - Topsoil management EMM B9 - Fauna management	Major	Likely	High	EMM B8 - Topsoil management: For areas that are Golden Sun Moth and/or Striped Legless Lizard habitat EMM B9 - All fauna EMM B9 - Threatened fauna EMM B20 - Striped Legless Lizard	Minor	Likely	Low
B17	**Death or injury of Growling Grass Frog** Construction activities resulting in the death or injury of EPBC Act Growling Grass Frog due to land clearance and works in/near waterways during construction.	Construction	All	EMM B1 - Vegetation management EMM B3 - Contractor awareness EMM B7 - Site rehabilitation EMM B2 - Pest plant/animal/pathogen control EMM B9 - Fauna management EMM B10 - Surface water sedimentation and runoff impacts to ecological values EMM B11 - Surface water contamination EMM C1 - Disturbance of existing contamination EMM C6 - Leaks or spills EMM SW4 - River bed or bank erosion EMM SW7 Design and construction management (Jacksons Creek) EMM SW9 Flood Management and Response Plan	Moderate	Likely	Medium	EMM B9 - All fauna EMM B9 - Threatened fauna EMM B21 - Growling Grass Frog	Minor	Unlikely	Low
B18	**Death or injury of fauna** Construction activities resulting in the death or injury of native fauna.	Construction	All	EMM B9 (initial) - Fauna management EMM B1 Vegetation management EMM B3 - Contractor awareness EMM B7 - Site rehabilitation EMM B8 - Topsoil management EMM B10 - Surface water sedimentation and runoff impacts to ecological values EMM B11 - Surface water contamination EMM B14 – Noise, vibration, lighting EMM C1 - Disturbance of existing contamination EMM C6 - Leaks or spills EMM SW4 - River bed or bank erosion	Minor	Likely	Low	EMM B9 - All fauna EMM B9 - Threatened fauna EMM B19 - Golden Sun Moth EMM B20 - Striped Legless Lizard EMM B21 - Growling Grass Frog EMM B22 - Fauna Mitigation - Platypus	Minor	Likely	Low

Risk ID	Risk pathway	Construction/ operation	Pipeline/ MLV/ compressor/All	Initial mitigation measure	Initial risk rating			Additional mitigation measure	Residual rating		
					Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating
				EMM SW7 Design and construction management (Jacksons Creek)							
B19	**Erosion / sedimentation (aquatic fauna) - HDD** HDD construction activities resulting in erosion / sedimentation, dust, litter or release of contaminants into waterways leading to loss or degradation of aquatic fauna habitat.	Construction	Pipeline	EMM B1 - Vegetation management EMM B3 - Contractor awareness EMM B7 - Site rehabilitation EMM B8 – Topsoil management EMM B2 - pest plant/animal/pathogen control pathogens, pests and waste (construction) EMM B10 - Surface water sedimentation and runoff impacts to ecological values EMM B11 - Surface water contamination EMM C1 - Disturbance of existing contamination EMM C6 - Leaks or spills EMM SW4 - River bed or bank erosion	Minor	Remote	Negligible	No additional EMM required	Minor	Remote	Negligible
B20	**Erosion / sedimentation (aquatic fauna) - open trench construction** Open trench construction construction activities resulting in erosion / sedimentation, dust, litter or release of contaminants into waterways leading to loss or degradation of aquatic fauna habitat.	Construction	Pipeline	EMM B1 Vegetation management EMM B3 - Contractor awareness EMM B7 - Site rehabilitation EMM B8 – Topsoil management EMM B2 - pest plant/animal/pathogen control EMM B10 - Surface water sedimentation and runoff impacts to ecological values EMM B11 - Surface water contamination EMM C1 - Disturbance of existing contamination EMM C6 - Leaks or spills EMM SW4 - River bed or bank erosion	Minor	Likely	Low	EMM SW5 – Implement a Monitoring Program EMM SW6 – Periodic visual monitoring	Minor	Likely	Low

Risk ID	Risk pathway	Construction/ operation	Pipeline/ MLV/ compressor/All	Initial mitigation measure	Initial risk rating			Additional mitigation measure	Residual rating		
					Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating
B21	**Waterway / wetland habitat (threatened terrestrial and aquatic fauna) - HDD** Construction activities within/around waterways and wetlands impacting riparian and in-stream habitats resulting in loss or degradation of habitats for threatened terrestrial and aquatic fauna.	Construction	Pipeline	EMM B1 - Vegetation management EMM B3 - Contractor awareness EMM B7 - Site rehabilitation EMM B2 pest plant/animal/pathogen control EMM B10 - Surface water sedimentation and runoff impacts to ecological values EMM B11 - Surface water contamination EMM C1 - Disturbance of existing contamination EMM C6 - Leaks or spills EMM SW4 - River bed or bank erosion	Minor	Unlikely	Low	No additional EMM required	Minor	Unlikely	Low
B22	**Waterway / wetland habitat (threatened terrestrial and aquatic fauna) - open trench construction** Construction activities within/around waterways and wetlands impacting riparian and in-stream habitats resulting in loss or degradation of habitats for threatened terrestrial and aquatic fauna.	Construction	Pipeline	EMM B1 - Vegetation management EMM B3 - Contractor awareness EMM B7 - Site rehabilitation EMM B2 - pest plant/animal/pathogen control EMM B10 - Surface water sedimentation and runoff impacts to ecological values EMM B11 - Surface water contamination EMM C1 - Disturbance of existing contamination EMM C6 - Leaks or spills EMM SW4 - River bed or bank erosion	Minor	Likely	Low	No additional EMM required	Minor	Likely	Low
B23	**Waterway / wetland habitat (non-threatened terrestrial and aquatic fauna) - HDD** Construction activities within/around waterways and wetlands impacting riparian and in-stream habitats resulting in loss or degradation of habitats for non-threatened terrestrial and aquatic fauna.	Construction	Pipeline	EMM B1 - Vegetation management EMM B3 - Contractor awareness EMM B7 - Site rehabilitation EMM B2 - pest plant/animal/pathogen control EMM B10 - Surface water sedimentation and runoff impacts to ecological values EMM B11 - Surface water contamination EMM C1 - Disturbance of existing contamination EMM C6 - Leaks or spills EMM SW4 - River bed or bank erosion	Insignificant	Unlikely	Negligible	No additional EMM required	Insignificant	Unlikely	Negligible
B24	**Waterway / wetland habitat (non-threatened terrestrial and aquatic fauna) - open trench construction** Construction activities within/around waterways and wetlands impacting	Construction	Pipeline	EMM B1 - Vegetation management EMM B3 - Contractor awareness EMM B7) - Site rehabilitation EMM B2 pest plant/animal/pathogen control	Insignificant	Likely	Low	No additional EMM required	Insignificant	Likely	Low

Risk ID	Risk pathway	Construction/ operation	Pipeline/ MLV/ compressor/All	Initial mitigation measure	Initial risk rating			Additional mitigation measure	Residual rating		
					Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating
	riparian and in-stream habitats resulting in loss or degradation of habitats for non-threatened terrestrial and aquatic fauna.			EMM B10 - Surface water sedimentation and runoff impacts to ecological values EMM B11 - Surface water contamination EMM C1 - Disturbance of existing contamination EMM C6 - Leaks or spills EMM SW4 - River bed or bank erosion							
B25	**Dewatering (aquatic GDEs)** Dewatering of groundwater during construction resulting in changes to aquatic groundwater dependent ecosystems.	Construction	All	Changes to aquatic GDEs will be minimised through: EMM B4 – GDE Mitigation EMM GW1 - Minimising dewatering rates and impact to groundwater levels and flows EMM GW2 - Minimise impact to groundwater bore users	Minor	Unlikely	Low	No additional EMM required	Minor	Unlikely	Low
B26	**Accidental clearing during construction** Removal of, or damage to Ecological Vegetation Classes (EVCs), immediately adjacent to the construction area.	Construction	All	Accidental damage to vegetation is expected to be limited to localised impacts and will be avoided or minimised through: EMM B1 - Vegetation management EMM B3 - Contractor awareness EMM B7 - Site rehabilitation	Minor	Unlikely	Low	EMM B15 – Reinstate native vegetation EMM B16 - Additional site assessment and management	Insignificant	Remote	Negligible
B27	**Accidental clearing during operation** Removal of, or damage to Ecological Vegetation Classes (EVCs), within and immediately adjacent to the operational easement area.	Operation	All	No vegetation removal is expected to occur during the operational phase. Should any accidental removal occur, it is expected that this would be limited to minor works associated with maintenance, with little if any impact beyond individual plants or extremely small patches of vegetation and will be avoided or minimised through: EMM B12 - Vegetation management - operation	Minor	Remote	Negligible	None required	Insignificant	Rare	Negligible
B28	**Spread of invasive weeds, pathogens, pests and waste during operation** Introduction or spread of weeds, pest species, or pathogens that leads to the reduction of ecological values.	Operation	All	The area is currently heavily infested with uncontrolled weed populations that are spread by vectors including human movement, stock, wind and vehicle movement. Further spread will be avoided or minimised through: EMM B13 - Pest plant/animal/pathogen control – operation	Minor	Likely	Low	None required	Minor	Likely	Low
B29	**Noise, vibration, lighting during operation (threatened fauna)** Operational noise, vibration and / or lighting resulting in	Operation	All	EMM B14 - Access dust, noise and lighting	Minor	Likely	Low	No additional EMM required	Minor	Likely	Low

Risk ID	Risk pathway	Construction/ operation	Pipeline/ MLV/ compressor/All	Initial mitigation measure	Initial risk rating			Additional mitigation measure	Residual rating		
					Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating
	elevated disturbance of threatened fauna.										
B30	**Noise, vibration, lighting during operation (non-threatened fauna)** Operational noise, vibration and / or lighting resulting in elevated disturbance of non-threatened fauna.	Operation	All	EMM B14 - Access dust, noise and lighting	Minor	Likely	Low	No additional EMM required	Minor	Likely	Low
B31	**Habitat fragmentation** Habitat fragmentation resulting in reduced effectiveness of terrestrial wildlife corridors and creation of barriers to fauna movement	Construction	All	EMM B1 - Vegetation management EMM B3 Contractor awareness EMM B7 - Site rehabilitation EMM B8 - Topsoil management	Minor	Likely	Low	No additional EMM required	Minor	Likely	Low
B32	**Soil compaction (threatened flora and TECs)** Soil compaction during construction leads to the loss or degradation of threatened flora and ecological communities	Construction	All	Considered unlikely or at worse temporary and will be avoided or minimised through: EMM B7 - Site rehabilitation EMM B8 - Topsoil management	Minor	Unlikely	Low	EMM B15 - Reinstate native vegetation	Insignificant	Remote	Negligible
B33	**Soil compaction (non-threatened flora and fauna)** Soil compaction during construction leads to the loss or degradation of non-threatened flora, fauna and ecological communities	Construction	All	Considered unlikely or at worse temporary and will be avoided or minimised through: EMM B7 - Site rehabilitation EMM B8 - Topsoil management	Minor	Unlikely	Low	EMM B15 - Reinstate native vegetation	Insignificant	Remote	Negligible

Risk ID	Risk pathway	Construction/ operation	Pipeline/ MLV/ compressor/All	Initial mitigation measure	Initial risk rating			Additional mitigation measure	Residual rating		
					Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating
B34	**Construction activities (Migratory)** Construction activities resulting in the loss of important habitat for EPBC Act Migratory species	Construction	All	EMM B1 Vegetation management EMM B3 - Contractor awareness EMM B7 - Site rehabilitation EMM B10 - Surface water sedimentation and runoff impacts to ecological values EMM B11 - Surface water contamination EMM C6 - Leaks or spills	Insignificant	Remote	Negligible	No additional EMM required	Insignificant	Remote	Negligible
B35	**Waterway works (threatened aquatic) - Open trench construction** Construction activities within/around waterways resulting in loss of connectivity and impeded passage for threatened aquatic species	Construction	Pipeline	EMM B17 – Barriers to fish passage and / or migration	Moderate	Remote	Low	No additional EMM required	Moderate	Remote	Low
B36	**Waterway works (non-threatened aquatic) - Open trench construction** Construction activities within/around waterways resulting in loss of connectivity and impeded passage for non-threatened native aquatic species	Construction	Pipeline	EMM B17 – Barriers to fish passage and / or migration	Minor	Unlikely	Low	No additional EMM required	Minor	Unlikely	Low

10. Impact assessment

This section discusses the expected and potential impacts of construction and operation of the Project on terrestrial flora, terrestrial and aquatic fauna, and terrestrial and freshwater ecosystems (existing conditions). Associated environmental management measures (EMMs) that aim to reduce impacts are discussed in Section 12.

This section is divided into construction and operational impacts and is further grouped by similar impacts to avoid repetition.

The impact assessment uses the results of the existing conditions assessment (Section 7) and risk assessment (Section 9) to address the following:

- Impacts on biodiversity from Project activities
- State and Commonwealth policy and legislation relating to impacts on native vegetation and threatened species and ecological communities (policy and legislation are summarised in Section 5)
- Impacts on biodiversity associated with changes in groundwater depths and flow paths
- Assessment of construction and operation impacts with consideration of:
  - The extent and quality of indigenous native vegetation that would be impacted during constructionar
  - Impacts on threatened flora, fauna and ecological communities
  - Impacts on known and potential fauna habitat (terrestrial and aquatic)
- EMMs recommended to avoid, minimise and/or offset impacts such as the removal of native vegetation
- Describe the residual environmental effects
- An ecological offset strategy

Where the initial risk ratings were categorised as medium or higher, these risks were more of a focus of the impact assessment and additional management measures were considered (where possible). However, all risks were considered in the impact assessment.

10.1 Construction impacts

This section describes the expected impacts on biodiversity from the construction of the Project.

10.1.1 Reduction in the area of native vegetation, populations and habitat

Impacts to threatened flora and communities relate to Risks B1, B2, B3 and B4. Impacts to non-threatened native vegetation in general relate to Risk B5 and Risk B6. This assessment has conservatively assumed that any flora or vegetation communities located within the construction corridor would be lost during construction of the Project. The assessment considered total impact across the whole of the Project Area. This section also details the impact of such losses of vegetation on habitat for threatened fauna (risk B13), non-threatened fauna (risk B14) and migratory species (risk B34).

The following risk pathways are discussed under this impact category:

Risk pathways	Initial risk rating	Residual risk rating
Risk B2, Risk B4	Very high	Very high
Risk B13	Medium	Medium
Risk B5	Medium	Low
Risk B1	Medium	Negligible
Risk B3, Risk B14, Risk B26	Low	Low
Risk B6, Risk B34	Negligible	Negligible

The total Project Area is approximately 178 ha, including non-vegetated areas, with most construction occurring on private property consisting of non-native vegetation that has replaced indigenous native vegetation because of agriculture, urbanisation and past clearing. A number of threatened flora were predicted to occur in the Project Area (Biosis, 2019) but were not observed mostly owing to a lack of suitable habitats, since most of the construction corridor is dominated by noxious weeds, pasture species and other non-indigenous vegetation (Biosis, 2020; GHD, 2020). Thus, the Project is considered unlikely to cause any significant impacts to threatened or non-threatened flora.

Where it occurs, native vegetation consists entirely of EVCs that are endangered in the VVP and CVU Bioregions, some of which are also listed as threatened communities under the FFG Act, and as threatened ecological communities (critically endangered) under the EPBC Act (refer Section 8.3.3.1).

The total extent of native vegetation mapped in the Project Area outside the MSA area is 13.39 ha. With addition of the area of native vegetation mapped by DELWP as time-stamped data in 2011 in the approved MSA area (5.94 ha), the total area of native vegetation in the Project Area is approximately 19.33 ha (Table 27, Section 8.3.3.1). However, it is anticipated that the actual amount of native vegetation in the approved MSA area for the Project is substantially less than currently mapped by DELWP, since VQAs conducted for the Project found that the extent of native vegetation in the MSA was approximately one third of the extent of the time-stamped data mapped in 2011. Therefore, a more realistic estimate of native vegetation removal, based on 2019/2020 field survey data, is 15.32 ha (Table 27, Section 8.3.3.1).

Primarily, loss of native vegetation will be addressed through a hierarchical application of mitigation measures: first, avoidance; second, minimisation; third, re-instatement, and finally by an ecological offsetting strategy for EPBC Act and FFG Act-listed threatened communities, endangered EVCs and large trees where these will be directly impacted, in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a) and the EPBC Act. Offsetting of FFG Act-listed threatened communities is incorporated in offsets for threatened EVCs Plains Grassland and Plains Grassy Woodland.

The results of desktop assessments (refer Section 8.3.2) and targeted surveys undertaken for the Project (see Section 8.3.3.4) concluded with a high degree of confidence that additional threatened flora are unlikely to occur within the Project Area. Thus, the potential for threatened flora to be impacted during construction is considered very low.

10.1.1.1 Land clearing during construction impacting EPBC Act and FFG Act threatened flora Matted Flax lily and Tough Scurf-pea (risk B1), and Victorian threatened species Arching Flax-lily *Dianella longifolia* var. *grandis* (risk B3)

Threatened flora listed under the EPBC Act (19 species), FFG Act (30 species) or flora that are considered rare or threatened in Victoria (26 species) were predicted to occur within a five-kilometre buffer of the Project Area. Of these, targeted surveys were conducted for 26 species with a medium or higher likelihood of occurrence. Three species were found during field surveys. Locations of these species are discussed further in Section 8.3.3.3 and mapped in Figure 7. The likelihood of occurrence of threatened species recorded on the VBA and/or predicted to occur in the Project Area is provided in Appendix B.

Matted Flax-lily

Matted Flax-lily is listed as endangered under the EPBC Act, threatened under the FFG Act and is recognised as endangered in Victoria on DELWP's advisory list (DEPI, 2014). A single Matted Flax-lily plant was recorded on a fenceline in an uncultivated area of roadside (KP 22.6; parcel 218268306) adjacent to a paddock supporting Plains Grassy Woodland (parcel 1PS733045), at the boundary of a temporary construction area and public land outside the approved MSA area. This section of the construction corridor will be bored using HDD and the Matted Flax-lily plant will be avoided during construction. It will be clearly demarcated and protected by fencing as a designated no go zone to avoid any accidental impacts.

To further minimise impacts to Matted Flax-lily, all vegetation clearing will be confined to the defined construction area, the boundary of which will be clearly demarcated with survey pegs and/or flagging (EMM B1). Contractors will attend inductions, so they are aware of environmental management requirements (EMM B3). To prevent habitat degradation, stockpiled topsoil from weed infested sites will not be respread over Matted Flax-lily habitat or anywhere nearby where native vegetation is to be reinstated (EMM B8).

Tough Scurf-pea

Tough Scurf-pea is listed as threatened under the FFG Act and recognised as endangered in Victoria on DELWP's Advisory List. A population of Tough Scurf-pea consisting of 48 individuals was recorded and mapped adjacent to a temporary construction area at Wollert Compressor Station (KP 50). The population is approximately 50 m from the construction corridor boundary. The pipeline has been realigned at this site to avoid the population of Tough Scurf-pea during construction.

To prevent accidental damage to the population, the Tough Scurf-pea population will be clearly identified and protected by fencing as a designated no go zone (EMM B1). Additionally, EMM B3 provides for contractor awareness to support this measure. Habitat decline in future will be avoided by not respreading stockpiled topsoil from weed infested sites in or near the Tough Scurf-pea population (EMM B8).

Arching Flax-lily

Arching Flax-lily is recognised as vulnerable in Victoria on DELWP's Advisory List (DEPI, 2014). The single Arching Flax-lily plant recorded at parcel 2PS343496 (KP 8 – KP 9) is on private property outside the approved MSA area and the pipeline construction will require the removal of one plant of Arching Flax-lily and its habitat. The species is distributed in grassland and grassy woodland in the VVP and Riverina and less commonly at higher altitudes in north-eastern Victoria (Vicflora, 2016). In spite of numerous records in the Study Area, only this single plant was recorded in the construction corridor and removal of a single plant is not expected to reduce the number of populations of a State or Commonwealth listed threatened species within Victoria, since a single plant does not comprise a viable population. Arching Flax-lily is not required to be offset in the NVR report.

Based on the pipeline alignment, the loss of the Arching Flax-lily plant and its habitat is unavoidable at the known site. HDD or horizontal boring beneath the plant is considered unfeasible owing to the high cost of implementing either of these methods.

To minimise additional impacts, any native vegetation in the vicinity will be protected through EMM B1 (Vegetation management), and EMM B7 (Site rehabilitation) requires that the construction corridor is reinstated with any removed native vegetation or adjoining indigenous native vegetation, including reinstatement of habitat features. Risk of weed invasion on disturbed ground and in nearby vegetation that may provide potential habitat will be addressed by topsoil management (EMM B8) and weed control measures during operation (EMM B13 – Pest plant/animal/pathogen control - operation) if permissible on private property.

10.1.1.2 Reduction in the area of EPBC Act-listed threatened communities *Grassy Eucalypt Woodland of the Victorian Volcanic Plain*; *Natural Temperate Grassland of the Victorian Volcanic Plain*, and FFG Act listed communities Western (Basalt) Plains Grasslands Community and Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland (risk B2)

Land clearing during construction will directly impact EPBC Act-listed TECs and FFG Act-listed threatened communities (refer Section 8.3.3). Two threatened EPBC Act or FFG Act-listed communities were mapped within the Project Area. The majority (86-96%) of the extent of both communities occur outside the MSA. These communities are:

- EPBC Act-listed threatened ecological communities:
  - *Natural Temperate Grassland of the Victorian Volcanic Plain* (3.43 ha outside the MSA area; 0.73 ha within the approved MSA area)
  - *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* (2.20 ha outside the MSA area; 0.06 ha within the approved MSA area)
- FFG Act-listed communities
  - Western (Basalt) Plains Grasslands Community 8.98 ha outside the MSA area; 1.38 ha within the approved MSA area)
  - Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland (4.30 ha outside the MSA area; 0.32 ha within the approved MSA area)

In addition, indirect impacts include of removal of large trees and fragmentation of patches to the extent that 15 out of 30 patches of NTGVVP and four areas of GEWVVP within a larger patch will no longer meet the patch size thresholds for the TECs and will therefore not meet condition thresholds. Fragmentation of the TECs has the potential to disconnect or remove habitat corridors, disrupt genetic exchange through removal of pollination pathways, increase edge effects leading to weed invasion, loss of species richness and degradation of ecological function. The indirect impacts of tree removal include loss of habitat for wildlife, loss of a key structural species and promote soil instability.

- Vegetation clearing is mostly unavoidable owing to construction costs over the length of the pipeline. EMMs to avoid impacts to threatened communities have been incorporated into the design as much as practicable by siting the majority of the Project Area within non-native vegetation. The pipeline alignment has undertaken a number of measures to avoid native vegetation including, realignment, bore, reduced construction corridors to avoid 2.8 ha of grassy woodland, including 10 large trees, at five locations and 0.98 ha of native grassland at five locations.

To minimise direct impacts during construction, tree retention will be informed by arborist's assessments of native trees as part of a Tree Management Plan (EMM B23) that will evaluate direct and indirect impacts to individual trees and their long-term viability, including those deemed 'lost' through encroachment of their TPZs, SRZs or groundwater changes. Trees assessed as being retained will be removed from offset calculations. See Appendix HH for list and map of trees throughout the site to inform Arborists assessment and those trees requing protection or deemed lost.

To minimise residual impacts, EMM B7 (site rehabilitation) contains several measures to reinstate impacted vegetation. Reducing the likelihood of weed establishment after construction will be managed under EMM B2 (Invasive weeds, pathogens, pests and waste - construction), and (EMM B13 – Pest plant/animal/pathogen control - operation) and under EMM B8 (topsoil management).

An additional EMM B15 (reinstate native vegetation) will maximise the long-term viability of reinstated vegetation by promoting regeneration *in situ* and thus maintaining ongoing genetic exchange between reinstated species and indigenous plant species in the broader area.

Residual impacts that cannot be avoided during construction will be addressed through offsetting, as required under the EPBC Act. Offsets for losses to EPBC communities have considered both direct impacts and impacts on the extent/size of patches. In situations where larger patches have been dissected by the alignment and the remaining non-impacted parts of the patch no longer meet the area criteria to qualify as the listed community (and consequently losing their protection under the EPBC Act), then the whole patch has been considered a loss and offsets have been applied to account for this. There are 14 fragmented NTGVVP and three GEWVVP patches that meet this criterion, resulting in an additional 271 ha loss of EPBC communities.

Residual impacts to communities listed as threatened under the FFG Act will be addressed through offsetting requirements for the endangered EVCs Plains Grassland and Plains Grassy Woodland, as well as offsets for large trees, in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a). An offset strategy has been prepared.

Where adjoining native vegetation is retained, potential direct or indirect impacts that are most likely during construction and operation are accidental damage to trees through encroachment into TPZs and accidental damage to overhanging branches by machinery. Avoiding any accidental clearing of adjoining native vegetation will be provided for by EMM B1 (vegetation management) through clearly defining the construction corridor and establishing no go zones and TPZs. A Tree Management Plan will be implemented as part of a Construction Environment Management Plan (CEMP) that will provide measures to protect trees (EMM B23). Appendix X identifies trees that are either within the construction corridor or within 15m of the edge of the corridor and need protection. Additionally, contactor inductions that include awareness of biodiversity values and penalties for non-compliance (EMM B3 contractor awareness) will further minimise damage to adjoining vegetation.

10.1.1.3 Reduction in the area of Victorian endangered Ecological Vegetation Classes Plains Grassland; Riparian Woodland; Plains Grassy Woodland; Plains Grassy Wetland; Stony Knoll Shrubland; Aquatic Herbland (Risk B4)

Land clearing during construction will directly remove endangered EVCs. Ecological Vegetation Classes are discussed in Section 8.3.3.1. Six endangered EVCs were mapped within the Project Area. The following includes the total area of vegetation mapped during field surveys within the approved MSA area and outside the MSA area. Most native vegetation occurs outside the approved MSA area.

The following direct impacts on native vegetation outside the MSA area (as calculated by the Native Vegetation Removal Report) are:

- Loss of 13.39 ha of native vegetation (four endangered EVCs):
  - Plains Grassland (8.98 ha)
  - Plains Grassy Woodland (4.30 ha)
  - Riparian Woodland (0.05 ha)
  - Aquatic Herbland (0.06 ha)

Within the approved MSA area 1.93 ha of native vegetation was mapped during VQAs. By comparison, 5.94 ha of native vegetation is mapped as time-stamped data, also in the approved MSA area (including 13 parcels not assessed in the field surveys) (refer Table 27). However, field survey results suggest that the actual area of impacted native vegetation is likely to be lower than the time-stamped data.

The following direct impacts on native vegetation within the approved MSA area are:

- Conservatively, loss of up to 5.94 ha of time-stamped native vegetation (up to six endangered EVCs, refer Table 27, Section 8.3.3.1 above):
  - Plains Grassland (1.89 ha)
  - Plains Grassy Woodland (2.47 ha)
  - Plains Grassy Wetland (0.17 ha)
  - Riparian Woodland (0.03 ha)
  - Stony Knoll Shrubland (1.37 ha)
  - Creekline Tussock Grassland (0.08 ha)

However, based on VQA mapping, impacts are likely to actually be:

- Loss of 1.93 ha of native vegetation (four endangered EVCs):
  - Plains Grassland (1.38 ha)
  - Plains Grassy Woodland (0.32 ha)
  - Riparian Woodland (0.08 ha)
  - Stony Knoll Shrubland (0.14 ha)

Outside the MSA, re-alignment, HDD or horizontal boring will be used to avoid 2.7 ha of Plains Grassy Woodland, 1.26 ha of Plains Grassland and 1.68 ha of Riparian Woodland (refer Section 13.1.3).

Outside the MSA, 13.39 ha of native vegetation will be removed during construction of the Project, or approximately 68% of the total native vegetation impacted by the Project.

These direct losses are considered unavoidable since design options have included using HDD, horizontal boring and realignment as described above, and siting temporary construction areas within areas of non-native vegetation. Indirect impacts include of removal of large trees and fragmentation, as described above.

Direct and indirect impacts will be minimised as described above, under EMM B1 (Vegetation management); EMM B2 (pest plant/animal/pathogen control), and during operation (EMM B13 – Pest plant/animal/pathogen control - operation); EMM B7 (site rehabilitation); EMM B8 (topsoil management).

There is low potential for impacts to retained native vegetation outside but adjacent to the construction corridor. These impacts are most likely during construction and to a lesser degree operation and include damage to trees through encroachment into TPZs and accidental damage by machinery to overhanging branches. EMM B1 (vegetation management) includes measures to prevent any accidental clearing of adjoining native vegetation through clearly defining the construction corridor and establishing no go zones and tree protection zones. Additionally, EMM B23 outlines tree protection measures through implementation of a Tree Management Plan (EMM B23), and EMM B3 (contractor awareness) will further minimise damage to adjoining vegetation by inductions that include awareness of biodiversity values and penalties for non-compliance. EMM 15 (reinstate native vegetation) will promote regeneration *in situ* and thus maintain the long-term viability of vegetation by providing for genetic exchange of reinstated vegetation with indigenous plant species in the broader area.

Residual impacts that cannot be avoided or minimised will be addressed through offsetting requirements in accordance with the Guidelines (DELWP, 2017a). A native vegetation removal report for the Project (Appendix BB) and offset strategy identify the general habitat units required for vegetation removal. No plant species habitat units are required for offsetting. An ecological offsetting strategy has been prepared.

10.1.1.4 Reduction in populations of non-threatened flora (risk B5) and the area of non-threatened Ecological Vegetation Classes (Risk B6)

None of the EVCs mapped within the Project Area during the field assessments are non-threatened in the VVP or CVU Bioregions, and diversity of non-threatened native flora within EVCs in the Project Area is generally low. While only threatened EVCs were mapped in the Project Area, these communities are made up of non-threatened flora, including large trees, which will be directly removed. Since the current design mostly intersects areas of non-native vegetation (approximately 77% of the Project Area) and has avoided a substantial amount of non-threatened flora, impacts to non-threatened flora have been avoided to a large extent. However, impacts to widespread and abundant non-threatened flora, are expected to occur more frequently than impacts to threatened flora, since very few species of the latter were recorded and only a single plant will be removed.

Impacts to non-threatened flora are considered unlikely to result in a substantial change or permanent loss of populations and will be managed as described above (Risk B4). Where directly impacted, flora that has been removed during construction will be reinstated *in situ* and where possible, using locally indigenous species suited to the landscape profile and setting, compatible with pipeline safety requirements and constraints (refer Section 13.3).

Protected flora

Out of the 83 non-threatened native species recorded, four species protected under the FFG Act-protected flora controls are present within the Project Area (Biosis, 2020). These are Common Cassinia *Cassinia aculeata* subsp. *aculeata*, Cudweed *Euchiton* sp., Jersey Cudweed *Laphangium luteoalbum* and Cotton Fireweed *Senecio quadridentatus* (Appendix C). All four are widespread opportunists that establish rapidly after soil disturbance. Thus, while these species would be impacted by construction, it is expected they would re-establish post construction and abundance of non-threatened protected flora within the Project Area may even increase. Therefore, EMMs are not required. Nevertheless, a permit to take (kill, injure, disturb, or collect) flora protected under the FFG Act is required from DELWP. Total losses of protected flora have been be quantified and all FFG Act permits will be obtained prior to commencement of construction.

Native Trees

Native trees were recorded within the Project Area as both small and large scattered trees, and as large canopy trees within patches. All native trees present within the Project Area are non-threatened species, including River Red Gum *Eucalyptus camaldulensis*, Yellow Gum *Eucalyptus leucoxylon* subsp*. leucoxylon*, Yellow Box *Eucalyptus melliodora*, Grey Box *Eucalyptus microcarpa*, Swamp Gum *Eucalyptus ovata* and Manna Gum *Eucalyptus viminalis*.

A total of 32 scattered trees (16 large and 16 small) and 12 large canopy trees within patches will be impacted by the Project. The most significant impact regarding trees is the loss of large trees that are decades old, and possibly well over 100 years old in some cases. Large trees are frequently hollow bearing and provide ecological 'stepping stones' within the landscape, providing pollination pathways and habitat for fauna. These trees cannot be replaced within much of the easement owing to safety requirements (refer Section 13.3) and where replanting is permissible will not reach comparable levels of maturity within the foreseeable future. Furthermore, under current climate change scenarios tubestock may not establish without regular watering and the current extent and abundance of weeds will outcompete seedlings without ongoing maintenance. Neither of these activities are likely to occur on private property.

Native trees (both scattered and in patches) will be avoided where possible, particularly large trees and/or trees with hollows which provide important habitat. Horizontal Directional Drilling to avoid 7 River Red Gums will be used at Deep Creek.

Given the uncertainties around rooting depths of native trees, it is difficult to present a precise discussion on the levels of protection required for individual trees. Impacts to individual trees are likely to vary based on the tree species, age, and magnitude of settlement and/or volume of altered soil conditions in contact with the root zone of trees. However, from an impact assessment perspective the following approach has been applied when considering whether a tree is considered lost for offsetting purposes:

- Any tree that has >10% encroachment within the TPZ is considered lost
- Any tree that has any encroachment within the Structural Root Zone (SRZ) is considered lost

Any native trees that have:

- Greater than 10% encroachment within the TPZ will be assessed by a qualified arborist to verify the acceptable level of encroachment and whether the tree is indeed deemed a loss
- Encroachment at a depth greater than the depth of the SRZ but less than two times the depth of the SRZ will be assessed by a qualified arborist to verify the acceptable level of encroachment

Prior to construction works starting, and during construction if required, native trees that may be indirectly impacted through encroachment into the TPZ or SRZ will be assessed by an arborist to determine their potential to be retained, or considered to remain viable, as part of a Tree Management Plan (EMM B23). Retained trees will be removed from the NVRR.

TPZs will be established so that retained trees are adequately protected from construction or related activities and any lopping of branches that may be required will be carried out by a qualified arborist (EMM B1 – vegetation management; EMM B23 – Develop and implement a Tree Management Plan). Additionally, contractor inductions that include awareness of biodiversity values and penalties for non-compliance (EMM B3 − contractor awareness) will further minimise damage to adjoining vegetation.

The loss of remaining large trees that will be directly removed will be addressed through an offsetting arrangement in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a). An ecological offsetting strategy has been prepared (GHD, 2021).

Native trees adjacent to the construction corridor (for example in temporary laydown areas) or adjacent to the construction corridor and deemed to be at risk by an arborist will also require protection for the duration of construction. Measures are included under EMM B23, which provides for development and implementation of a Tree Management Plan.

10.1.1.5 Removal of EVCs immediately adjacent to the construction area from accidental clearing (Risk B26)

Most of the Project is located in non-native vegetation. In the event of unforeseen circumstances during the construction phase of the Project, causing accidental damage to native vegetation resulting in removal or damage, it is expected that this would be limited to localised impacts. Should construction activities result in accidental clearing, works will cease immediately within or adjoining the construction corridor (EMM B16 – Additional site assessment and management). Botanical surveys will be conducted to assess and map the condition and extent of native vegetation (preferably), or DELWP modelled mapping data may be used to determine offset requirements when site-based information of the native vegetation can no longer be acquired. Within the approved MSA area, time-stamped mapping will apply. The extent and condition of accidental vegetation removal will be reported to the relevant authority as soon as practicable.

Measures to avoid accidental clearing are provided through EMM B1 (Vegetation management) and EMM B3 (Contractor awareness). Implementation of EMM B7 – site rehabilitation will provide measures to reinstate native vegetation and habitat features, and to remediate soils if necessary.

10.1.1.6 Loss or degradation of habitat supporting threatened fauna (risk B13) or non-threatened fauna (risk B14)

Construction of the pipeline and associated infrastructure requires land to be cleared of its vegetation and fauna habitat. Some of these impacts are expected to be permanent (e.g. at the MLV and compressor locations) but a majority of losses would be shorter term (e.g. access, laydown, spoil storage, parking, trenching).

Land clearing during construction may also result in indirect loss or degradation of adjacent habitat that is not cleared, but which becomes exposed to new detrimental influences (edge effects). Depending on the severity of the effect, weed invasion,soil compaction, sedimentation and/or erosion, dust, noise, vibration and lighting, shading and surface water or groundwater changes can all contribute to habitat degradation, or even habitat loss.

Loss and degradation of habitat reduces foraging, nesting and dispersal opportunities for fauna in the local area, and confines fauna to the extent of suitable habitat that remains, often increasing within-species and between-species competition. Loss of too much habitat, relative to the original contiguous habitat patch, can threaten the viability of some populations that currently rely on the extent of habitat present. Small proportional losses are less detrimental than large proportional losses. Animals that are unable to seek and obtain resources from alternative sources (closed population) are more disadvantaged by habitat loss than those that can freely move to and use other areas (open population).

Loss or degradation of habitat affects species differently. Some species (such as Australian Magpie) are mobile and adaptable, and are able to use remaining habitats or even a degraded form of the same habitat. Others (such as Golden-headed Cisticola) are more sensitive to habitat extent and condition, and may decline or disappear as habitat patches get too small or too degraded. Most of the fauna that persist in the Project Area are adaptable fauna, already coping with a fragmented and degraded habitat landscape.

All habitats within the Project Area support non-threatened terrestrial fauna, and land clearing would impact on those species. Most of the non-threatened native fauna that persist in the Project Area (such as Red Wattlebird, Rainbow Lorikeet, Australian Magpie, Common Froglet) are mobile and/or adaptable, and are persisting within a fragmented and degraded habitat landscape. These species are able to use remaining habitats or even a degraded form of the same habitat.

Some of the habitats that would be affected are known to or may support threatened fauna also. Habitats within the Project Area that support threatened terrestrial fauna are mainly confined to the higher quality grassland areas and waterways. Impacts on threatened fauna are expected to be largely limited to four species: Golden Sun Moth, Striped Legless Lizard, Growling Grass Frog and Tussock Skink. EMMs would be applied to minimise the impacts on individuals and their habitat. Impacts within the area covered by the MSA area are offset through the Environment Mitigation Levies. The following table details the extent of potential impacts on known or assumed habitat in the Project Area outside the MSA area not subject to the levies (Table 52).

Table 52 Summary of impacts to threatened fauna habitat outside the MSA area

Species	Extent of habitat impacted
Golden Sun Moth	19.93 ha of known and assumed habitat
Striped Legless Lizard	39.34 ha of known and assumed habitat
Growling Grass Frog	Deep Creek known habitat (HDD) Jacksons Creek assumed habitat (open trench construction) (0.03 ha)
Tussock Skink	6 parcels

The Golden Sun Moth, Striped Legless Lizard and Tussock Skink are confined to the grassy and grassy woodland habitats. Disturbance of understorey habitats within the Project Area is expected to be temporary with habitats reinstated following works. However, Golden Sun Moth and Striped Legless Lizard in particular are very susceptible to ground disturbance and may not successfully recolonise these areas. With a majority of the Project Area comprising grassland habitats, it is the Golden Sun Moth and Striped Legless Lizard that are expected to experience the greatest impacts of land clearance in the Project Area, with respective totals of 19.93 and 39.34 ha of known or assumed habitat expected to be impacted.

With time, it is possible that the species may return to some or all uses of the Project Area following the establishment of vegetation, especially foraging. However, it is unknown how effectively Striped Legless Lizards can utilise areas subject to ground disturbance as part of their foraging territory. Contrastingly, removal of rocks and cracking soils through compaction, which is not then able to be reinstated, may result in permanent impacts.

Similarly, it is possible that the Golden Sun Moth may return to some or all uses of the Project Area after vegetation has been re-established such as flying over the disturbance area and ultimately laying eggs within suitable tussocks but there is no documented evidence to support this and the degree to which Golden Sun Moth may recolonise disturbed ground is not well known. Consequently, these areas are considered lost.

Such impacts are expected to result in a reduction in the area of occupancy of both the Striped Legless Lizard and Golden Sun Moth.

Habitat surrounding the Project Area is typically managed at a parcel scale with vegetation structure, composition and land use typically being uniform across the parcel. Consequently, there is typically habitat of a similar condition immediately adjacent to the Project Area that would be likely to support the species following such localised displacement.

The Growling Grass Frog is known or assumed to be present in two locations outside the MSA area: Deep and Jacksons Creeks. The crossing at Deep Creek (where the species was recorded) is expected to be constructed using HDD methods, therefore impacts on instream and near-bank habitat will be avoided and impacts on any adjacent terrestrial habitat minimised.

Jacksons Creek is proposed to be crossed using open trench construction methods. Here the Project Area width has been reduced to 20 m wide within the waterway. The habitat on one side of the bank at Jacksons Creek is pasture grasses, cattle grazed and pugged all the way to the water's edge. The other bank is fenced to exclude cattle, however the bank is very steep to the point that it is likely to provide less favourable habitat for frogs. Very little habitat in the form of either emergent or bank aquatic vegetation is present. Whilst Growling Grass Frog are known from this waterway, the chance of the species using the actual Project Area is considered low. The extent of the area of impact at this location is restricted to 0.03 ha, and the impact will be temporary and impacted areas will be reinstated following works they are not expected to result in the loss of dispersal or overwintering opportunities given the duration of works. Works are also proposed to be limited to the low flow period (March to May) when flow variability is also lower; Technical Report D – Surface Water) to minimise impacts from high flow events such as erosion. Works will be managed through the implementation of EMMs that minimse impacts to the waterway and habitat including waterway specific construction management measures including timing of works, flow management, timing alignment with long term weather forecasts (EMM SW7), and Flood Management and Response Plans (EMM SW9).

Habitat suitable for the species does not extend beyond the banks of either Deep or Jacksons Creek with the vegetation beyond the banks comprised grazed pasture grasses.

The possible use of a trenchless construction technique, such as HDD, has been considered for the Jacksons Creek crossing based on a number of contributing factors, to avoid construction disturbance within this sensitive area. The assessment outcome indicated that crossing Jacksons Creek using a trenchless construction technique was not feasible, the rationale for which is detailed within the Surface Water Technical Report (Technical report B) and EES Chapter 3 – Project Development.

At three locations (2LP137651, 1LP137651, D16PP2761) dams are proposed for removal. These dams were dry at the time of initial habitat assessment so at that time did not provide breeding, foraging or dispersal habitat for Growling Grass Frogs. Subsequently, they were reassessed during November and December 2020 and were found to contain water, but nocturnal targeted assessment resulted in the species not being detected at these waterbodies. Dams that are ephemeral or that intermittently hold water over the spring/summer period are less likely to provide core breeding habitat for the species, but may provide opportunistic dispersal opportunities between more permanent habitats.

Hollow-bearing trees are present but not prolific within the Project Area, with the Project Area being dominated by grassland habitats. The location of hollows is currently unknown and will be identified within the Tree Management Plan (EMM B23). Through this process, trees to be removed and retained will also be identified and documented.

Loss of vegetation and subsequent loss of some fauna habitat is unavoidable. However, by adhering to the Project EMMs, this clearing would be avoided as far as possible through design, and minimised within each site during construction.

Adoption of EMM B1 (vegetation management) would see the Project avoid as far as practicable the removal of native vegetation and fauna habitat and impacts on habitat connectivity through the establishment of no-go-zones and clear works areas to protect vegetation and fauna habitat to be retained.

Adoption of EMM B3 (contractor awareness) would see the implementation of inductions to all contractors covering measures to protect environmental values.

Adherence to EMM B7 (site rehabilitation) would see the Project Area reinstated with consideration to native vegetation, habitat features and soil compaction. EMM SW4 (Develop appropriate control measures as part of the Construction Environment Management and Site Rehabilitation Plan for open trench construction) and EMM SW8 (Site rehabilitation – Jacksons Creek) complement this measure by outlining site specific rehabilitation for Jacksons Creek which includes the requirement to determine the timing of waterway bed and bank restoration, bed and bank protection measures and monitoring.

Adoption of EMM B8 (topsoil management) would see the Project minimise the risk of spread of weeds and manage topsoil for rehabilitation and reinstatement, with management of Golden Sun Moth and Striped Legless Lizard habitat considered. Topsoil management is required to take into account the duration of displacement, separation and replacement of original topsoils and revegetated with Golden Sun Moth food source species.

Adoption of EMM B10 (surface water sedimentation and runoff) would minimise the risk of sedimentation and run off into waterways.

Where the removal of native vegetation (fauna habitat) is unavoidable, the Project would meet the assessment and offset requirements of the *Guidelines for the removal, destruction and lopping of native vegetation* (DELWP, 2017a).

Most habitat loss that is likely to, or that may, occur as a result of this Project, is small and localised, and for fauna is expected to result in the loss or displacement of individuals rather than populations or species.

Habitat degradation (direct or indirect) resulting from nearby land clearing can generally be mitigated, managed and reversed through management actions. Habitat degradation that results from edge effects (where some fauna prefer not to occupy the exposed habitat edge and move deeper into the habitat that remains) is more difficult to mitigate and manage, but is considered unlikely to have anything more than a negligible impact on threatened or non-threatened fauna in the Project Area, given the extensive and largely homogenous nature of the surrounding habitats.

The potential impact of loss of habitat for EPBC Act threatened species is assessed using the criteria for EPBC Act Matters of National Environmental Significance – Significant impact guidelines 1.1 (Department of Environment, 2013) and any relevant species specific Guidelines. For the most part, habitat loss across the Project Area is expected to have a minor impact on threatened and non-threatened terrestrial fauna, with the exception of the Golden Sun Moth and Striped Legless Lizard, where impacts are expected to trigger residual significant impacts under the EPBC Act (DEWHA 2009b) and will require offsets under this Act.

10.1.1.7 Loss of important habitat for EPBC Act Migratory species (risk B34)

The potential impact of loss of important habitat for an EPBC Migratory species is assessed here using the criteria outlined for Migratory species in the Impact Significance Guidelines 1.1 under the Commonwealth EPBC Act (Appendix Z). The Migratory status of a species is a Commonwealth and international matter rather than a state (Victoria) or local matter.

The consequence and severity of losing important habitat for a Migratory species would be major, because it could jeopardize the success or recovery of a species internationally. And, unless comparable habitat were replaced nearby, the duration would be long-term, because the habitat would be lost permanently. However, these impacts are not expected to occur during construction, because important habitat is not expected to be lost as a result of construction of this Project.

Twenty bird species known or predicted to occur within the Study Area are listed as Migratory under the EPBC Act (Appendix L). Some of these may use or visit habitats within the Project Area occasionally (such as White-throated Needletail, Fork-tailed Swift and Latham's Snipe), but most are seabirds or coastal shorebirds and are unlikely to use habitats within the Project Area in large numbers or frequently.

There is no indication that any location with the Project Area supports or attracts an ecologically significant proportion of any Migratory species, or would be considered important habitat for any Migratory species.

Direct and indirect impacts on Migratory species and their terrestrial and wetland habitats during construction would be managed and minimised through numerous EMMs (particularly EMM B1, B10, B11 and C6) which will see native vegetation removal minimised and aquatic habitats protected through management of erosion and sedimentation, run off and potential waterway contamination or degradation.

Adoption of EMM B3 (contractor awareness) would see the implementation of inductions to all contractors covering measures to protect environmental values.

Adherence to EMM B7 (site rehabilitation) would see the Project Area reinstated with consideration to native vegetation, habitat features and soil compaction.

Proposed Project impacts are not expected to have a significant impact on migratory species under the EPBC Act.

10.1.2 Degradation of vegetation and terrestrial habitat through erosion, sedimentation, dust, contamination or soil compaction

The following risk pathways are discussed under this impact category:

Risk pathways	Initial risk rating	Residual risk rating
Risk B8, Risk B32, Risk B33	Low	Low
Risk B7, Risk B15	Negligible	Negligible

10.1.2.1 Loss or degradation to EPBC Act and FFG Act threatened flora Matted Flax lily, Tough Scurf-pea and Arching Flax-lily; EPBC Act threatened ecological communities, FFG Act-listed communities and threatened EVCs from erosion / sedimentation, dust, litter or release of contaminants (risk B7)

Construction activities such as access road upgrades and excavation can lead to the mobilisation of sediments and/or contaminants and can have detrimental impacts to threatened native vegetation by reducing photosynthetic capacity (e.g. sedimentation and dust), mechanical damage to plants (litter) or physiological impacts (contaminants). However, these impacts are likely to be temporary or minor. During construction, measures to avoid impacts from erosion / sedimentation, dust, litter or release of contaminants to retained threatened flora and threatened communities include hazard management activities that will be managed through EMM B10 (surface water sedimentation and runoff impacts to ecological values) and EMM B8 (topsoil management). Where site rehabilitation is required this will be undertaken in accordance with EMM B7 (site rehabilitation). EMM B1 (Vegetation management) provides measures to retain environmental features such as rocks and coarse woody debris that assist with soil stabilisation.

The area occupied by the single Matted Flax-lily plant will be bored using HDD and the single population of Tough Scurf-pea at Wollert Compressor station is at a sufficient distance from the construction corridor that any significant impacts are not expected and measures will be implemented as described above. The individual Arching Flax-lily plant will be removed during construction.

Impacts to botanical values from disturbance of sodic soils are not expected to occur, since these are currently considered as a low risk and manageable (but require further testing and analysis refer to Technical report D – Ground movement and land stability). The potential impact from acid sulfate soils is considered to be low or negligible once mitigation measures are implemented (refer to Technical report E – Contamination).

Impacts to EPBC Act-listed TECs and endangered EVCs, where these are retained, are also expected to be temporary and will be managed in accordance with the above EMMs. TECs are *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* and *Natural Temperate Grassland of the Victorian Volcanic Plain*. FFG Act-listed threatened communities are Western (Basalt) Plains Grasslands Community and Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland. Endangered EVCs are Plains Grassland; Riparian Woodland; Plains Grassy Woodland; Plains Grassy Wetland; Stony Knoll Shrubland; Aquatic Herbland.

10.1.2.2 Loss or degradation of non-threatened flora and non-threatened Ecological Vegetation Classes from erosion/sedimentation, dust, litter or release of contaminants (risk B8)

As discussed above, the consequences of any potential impacts are expected to be temporary or minor. No non-threatened EVCs occur in the Project Area.

Non-threatened flora are components of threatened vegetation communities in the Project Area and any impacts to these species from erosion / sedimentation dust, litter or release of contaminants during construction would be managed as above (Section 10.1.2.1), primarily through EMM B10 (surface water sedimentation and runoff impacts to ecological values).

10.1.2.3 Loss or degradation of threatened flora and ecological communities from soil compaction (Risk B32)

Soil compaction impacts can lead to the loss or degradation of habitats for threatened flora, fauna and ecological communities by hindering moisture absorption, constricting root growth, inhibiting accumulation of soil seed banks and thus seedling recruitment, and promoting establishment of shallow rooted, weedy annual species. Soil compaction during construction impacting threatened flora and ecological communities is considered potentially unlikely, or localised and temporary at worst, since the one Matted Flax-lily plant will be avoided due to use of HDD. The one individual plant of Arching Flax-lily will be removed during construction.

Construction impacts will be confined to the Project Area and soil compaction during construction will be avoided or minimised by employing EMM B8 (topsoil management) and EMM B7 (site rehabilitation). Soil surfaces that have been compacted due to construction activities, such as those subject to traffic and/or storage areas within the site, would be ripped to allow the topsoil to bind with the subsoil and increase water filtration, prior to revegetation with indigenous native species.

10.1.2.4 Loss or degradation of non-threatened flora, fauna and ecological communities from soil compaction (Risk B33)

There are no non-threatened EVCs in the Project Area and non-threatened flora mostly occur as scattered individuals or as components of EPBC Act-listed threatened ecological communities, FFG Act-listed threatened communities and threatened EVCs. Impacts to non-threatened species will be addressed by implementing EMM B7 (site rehabilitation) and EMM 8 (topsoil management), as above, and EMM B7 (Site rehabilitation after construction) contains several measures to reinstate vegetation that will be removed during construction. Where these communities will be removed, residual impacts to non-threatened flora will be addressed through an offsetting strategy.

Impacts to vegetation adjacent to the Project Area will be avoided by implementation of EMM B1, which includes confining all vegetation clearing works to the defined construction corridor, demarcation of all buffer zones, no go zones, tree protection zones, the boundary of the construction area, and retention of environmental features within or directly adjacent to, the construction corridor.

A qualified arborist will be responsible for trimming / lopping branches of trees on the edge of the construction corridor but overhanging into construction / activity areas as necessary.

A Tree Management Plan developed for the Project will also address trees that are determined by an arborist as potentially (directly or indirectly) impacted (EMM B23).

10.1.2.5 Degradation of terrestrial fauna habitat from erosion/sedimentation, dust, litter or release of contaminants into wetlands and waterways (risk B15)

Construction activities involving excavation, transport and stockpiling of soils, create environments that are prone to mobilising contaminants, especially during rainfall events where runoff can transport contaminants. Construction activities without appropriate mitigation preventing transport into waterways can cause risk of water pollution from suspended sediments and chemical contaminants bound within the sediments (e.g. toxicants and nutrients). The operation of machinery and use of various construction materials also introduces risk that fuels or other chemicals on site may accidentally spill or be inundated during flooding, potentially entering the waterways. Disturbed soils are especially prone to erosion, due to the lack of vegetation or protective ground covering. Eroded soils that enter drainage networks alter the quantity and type of sediment entering waterways, which can change physical habitat and alter geomorphological processes. Similarly, litter from construction and associated activities is also susceptible to being transported into the drainage. The risks of erosion/sedimentation, and contaminants on aquatic habitat is addressed separately (risks B19 and B20).

Wetlands and waterways in the Project Area are, or may be, used by a range of threatened and non-threatened terrestrial fauna, including frogs, ducks, egrets, crakes and rails. Construction of the Project may result in unplanned sedimentation and/or erosion that contribute to degradation of wetland habitats for terrestrial species.

Direct and indirect impacts during construction would be managed and minimised through numerous EMMs. Adoption of EMM B10 (surface water sedimentation and runoff), EMM B11 (surface water contamination), EMM C1 (disturbance of existing contamination) and EMM C6 (Leaks or spills) all aim to reduce the risk of sedimentation, run off and contaminants entering waterways.

Through full implementation of mitigation actions, small and localised incidents of erosion, sedimentation or contamination during construction may still occur due to unexpected events (such as particularly heavy rain). However, the likelihood of those localised incidents causing further ecological degradation of wetland habitats is considered negligible.

10.1.3 Spread of weeds, pest species or pathogens

The following risk pathway is discussed under this impact category:

Risk pathways	Initial risk rating	Residual risk rating
Risk B9	Low	Low

10.1.3.1 Reduction of ecological values from the introduction or spread of weeds, pest species, or pathogens (Risk B9)

Weeds

Weeds are recognised as a major threat to biodiversity globally and include species that have been introduced to Australia, as well as native species that have spread beyond their range (White et al., 2018). Many weeds are particularly problematic in areas of fertile soils, such as in the Project Area, where they can take advantage of available nutrients and out compete slower growing native species. The Project Area and surrounding landscape has generally very high levels of weed infestation, including widespread populations of *Catchment and Land Protection Act 1994 Act* (CaLP Act) - listed noxious weeds (Table 53). These weeds have colonised much of the construction corridor, frequently to the exclusion of native species.

Construction may spread these listed weeds lresulting in the decline in quality of native vegetation within the Project Area and adjacent areas. Many weeds in the Project Area are aggressive colonisers well suited to fertile basalt soils and can outcompete and displace native vegetation.

The seeds of weed species and other pathogens can become lodged in plant and equipment (particularly in the mud of tyre treads) when driven through infested areas. The seeds and/or pathogens may then be carried some distance before being unintentionally deposited in areas free from previous infestations of the species or pathogens. Conversely, plant and/or equipment moving from the Project boundary could result in off-site infestations of those species present within the Project boundary.

While most of the noxious weeds recorded are widespread, Lobed Needle-grass (*Nassella charruana*) was recorded only at 23 locations close to the Wollert Compressor Station, the majority of which are outside the Project Area and has been identified by the City of Whittlesea as a priority for control. It is also known from the Donnybrook area. To assist the City of Whittlesea with their eradication program for the species, a CEMP for the Project will specifically address risk of spread of this species during the clear and grade phase and reinstatement phase.

CaLP Act listed Weed species recorded during the field assessments are listed below in Table 53.

Table 53 CaLP Act-listed noxious weeds recorded in the Project Area (Biosis, 2020; GHD, 2020)

Scientific name	Common name	Status in Port Philip and Westernport CMA
Chrysanthemoides monilifera	Boneseed	Regionally Controlled
Cirsium vulgare	Spear Thistle	Regionally Controlled
Cynara cardunculus subsp. *flavescens*	Artichoke Thistle	Regionally Controlled
Lycium ferocissimum	African Box-thorn	Regionally Controlled
Marrubium vulgare	Horehound	Regionally Controlled
Nassella charruana	Lobed Needle-grass	State Prohibited
Nassella neesiana	Chilean Needle-grass	Restricted
Nassella trichotoma	Serrated Tussock	Regionally Controlled
Opuntia spp.	Prickly Pear	Restricted
Rosa rubiginosa	Sweet Briar	Regionally Controlled
Ulex europaeus	Gorse	Regionally Controlled

To avoid any exacerbation of the already high weed levels in the Project Area, works will be consistent with weed control measures in the CEMP developed for the Project. The CEMP will include reasonable steps to prevent the growth and spread of CaLP Act listed noxious weeds, and prevent spread of established weed species during construction, including vehicle and equipment hygiene. The risk of introduction or spread of weeds during the clear and grade phase and reinstatement phase, when topsoil is re-located, will be managed by employing EMM B2 (pest plant/animal/pathogen control - construction), using the following measures to manage biosecurity risks and meet CaLP Act obligations:

- During the clear and grade phase and reinstatement phase when topsoil is re-located, locate listed weeds in the construction corridor to assess the risk of additional spread during construction of the Project
- To the extent reasonably practicable during the clear and grade phase, ensure that vehicles and plant are free of soil clumps and sods prior to entry and exit from Project Area
- Evaluate disturbed areas post-construction and implement remedial measures as required within a reasonable time frame
- Waste is to be managed in accordance with EMM C1

Additionally, at waterways during each phase of works:

- All vehicles and plant undertaking construction works directly in the watercourse (Merri and Jacksons Creeks) must be cleaned, free of soil sods and sprayed with bleach prior to initial entrance and final exit of each waterway (excluding vehicles and plant using the constructed access route)

Cinnamon Fungus

Cinnamon Fungus (*Phytophthora cinnamomi*) is a soil-borne pathogen that attacks and destroys plant root systems causing plants to die through lack of water and nutrients. The disease is also known as die back, root rot, PC or Phytophthora and has the ability to alter the ecology of entire ecosystems, including the loss of shelter and nesting sites or food for fauna (Australian Government, 2018).

Disease caused by Cinnamon Fungus is a key threatening process under the EPBC Act due to its actual and potential impacts on threatened species and ecological communities, and is considered a major threat to Australia's biodiversity. Phytophthora dieback can cause permanent damage to ecosystems and plant communities and cause major declines in some insect, bird and animal species due to the loss of shelter, nesting sites and food sources. Once an area is infested with the pathogen, eradication is usually impossible.

While the pathogen can spread locally through soil or water via tiny swimming spores, it is more commonly spread through the movement of contaminated soil and gravel carried by vehicle or foot traffic. Without proper soil testing, this microscopic pathogen is difficult to detect. It is more actively spread in moist soils during warm weather and can survive drought. It can be present even if vegetation appears healthy as not all plants are susceptible.

The risk of Cinnamon Fungus occurring in the Project Area is minor, since it is commonly found in soils that have neutral to acidic pH, which are most favourable for the formation of spores and the survival of the fungus (Zentmyer, 1980), rather than in grassy vegetation on fertile soils, such as in the Project Area.

Potential introduction and spread of Cinnamon Fungus is considered highly unlikely owing to vegetation and soil types within the Project Area and will be managed through EMM B2 (weeds/pathogens and waste during construction) and EMM B8 (topsoil management), using the following measures during the clear and grade phase of construction:

- To a reasonable extent practicable during the clear and grade phase, ensure that vehicles and plant are free of soil clumps and sods prior to entry and exit from Project Area
- Waste is to be managed in accordance with Contamination EMM C1

Pest fauna species

Some non-native terrestrial and aquatic fauna species in the study area are considered pest species, and are likely to be having a detrimental impact on the natural ecology of the Project Area. Given the Project Area is already highly disturbed and partly urbanised, the Project is considered unlikely to exacerbate the impact of any pest animal or fish species.

Management measures to reduce the risk of exacerbating the impact of terrestrial pest animals would be employed by the implementation of EMM B2 to enable management measures for waste (including litter, which may attract pest animals) minimisation during construction and operation in accordance with the EP Act and the spread of weeds which can also encourage pest animal use.

Amphibian Chytrid Fungus

One known pathogen that affects fauna is the Amphibian Chytrid Fungus, which causes the disease chytridiomycosis, which can result in high mortality of frogs. Worldwide, the impact of this fungus has been catastrophic – in numerous locations (including Australia), many species have become extinct or endangered as a result of its inadvertent introduction (Schloegel et al., 2006; Skerratt et al., 2007) and it is likely the decline of the Growling Grass Frog across its range is linked to introduction of the fungus into new areas.

Chytridiomycosis due to the amphibian chytrid fungus was included on the List of Key Threatening Processes under the EPBC Act on 23 July 2002.

The fungus appears to have been spread worldwide by various means from Africa (Weldon *et al.,* 2004). It is highly infectious and can be spread via zoospores on frogs and tadpoles, and potentially in water, on wet equipment and within moist soils (such as on boots, tyres vehicles, equipment) (Murray *et al.,* 2011). There is evidence that different strains of the fungus vary in their impact; some strains are more lethal to frogs than others (Berger *et al.,* 2005).

The typical response pattern of chytrid introduction into a previously uninfected area is for there to be a rapid mass die-off of frogs (epidemic chytrid infection); common and abundant species tend to become rare, while uncommon or rare species may decline to such small population sizes that they become undetectable, extirpated or even extinct (Lips *et al.,* 2006). In the years following the epidemic, the species that persist may build their populations again, now with endemic chytrid infection (Retallick *et al.,* 2004; McDonald *et al.,* 2005). During this phase, there may be a continual or episodic mortality of smaller numbers of frogs, but the mass population-scale die-offs tend not to occur.

Locations where the fungus has had the most catastrophic impacts have been mostly remote locations (such as rugged mountainous areas) where humans rarely visit, rather than urbanised areas that have sustained a high level of human and other disturbance historically.

While little is known of the status or distribution of the fungus in the Melbourne area and across most of Victoria, the Amphibian Chytrid Fungus is known to have been in Australia since 1978 and in Victoria since 1998 (Murray *et al.,* 2010). Recent research has identified the abundant and ubiquitous Common Froglet (*Crinia signifera*) as a likely reservoir host, spreading chytrid spores among frog populations without succumbing greatly to the disease itself (Brannelly *et al.,* 2018). Given the highly infectious nature of the fungus, the long history of disturbance to waterways and landforms in the Melbourne area, and the ubiquity of *Crinia signifera* in Melbourne's waterbodies, it is highly unlikely that any wetlands or waterways (habitats for frogs) in the Melbourne area have remained free of chytrid infection to this point. It is likely to be widespread throughout frog habitats within the Project Area already.

Therefore, the likelihood of introducing the fungus to the Project Area (such as through transport of soil, wet or muddy equipment) is low, as is the likelihood of a catastrophic epidemic occurring within the Project Area as a result of this Project. However, different strains of the fungus may vary in how lethal they are to frogs, so avoiding continued spread of the fungus is critical to management of this pathogen. If a new strain of the chytrid fungus is introduced to the Project Area, then a larger impact is possible. If infected materials (such as soil, equipment, vehicles) are brought in from elsewhere, there is a chance of a novel and more pathogenic strain becoming established.

Measures can and would be taken to minimise the risk of spreading the Amphibian Chytrid Fungus into, out of or within the Project Area. Management measures to reduce this risk of spreading the chytrid fungus would be employed by the implementation of EMM B2 which details requirements for, and to raise awareness of, soil management to regulate the movement of soil and cleaning of vehicles and plant with bleach and so reduce the risk of chytrid-infected soil leaving or entering the site.

EMM B21 which details that hygiene protocols for the handling of any frogs must be developed to minimise the risk of spread of chytrid fungus between individual frogs during any handling required.

The risk to the Project from the Amphibian Chytrid Fungus is expected to be low.

Epizootic Haematopoietic Necrosis Virus (EHNV)

Epizootic Haematopoietic Necrosis Virus (EHNV) is an Australian virus that has the potential to negatively impact several native fish species. EHNV enters fish through the body surface or gastrointestinal tract, multiplies in the blood forming organs such as the spleen and kidney and destroys them in the process. The liver is also affected by the virus. Most infected fish are believed to quickly succumb and die.

Native fish species that may be affected by EHNV include Macquarie Perch, Freshwater Catfish, Murray Cod, plus exotic fish species, Eastern Gambusia, Rainbow Trout and Redfin Perch. At present, Australian field studies have only detected EHNV infection in Redfin Perch

and farmed Rainbow Trout. It is suspected that illegal movements of Redfin Perch by anglers may have played a part in the distribution of EHNV in the past. Relevant to the Project is that the movement of construction equipment from one waterway to another can spread the virus. The risk to the Project from EHNV is expected to be low and managed through EMM B2 that aims to prevent the movement of the virus by cleaning all vehicles and plant prior to initial entrance and final exit of each waterway, treating all vehicles and plant with bleach prior to entrance of each waterway if working between multiple waterways, and following vehicle washdown protocols that will be detailed within the CEMP or a specific biosecurity management plan.

10.1.4 Degradation of aquatic habitat through erosion, sedimentation, dust, litter or contamination

This section details impacts to aquatic fauna habitat under Risk B19 for HDD construction and Risk B20 for open trench construction. The following risk pathways are discussed under this impact category:

Risk pathways	Initial risk rating	Residual risk rating
Risk B19	Negligible	Negligible
Risk B20	Low	Low

10.1.4.1 HDD construction activities (risk B19) and open trench construction activities (risk B20) resulting in erosion, sedimentation, dust, litter or release of contaminants into waterways leading to loss or degradation of aquatic fauna habitat

Construction activities introduce risks of sediment, dust, litter or the release of other contaminants to waterways and wetlands that can degrade aquatic fauna habitat. The use of HDD is assessed as a 'negligible' risk with a minor consequence while open trench construction is a 'low' risk with a minor consequence. The increased risk associated with open trench construction compared to HDD is related to the greater level of physical disturbance of the Project Area during construction and increased likelihood of the mobilisation of sediments, contaminants, etc.

Aquatic habitats receive water from point-sources such as stormwater outlets and non-point sources such as overland flow. This places habitat for aquatic fauna in the direct path of sediments and other contaminants that are mobilised and enter the drainage network. Aquatic habitats are the sink for most mobilised sediments and contaminants, which are generally only removed by transport further downstream. The impacts of sediments and contaminants on aquatic fauna may occur directly or indirectly. For example, an increase in sediment loads can smother aquatic plants and reduce substrate complexity, thereby indirectly reducing available habitat and indirectly influence aquatic fauna. Contaminants can potentially lead to direct toxicity, physical stress and behavioural effects on aquatic fauna. Species most likely to be impacted are the less mobile taxa (e.g. macroinvertebrates and macrophytes) with the more mobile fish species expected to avoid any adverse conditions.

The potential for erosion and sedimentation at the waterways where open trench construction is to be applied has been assessed in the Surface Water Technical Report B in Section 6.2, Table 6-1 and Section 7, Table 7-1. The initial risk in Merri Creek and all other wetlands (e.g. wetlands near KP44.8) is low due to relatively low water velocities and stable banks. The initial risk in Jacksons Creek is medium due to relatively high water velocities and existing evidence of erosion. However, the Surface Water Technical Report B suggests the risk of erosion is low to negligible for all waterways following the implementation of EMM SW4. Based on this, and the fact that Jacksons Creek already suffers from erosion and sedimentation and high turbidity, overall risks to biodiversity values are also considered low. Given works are planned to occur

during a low flow period, it is also expected that impacts will be localised to within or near the Project Area. There are additional risks of erosion and sedimentation at Merri Creek due to the construction of the access track that will remain for approximately three months.

Although construction works are planned during a low flow period to best manage impacts associated with erosion and sedimentation, there is a chance of unforeseen rainfall events occurring. To further manage these risks, along with the potential for an increase in runoff and delivery of contaminants, The Surface Water Technical Report includes a number of measures in addition to EMM SW4 that should be implemented to prevent risks to biodiversity during construction (i.e. EMM SW1 to EMM SW9).

Other contaminants may be released into waterways through the use of temporary drilling fluids (such as bentonite) during trenchless HDD or pipe-jacking operations. This can result in blow-out (also known as “fracking”), whereby the drilling fluid leaks through the bore into the surrounding soil, surface water or aquifer. Drilling fluids are unlikely to be a risk to biodiversity as the drilling fluids are generally biodegradable and inert. Impacts from blow out into Deep Creek and across land would be anticipated to be short term, reversible and on a localised scale. The EES Technical Report E: Contamination discusses in detail the impact of blow out to the environment including recommended mitigation measures outlined in EMM C9. The EES Technical Report D: Ground movement and land stability also describes implementation of mitigation measures to reduce the likelihood of blow out occurring based on assessing ground conditions and monitoring of drilling fluids for HDD activities (EMM GM-05 and EMM GM–06).

Potential impacts are most likely during the construction phase on the Project with no impacts expected once the pipeline is installed and in operation provided the site undergoes rehabilitation. Through appropriate EMMs during the construction phase, the likelihood and extent of potential impacts are reduced. In addition to the EMMS related to fracking and unforeseen rainfall event discussed above, the relevant EMMs during the construction phase are targeted at limiting impacts by restricting vegetation losses (EMM B1), using suitable erosion and control measures (EMM B10 and EMM SW4), preventing the delivery of contaminants to waterways (EMM B11) and rehabilitating the Project Area to prevent future erosion and sedimentation impacts (EMM B7).

10.1.5 Activities within/around waterways and wetlands impacting riparian and in-stream habitats resulting in loss or degradation of habitats

This section details risks to terrestrial and aquatic fauna via changes to riparian and in-stream habitat under Risk B21 and Risk 23 for HDD construction and Risk B22 and Risk 24 for open trench construction. The following risk pathways are discussed under this impact category:

Risk pathways	Initial risk rating	Residual risk rating
Risk B21	Low	Low
Risk B23	Negligible	Negligible
Risk B22 and Risk B24	Low	Low

10.1.5.1 HDD construction activities within/around waterways and wetlands impacting riparian and in-stream habitats resulting in loss or degradation of habitats for threatened (risk B21) and non-threatened (risk B23) terrestrial and aquatic fauna

10.1.5.2 Open trench construction activities within/around waterways and wetlands impacting riparian and in-stream habitats resulting in loss or degradation of habitats for threatened (risk B22) and non-threatened (risk B24) terrestrial and aquatic fauna

Construction activities introduce risks of impacts on riparian vegetation and in-stream habitats associated with waterways and wetlands leading to a loss or degradation of habitats used by both threatened and non-threatened terrestrial and aquatic fauna. The use of HDD is assessed as a 'low' risk with a minor consequence for threatened species and an 'insignificant' risk with a negligible consequence for non-threatened species. Open trench construction is a 'low' risk with a minor consequence for threatened species and a 'low' risk with a negligible consequence for non-threatened species.

While higher risks may be expected for open trench construction compared to HDD, the same 'low' risk to threatened species for both construction techniques is based on the limited differences in the likelihood of impacts in the waterways. That is, for both construction techniques an insignificant changes in state or commonwealth listed species is expected (minor consequence). The likelihood of HDD impacts on riparian and in-stream habitats is unlikely but could occur in certain conditions. For open trench construction the likelihood is considered occasional with impacts probably occurring in most circumstances. The consequence and likelihood for both construction techniques result in a low 'risk'. It could be argued the likelihood of open trench construction could be considered frequent and expected to occur in most circumstance or is planned to occur which would result in a 'medium' risk. However, the limited riparian vegetation and in-stream habitat in open trench construction areas informed the decision to adopt the occasional likelihood.

Generally, the riparian zone is the area of land bordering rivers and other waterbodies (including the bed, banks and adjacent land) that directly influences ecosystem health. Riparian zones provide critical habitat for flora and fauna and provide connectivity between remnant vegetation in the landscape. Vegetation in the riparian zone supplies organic matter to waterways that provides food and habitat for fish and other fauna, while shading can regulate water temperature and reduce the occurrence of algal blooms. This vegetation can also filter sediment and nutrients from runoff and aid to stabilise banks and reduce erosion.

Therefore, construction activities may increase the risk to terrestrial and aquatic fauna that use rivers and other waterbodies either indirectly reducing habitat through the loss of riparian vegetation, or directly through the physical disturbance of aquatic habitat. Potential impacts are most likely during the construction phase on the Project with no impacts expected once the pipeline is installed and in operation provided the site undergoes rehabilitation. Through appropriate EMMs during the construction phase, the likelihood and extent of potential impacts are reduced. The relevant EMMs during the construction phase are targeted at limiting impacts by restricting vegetation losses (EMM B1), using suitable erosion and control measures (EMM B10), preventing the delivery of contaminants to waterways (EMM B11) and rehabilitating the Project Area to prevent future erosion and sedimentation impacts (EMM B7).

10.1.6 Loss of connectivity and impeded passage for native aquatic species

This section details impacts to aquatic fauna due to the construction of barriers to movement and migration under Risk B35 for threatened species and Risk B36 for non-threatened species. The following risk pathways are discussed under this impact category:

Risk pathways	Initial risk rating	Residual risk rating
Risk B35	Low	Low
Risk B36	Low	Low

10.1.6.1 Construction activities within/around waterways resulting in loss of connectivity and impeded passage for threatened (Risk B35) and non-threatened (Risk B36) aquatic species

The use of HDD is not considered to pose a risk through the creation of barriers to movement and migration of aquatic fauna and this risk pathway applies to open trench construction techniques. For both threatened and non-threatened species, the use of open trench is assessed as a 'low' risk although the consequence is moderate for threatened species and minor for non-threatened.

Restrictions to movement and migration of native fish have the potential to occur in Jacksons Creek and Merri Creek during construction due to works in waterways (such as the use of cofferdams) or in Merri Creek due to construction of the temporary access track. Threatened aquatic species, in particular the migratory Australian Grayling (*Protonectes mareana*), are not reported to occur in these two waterways and were not detected during the targeted surveys. Missing a spawning season, due factors such as barriers to migration, may have major implications for Australian Grayling as the species may spawn only once or twice in its lifetime and many only live for a couple of years (Bishop and Bell, 1978; Backhouse et al., 2008). As such, the consequence for the species is considered moderate as it may result in a measurable change to a population. However, the likelihood of an impact due to the creation of barriers is considered remote as the species is not expected to be present and this results in the 'low' risk.

The native fish species that are known to occur and were found during targeted surveys are common, widespread and abundant and many are not obligate migratory species. Those that are obligate migratory species are Common Galaxias (*Galaxias maculatus*), Australian Smelt (*Retropinna semoni*) and Southern Shortfin Eel (*Anguilla australis*). However, the likelihood of impacts to native fish is considered unlikely due to their life-cycles (see below) and the consequence minor as insignificant changes to populations are expected. This also results in a 'low' risk to native fish species.

Common Galaxias tend to migrate downstream to estuaries during 'spring' tides in autumn with larvae spending five to six months at sea before returning to freshwater during spring (Allen et al., 2006; Lintermans, 2007). The lifecycle of Australian Smelt is completed entirely in freshwater (Cadwallader and Backhouse, 1983) although upstream migrations of juveniles and adults have been recorded in the Murray and Murrumbidgee Rivers (Lintermans, 2007). Short-fin Eel are able to climb barriers such as waterfalls and dam walls during migration (Gomon and Bray, 2018).

It is understood that during construction cofferdams or similar methods will be used, likely across the entire waterways. However, it is anticipated the works will occur for around two to four weeks and barriers to migration already exist in Jacksons Creek immediately downstream of the Project Area and in the Merri Creek near Craigieburn (Melbourne Water, 2018a). Given the above, the risks of a temporary lack of connectivity would be minor and not cause any impacts to population viability.

To manage impacts due to the creation of a barrier that impedes passage or migration for native fish, the time required to complete construction while cofferdams are in place will be limited as outlined in EMM B17. The temporary access track over Merri Creek will be constructed to minimise obstructions to passage and impacts on the hydraulic conditions at the site. As part of the CEMP culverts will be checked for blockages as part of ongoing inspections and the culverts must provide passage for fish and other aquatic fauna when flow is present. Provided the site undergoes rehabilitation, there will be no ongoing impacts (EMM B7).

10.1.7 Drawdown of groundwater resulting in degradation of groundwater dependent ecosystems

The following risk pathways are discussed under this impact category:

Risk pathways	Initial risk rating	Residual risk rating
Risk B10 and Risk B25	Low	Low

10.1.7.1 Dewatering of groundwater during construction resulting in changes to terrestrial (risk B10) and aquatic groundwater dependent ecosystems (risk B25)

For both terrestrial and aquatic flora and fauna, the potential for impacts due to changes in groundwater depth are assessed as a 'low' risk with a minor consequence. Impacts to 1.68 ha of Riparian Woodland and instream aquatic flora and fauna values have been avoided using HDD at Deep Creek. Elsewhere at Jacksons Creek and Merri Creek, pipeline construction will use open trench construction, since HDD is not possible given geotechnical constraints.

GDEs are complex, dynamic ecosystems that rely upon groundwater contribution on a permanent or intermittent basis to sustain their ecological functions, provide ecosystem services and maintain flora and fauna communities with requirements for specific watering regimes. GDEs include ecosystems that depend on the surface expression of groundwater, the subsurface presence of groundwater, or reside within a groundwater resource. During construction there is likely to be some excavations deeper than the water table that will therefore require dewatering over short periods. During operation the pipe and pipe trench may be below the water table which may potentially impact on groundwater flow paths. These potential impacts on groundwater levels may subsequently impact GDEs and their associated plants and animals, depending on their degree of groundwater dependency. The Alluvium (2019) desktop assessment of Surface Water and Groundwater within the Project Area identified potential impacts on groundwater to be very low, with the predominant risk being the potential to create preferential flow paths that may inadvertently change groundwater flow directions. Technical Report C – Groundwater Assessment also suggest the impact of construction dewatering drawdown on GDEs is considered to be minor at worse considering:

- The drawdown extent and level are localised and minor
- The duration is short (approximately two to four weeks)
- Construction activities (i.e. coffer dams) through the rivers will be designed to minimise the degree of groundwater and surface water interaction (i.e. trench breakers) and therefore minimise the dewatering requirements.

The potential GDEs identified within the Project Area are outlined in Section 8.3.2.7 and relate to two types of ecosystems:

- Terrestrial ecosystems that rely on the subsurface presence of groundwater – potentially, this includes all vegetation ecosystems

- Aquatic ecosystems that rely on surface expression of groundwater such as rivers, wetlands and springs

Regarding terrestrial ecosystems, numerous patches of vegetation considered groundwater dependent are within the Project Area, mostly based on 2005 modelled vegetation mapping by the former Victorian Department of Sustainability and Environment. Only Riparian Woodland distributed along major waterways is addressed in this section, since groundwater impacts to grassy woodland, grassland or shrubland are remote at best. The deep-rooted and perennial River Red Gum dominates riparian woodlands within the construction corridor and has the ability to actively manage their groundwater dependency. Available evidence suggests River Red Gum roots can penetrate to 10 metres (Davies 1953) and potentially deeper. River Red Gums have the ability to rapidly increase root depth and establish extensive root systems (Bacon et al., 1993) following a decline in water table depth during dry periods (summer), and contract their root system in wetter periods (winter) in response to increased water availability (Canham et al., 2012). However, if a groundwater depth threshold is reached whereby tree roots are no longer able to access available soil moisture, tree condition is likely to deteriorate and trees may suffer.

With regard to aquatic ecosystems, there are several wetlands throughout the Project Area identified as GDEs (see 8.3.2.7 and Table 25). The majority of fauna associated with GDEs are highly mobile (e.g. waterbirds) and are not expected to be impacted by any potential impacts to GDEs. The less mobile frogs may be impacted if there is a loss of these wetland habitats. However, targeted survey within the Project Area has demonstrated that frogs are not prevalent throughout the Project Area with the targeted surveys for Growling Grass Frog not finding frogs of any species in a majority of locations surveyed. The Growling Grass Frog was found to present in only one wetland (inside the MSA) but which is not considered a GDE.

The more significant river assets with respect to potential groundwater impacts, are Jacksons Creek and Merri Creek, both being identified as potential aquatic GDE's and therefore expected to receive some groundwater baseflow in certain periods, which is supported by bore data (see Technical report C – Groundwater Assessment). Surface water flow in Jacksons Creek is perennial, although it undergoes natural periods of high and low flow in response to climatic conditions. Any impact on total baseflow in Jacksons Creek, across these small stretches for the short period of time, would be difficult to detect and are expected to be within natural climatic variations.

Merri Creek at the crossing is ephemeral with no flow conditions expected during the drier periods of the year. However, upper reaches of Merri Creek, north of Craigieburn, contains pools that act as drought refuges, with stream flow in some areas continuing during drought periods indicating a high likelihood of a groundwater baseflow (Alluvium, 2019). Technical report C – Groundwater Assessment, determined the estimated distance of groundwater drawdown influence from the Merri Creek crossing is approximately 50 m. During the aquatic ecology field assessment there were no areas considered to contain refuge pools within this distance from the crossing, with the closest potential pool estimated to be around 100 m away. As a conservative approach, it is recommended to undertake a site survey during summer to confirm the location of refuge pools near the Merri Creek crossing.

Consequently, impacts due to groundwater changes on biodiversity values associated with GDEs are highly unlikely for the following reasons:

- Local terrestrial GDEs are considered unlikely to be impacted by drawdown over this short period
- Unless there is a particularly dry period/drought, the risks of groundwater dewatering impacting GDE's or the receiving environments is considered to be low

- The dominant species, River Red Gum, is sufficiently deep-rooted to withstand temporary and short-lived fluctuations in the water table
- Understorey vegetation associated with Riparian Woodland consists of widespread and common species that are not considered to be groundwater dependent. Impacts to these species are addressed under Risks B2, B4 and B5.
- Wetlands in the Project Area are naturally ephemeral and flowing waterways also experience high and low flows in response to climatic conditions. Any minor or short-term changes due to groundwater drawdown are localised and expected to be within the natural range
- There are no drought refuge pools within the estimated distance of groundwater drawdown influence from the Merri Creek crossing (TBC during a future site survey)

Potential impacts to GDEs would be addressed through EMM B4.

10.1.8 Death or injury of fauna during construction

The following risk pathways are discussed under this impact category:

Risk pathways	Initial risk rating	Residual risk rating
Risk B16	High	Low
Risk B17	Medium	Low
Risk B18	Low	Low

10.1.8.1 Construction activities resulting in the death or injury of native fauna (risk B18), Striped Legless Lizard (risk B16) or Growling Grass Frog (risk B17)

The Project occurs at least partly across a rural landscape. Project construction may result in the injuring or killing of fauna, mainly through land clearing (habitat removal) or fauna straying into a construction area. Fauna most at risk are fauna that reside in the habitats to be removed and that have limited mobility (such as frogs, small reptiles, possums), and/or dependent young (such as young birds in a nest, Platypus juveniles in burrows), or fauna that stray into a construction area during a quiet time (for example, overnight). Fauna straying into a noisy active construction site during the day is considered unlikely, and would be actively managed through general site management and trench management (EMM B9).

For most of the Project Area, fauna most likely to be encountered in a construction site are common species. Presence of uncommon or threatened species is expected to be limited to sections of the Project Area where known or assumed habitat has been identified.

Death or injury of some fauna may occur, but is expected to be localised, and most likely to affect individuals rather than populations or species. While killing an individual animal would be permanent, the impact on the population of that species (particularly if that species is common and adaptable) may be only short-term. Population impacts may occur to fauna in highly localised habitats, such as frogs within an isolated dam. Though for most fauna, populations would be expected to recover relatively quickly. Therefore, death or injury of common species is not expected to have a long-lasting effect on any species of common fauna in the Project Area.

Notably few fauna were observed during habitat assessments and targeted surveys; whilst some species are cryptic and difficult to see, others are more obvious and should have been observed more readily if present. During targeted frog surveys, very few dams were observed to contain actively calling frogs. The three dams proposed for removal (outside of the MSA) were apparently devoid of frogs at the time of assessment, minimising the risk of impact.

Risks to common species are expected to be managed through implementation of EMM E9 which would require management of fauna displaced or harmed due to habitat removal in compliance with the Wildlife Act, undertaking pre-clearing surveys and inspections to confirm the on-site location of fauna immediately prior to habitat removal, and assisting fauna to safety as necessary. This would also enable the reporting of incidental threatened fauna finds, with any clearing works in the vicinity to be stopped until an evaluation and approved response could be established.

Risks to Platypus are related to open trench construction at Jacksons Creek given they are known to exists within the Study Area at this location, and have a low likelihood of occurring in Merri Creek and Deep Creek (see Section 7.5.3; Appendix R). Furthermore, risks in Deep Creek are reduced due to the use of HDD.

A number of issues for Platypus health and survival have been identified by the Australian Platypus Conservancy (https://platypus.asn.au/) and in scientific journals (e.g. Grant & Temple-Smith, 2003; Bino et al., 2019). Those relevant to the Project include the deterioration or loss of habitat and food sources, changes to flow and water quality, an increase in litter, creation of dams and weirs, issues associated with pumps, pipes and culverts, and an increase in predation. In addition, there are direct impacts that may occur during construction such as individuals in burrows (adults and juveniles) being injured or killed while excavations are occurring for open trench construction in Jacksons Creek.

While there would be some loss of potential Platypus habitat in Jacksons Creek during open trench construction, this loss would be relatively minor compared to available habitat elsewhere in the waterway. By adhering mitigation measures that limit the direct loss of habitat such as vegetation (EMM B1) or indirect loss due to erosion/sedimentation (EMM B10) and contamination (i.e. EMM B11), the loss of habitat can be limited. Site rehabilitation after construction should also be employed to recover any lost habitat (EMM B17). Appropriate mitigation measures would also limit the influence of changes to flow (EMM SW7) and water quality (EMM SW5 and EMM SW6). Given the window for undertaking works in EMM B22 is between March and August, and surface water measures (e.g. EMM SW7) recommends works during the low flow period, the window for open trench construction is between March and May.

Issues due to the creation of dams and weirs identified in the literature are more related to large infrastructure that prevent movement of Platypus throughout a waterway. In the case of Jacksons Creek, coffer dams would prevent movement between reaches upstream and downstream of the Project Area but this can be considered important to prevent Platypus from becoming trapped (EMM B22). However, egress points in the coffer dams and trenches should be installed to allow any trapped individuals to escape (EMM B22). Platypus would have the ability to go around any obstructions such as the coffer dams although this would increase the risk of predation by foxes, dogs, cats and other predators. The risk of this is reduced using suitable exclusion fences (EMM B22).

Litter has the potential to lead to the death or injury of Platypus through entanglement which can be reduced by adhering to EMM B10 and EMM B11. Platypus have also been subjected to injury or death by becoming trapped in pipes and associated pumps. The use of exclusion grills on pumps and pipes used to transport water across or to dewater the coffer dams should be used as a mitigation measures (EMM B22).

Of concern during the construction of the trench across Jacksons Creek is the potential to directly impact on Platypus in burrows, particularly during the breeding season while females are caring for juveniles. This risk is low if construction works are delayed until March when nesting burrows are no longer used and juveniles have left. Surveys for burrows are required prior to excavation works to determine if there are nesting or camping burrows that may be

impacted (EMM B22). If burrows are observed or can't be ruled out careful excavations can allow any individuals to present to escape (Grant, 2014).

The risk assessment found that risks to Golden Sun Moth, Striped Legless Lizard and Growling Grass Frog were initially relatively high due both to their listed status and that impacts on fewer individuals could have a greater impact than it might for common widespread species. However, by adhering to the fauna mitigation measures in EMM B9, EMM 19, EMM 20 and EMM 21, residual risks to all these species can be reduced to low.

The larval stage of the Golden Sun Moth is perhaps the most susceptible to death or injury during construction activities. Individuals spend most of their life cycle (two to three years) underground feeding on grass roots (DEWHA 2009b). Topsoil management is expected to be particularly important to survival of larva. Glasshouse and field trials in the Australian Capital Territory have indicated that Golden Sun Moth larvae can be translocated in soil containing larvae (EPSDD – Environment 2020) which provides promising evidence that appropriate topsoil management will minimise death of individual larvae, though the full details of this project are not known and it is recognised that this should not be relied on. EMM B19 requires the preparation of a Golden Sun Moth Management Plan that details appropriate mitigation including, as a minimum, locations of habitat subject to mitigation, topsoil management, rehabilitation measures, on-going management and/or monitoring. Dust will also be managed during the flying season (November to January) in properties that are known or assumed habitat to minimise impacts to flying adult Golden Sun Moth (EMM B14).

In areas of known Striped Legless Lizard habitat, EMM B20 would allow for management of habitat to minimise risk of death or injury by initially making the habitat unsuitable, tyning the area, relocating any individuals found during tyning and installing fauna proof fences to prevent recolonisation attempts during construction. Subsequent reinstatement of habitat and removal of fauna fences would then follow, once construction was complete. Details of these activities would be outlined within a Striped Legless Lizard Management Plan.

EMMs B1 (land clearance and vegetation loss), B4 (contractor awareness), B7 (site rehabilitation) and B8 (topsoil management) are also applicable to reducing the risk of death or injury to the Striped Legless Lizard by minimising the extent of habitat removal, implementation of inductions to contractors covering measures to protect environmental values, reinstatement of habitat with consideration to native vegetation, habitat features and soil compaction and protection of topsoil in areas of temporary works.

Several measures outlined in EMM B21 are specific to minimising death or injury to Growling Grass Frog in areas of known or assumed habitat for this species. Deep Creek is expected to be crossed via HDD and impacts at this location are expected to be minimal. At Jacksons Creek, construction will be restricted to outside the frog's peak active period (November to March) but is required to be conducted between March to May. This is outside of the Growling Grass Frog season and during the low flow period that has the least amount of variability; to both avoid impacts to Growling Grass Frog individuals and minimise potential damage to habitat as a result of erosion caused by high flow events. Whilst the chance of Growling Grass Frog individuals within the actual Project Area at these locations is considered low, impacts to individuals will be further mitigated through pre-clearance and salvage and relocation activities (relocation is required within adjacent habitat, preferably within 100 m). A salvage and relocation plan will be prepared for the Project for this species to detail habitat removal, salvage protocols and locations of relocation.

EMMs B1 (land clearance and vegetation loss), B4 (contractor awareness) and B7 (site rehabilitation) are also applicable to reducing the risk of death or injury to the Growling Grass Frog and to allow frogs to recolonise disturbed habitats and resume pre-construction habitat use. Additionally, EMM B2 is required to minimise the risk of the spread of chytrid fungus.

Indirect impacts that could result in death or injury to Growling Grass Frog such as sedimentation, run off, surface water contamination, leaks or spills and river bed or bank erosion are managed through EMM B10 (surface water sedimentation and runoff), EMM B11 (surface water contamination), EMM C1 (disturbance of existing contamination), EMM C6 (leaks or spills) and EMM SW4 (river bed or bank erosion).

All threatened fauna salvaged during construction are required to be relocated to the nearest available suitable habitat. If at any locations this is expected to be in excess of 100 m from the point of capture, then details of a suitable location or protocol will be outlined within the applicable fauna management plan (EMM B9).

10.1.9 Disturbance of fauna through noise, vibration or lighting

The following risk pathways are discussed under this impact category:

Risk pathways	Initial risk rating	Residual risk rating
Risk B11 and B12	Low	Low

10.1.9.1 Construction noise, vibration and/or lighting resulting in elevated disturbance of threatened fauna (risk B11) or non-threatened fauna (risk B12)

The Project is partly in a rural landscape where the prevailing habitat types are largely contiguous and the proposed area of impact is restricted to a narrow corridor (up to 30 m in most places). As such, impacts as a result of noise, vibration and lighting are expected to be minimal as they are expected to be highly localised and short term.

The potential severity of disturbance varies with species and location. Disturbing a threatened species to the point that it abandons its breeding habitat (such as the Growling Grass Frog in Jacksons Creek) would be a severe impact, while localised and temporary disturbance of small numbers of individuals of common species (such as the Red Wattlebird, Noisy Miner) from marginal foraging habitat would be relatively inconsequential ecologically.

For this Project, impacts on non-threatened terrestrial fauna are expected to be minimal but more widespread than those on threatened fauna, due to the ubiquitous distribution of non-threatened fauna and the more localised distribution of threatened fauna within the Project Area.

Lighting

Project construction at night would require adequate lighting, which may disturb or displace native or non-native fauna. Lighting during construction would be temporary, moving with the work front.

Artificial light can reduce the success of some nocturnal predators, by giving the potential prey an advantage or favour more tolerant nocturnal predators, potentially changing the composition of both predator and prey species. Artificial light at night can disrupt the typical nocturnal behaviour of fauna (diurnal birds may not roost, nocturnal frogs may not call, insects may be fatally attracted to lights). The effects of lighting may result in some fauna no longer occurring in habitats nearest to the lit areas.

Disturbance of some fauna by light is unavoidable, but is expected to be minor and localised. Disturbance of fauna is most likely to affect individuals rather than populations or species and is not expected to have a long-lasting effect on the populations of fauna in any location.

In some situations, construction site lighting may actually help to keep threatened species (e.g., Growling Grass Frogs) away from the immediate construction area during the construction period.

Typical construction works (this is inclusive of open trench construction works) may occur for up to 11 hours per day, seven days a week, restricted to between 7 am and 6 pm where lighting is largely unnecessary. Activities that occur during dark and require lighting e.g. HDD drilling and hydrostatic testing will adhere to EMM B5.

EMM B5 (lighting impacts to fauna) outlines measures to minimise the escape of light during the Project's construction and sees measures developed to minimise light spillage during construction which would protect significant native fauna habitat to the extent practicable in line with best practice lighting design.

Noise and vibration

Project construction would involve increased noise. Displacement of fauna into sub-optimal habitats could increase their susceptibility to predation and competition, or other source of harm (e.g. onto roads). Noisy environments may make it harder for fauna to hear each other and to hear predators moving around.

Noises that disturb fauna tend to be loud, sudden and unexpected noises (such as explosions, blasting, pile driving) rather than predictable constant noises (such as loud machinery in continual use). Fauna can become habituated to predictable noises, even if those noises are very loud (for example, birds that use airfields as habitat). Noises generated by the Project are expected to vary in intensity and may or may not be accompanied by vibrations that affect terrestrial and aquatic fauna.

During daylight hours, construction noise has the potential to impact on terrestrial fauna in a few ways. It could result in temporary displacement of active diurnal birds – individual birds may choose to forage and roost further from the corridor than they normally do, for the period of disturbance. It could also result in displacement of roosting nocturnal fauna – birds or mammals (such as possums) when disturbed may flee from the corridor and seek a quieter location. Because this would be during daylight hours, it could make the nocturnal fauna more susceptible to predators, competitors and/or temporary harassment (such as mobbing of owls by birds such as noisy miners).

At night, construction noise has the potential to impact on terrestrial fauna through temporary displacement of nocturnal birds and mammals – owls and possums that might forage or roost occasionally near the corridor may abandon a disturbed area for a period of time. It could also result in displacement of roosting diurnal fauna – birds when disturbed may flee from the corridor and seek a quieter location. Because this would be at night, it could make them more susceptible to predators.

Construction noise at night could result in temporary silencing of frogs – frogs may not call during the period of disturbance, or may call but have lower reproductive success due to not being heard. If the construction period lasts longer than the frogs' breeding/calling season, then there is a risk of losing an entire breeding cohort from that location.

Reptiles may also experience temporary displacement for example, snakes and lizards may move away from noise or vibration in the area where high-impact disturbance occurs, such displacement may push individuals into sub-optimal habitats increasing their susceptibility to predation and competition

The Project is not expected to result in persistent noise (such as loud traffic noise near a busy road) which has the potential to disrupt acoustic communication by some fauna, as the Project noise is expected to be almost solely associated with construction.

Fish use sound in a number of ways, including communication, hunting and predator avoidance. Human-induced noise may impact fish by generating high intensity (acute) or low intensity (chronic) noise (Popper and Hastings, 2009). High intensity noise may kill or damage hearing of fish or lead to a startle response, whereas low intensity noise may pervade the environment and lead to behaviour changes over a long-term period.

For this Project, most of the fauna habitats nearest the corridor are not known to support threatened species that would be impacted by noise. The most susceptible species is expected to be Growling Grass Frog at locations where works are near waterways with known or assumed habitat. Blasting is proposed at 13 locations (see Technical Report F: Noise and Vibration) of which five are outside the MSA. There is no Growling Grass Frog habitat in the vicinity of the Project Area (within 100 m) at any of these five locations. Within the MSA the key areas of concern for blasting are within the two Conservation Areas (see section 8.7). The risk to Growling Grass Frog at Conservation Area 34a – Northern Growth Corridor (between KP42 and KP44) may need to be addressed as part of the WICA approval, though blasting would be confined to daylight hours which further reduces the chance of impacts to this species.

Outside of the MSA, construction is expected to avoid the peak breeding/calling period of the Growling Grass Frog (November and December) and the entire active season (November to March) with works in Jacksons Creek expected between March and May (DEWHA 2009c). Therefore noise is not expected to disrupt the species' ability to hear or be heard when calling. As impacts within waterways are expected to be limited to approximately two to four weeks and not commencing before March, the calling season is not expected to be disrupted. Typical construction works (this is inclusive of open trench construction works) may occur for up to 11 hours per day, seven days a week, restricted to between 7 am and 6 pm. Some activities e.g. HDD drilling and hydrostatic testing may be performed as a continuous activity spanning the day and night (Technical Report F– Noise and Vibration). Consequently, construction noise is expected to be confined to daylight hours and outside of the typical daily calling period and calling season at Jacksons Creek. Construction at Deep Creek may occur at any time and therefore may occur after dark when Growling Grass Frog predominately call. As calling is typically restricted to November and December and construction is scheduled after January at both Deep and Merri Creeks this is not expected to result in disruption to Growling Grass Frogs ability to hear or be heard.

Access across Merri Creek is proposed from January to facilitate construction at the watercourse during low flow period and also provide access to construct the pipeline between the railway crossing and Merri Creek at KP 41-43. If this timing is not achieved, then an additional 3.4 km of new access track will be required to provide access (to the north of KP 42 to Beveridge Road). With the appropriate mitigation (as outlined in EMM 21), the risk of impacts to individual Growling Grass Frog at this location are considered low as a result of seasonal timing and diurnal noise and are preferable to additional clearance of this quantity.

The risk of blasting to the Striped Legless Lizard has also been considered. Blasting is not proposed in any known habitat outside of the MSA area, though is proposed within some areas of assumed habitat including both areas that have and have not been subject to tile grid survey. Whilst presence of the species has been assumed in these areas, the likelihood of occurrence of the species is lower. Within the MSA area blasting is proposed within Conservation Area 28b – Summerhill Road (East), Wollert (between KP48 and 50). This risk may need to be addressed as part of the WICA approval but here and outside of the MSA could be managed through employment of EMM B20 where the habitat will be made unsuitable, then tyned and individuals salvaged and relocated in areas considered habitat.

For this Project, noise during construction would be temporary and short term. The implementation of noise and vibration EMM B6 (noise impacts to fauna) would require that noise and vibration be managed in accordance with the requirements outlined within EMM NV1 and NV2 through the CEMP. These measures outline the required Guidelines for noise and vibration and at different work hours.

Vibrations are considered less likely than noise to disturb terrestrial fauna. Vibrations from high-impact ground disturbance (such as HDD, pile driving, blasting) tend to be localised and relatively minor in effect to terrestrial fauna. For terrestrial fauna at or near these locations, it is expected to be the noise that disturbs, rather than vibrations.

Disturbance of some terrestrial fauna is unavoidable, but is expected to be minor, localised and short term (in that fauna would most likely return to the habitat when the noise disturbance subsides). Disturbance of fauna is most likely to affect individuals rather than populations or species, and is not expected to have a long-lasting effect on any populations of fauna.

10.1.10 Fragmentation of terrestrial or aquatic wildlife corridors creating barriers to fauna movement

The following risk pathways are discussed under this impact category:

Risk pathways	Initial risk rating	Residual risk rating
Risk B31	Low	Low

10.1.10.1 Habitat fragmentation resulting in reduced effectiveness of terrestrial wildlife corridors and creation of barriers to fauna movement (risk B31)

Construction of the Project would involve removal of vegetation (habitat) and/or temporary modification of waterways in some areas, which may result in temporary localised fragmentation of some fauna habitats.

Operation of the Project will not result in further habitat fragmentation.

Fragmentation of habitat and isolation of habitat patches reduces the ability of some fauna to disperse across the landscape, and may threaten the viability of some populations that rely on habitat connectivity. Generally, the worst ecological consequences for habitat fragmentation or isolation result when disruption to connectivity is large (such as a broad area of habitat clearing across a wildlife corridor), and/or the habitat fragmented is highly functioning ecologically.

Habitat fragmentation can affect common non-threatened fauna and rarer threatened fauna alike. Common, mobile and adaptable species (such as the Red Wattlebird, Rainbow Lorikeet) tend to be least affected by fragmentation, as habitat gaps tend not to create barriers to their movement. These species tend to be the ones that persist in the disturbed areas currently. Some mobile threatened species also are able to cope with already fragmented landscapes (such as the Grey-headed Flying-fox), as determined by their continued use of trees in metropolitan, rural and disturbed areas.

Areas where connectivity for fauna movement will be restricted during construction may also impact local kangaroo (Eastern Grey Kangaroo) populations. In areas where this is expected the risks to kangaroo individuals will be managed through specific Kangaroo management outlined within the Fauna Management Plan (EMM B9).

The loss of habitat connectivity associated with this Project is expected to be temporary, localised, and minimal for most species. The pipeline will occupy an easement of approximately 15 m width and be buried for its entire length. For construction, the Project Area is typically 30 metres wide and includes additional space in certain sections to accommodate machinery, vehicle turnarounds and material storage. The pipeline for much of its length will be installed via open trench construction method and during this period is likely to create a barrier to movement for both threatened and non-threatened fauna that are ground-dwelling and relatively immobile. However, following installation of the infrastructure, trenches will be backfilled and habitats will be rehabilitated. These areas are expected to be recolonised by most species, and no long-lasting fragmentation is expected.

Grassland threatened species such as Golden Sun Moth are capable of flying across such distances during works and following reinstatement so the Project Area is not expected to create a long-term barrier. However, the ability for the Striped Legless Lizard to cross disturbed ground is not well understood. Following establishment of vegetation, it is possible that the species may utilise the areas as part of its broader foraging territory, but it is unknown to what degree if at all this may occur. It is therefore possible that the Project Area may become a short- to medium-term barrier to movement by the Striped Legless Lizard, resulting in fragmentation of its habitat until such time as the grass cover and structure (i.e., providing shelter and potentially supporting a food source) returns.

Rehabilitation activities are expected to be completed within three months of construction with the aim of restoration of ground cover within six months (EMM B7). It is likely that until ground cover is established these areas will not be used by fauna.

Restrictions to movement have the potential to occur in Jacksons Creek and Merri Creek during construction due to works in waterways. It is understood that during construction, cofferdams or similar methods would be used, likely across the entire waterways. However, it is anticipated the works will occur for approximately two to four weeks. The relatively short duration of works, combined with the fact that barriers already exist downstream from the Project Area in both waterways, mean that impacts will be temporary and not cause long-term fragmentation of habitat. The access track constructed over Merri Creek will be present for a longer period of approximately three months. However, the access track will be constructed to minimise obstructions to passage and impacts on the hydraulic conditions at the site. Culverts associated with the track will be checked for blockages as part of ongoing inspections and the culverts must provide passage for fish and other aquatic fauna when flow is present.

Works within Jacksons Creek will be outside the Growling Grass Frog peak active period (November and December) to minimise impacts to individuals and connectivity. Following works, waterways will be reinstated and there will be no permanent barrier to frog movement.

Habitat fragmentation would be minimised through Project design, and measures to avoid accidental loss of habitat (EMM B1) and contractor awareness (EMM B3). Reinstatement of vegetation (EMM B7) and topsoil management (EMM B8) within the Project Area would allow continued passage of fauna and help to reduce the long-term effect of additional habitat fragmentation (EMM B7).

10.2 Operation impacts

This section describes the impacts that have the potential to result in impacts to ecological assets, values and uses from the operation of the Project.

10.2.1 Accidental clearing

The following risk pathway is discussed under this impact category:

Risk pathways	Initial risk rating	Residual risk rating
Risk B27	Negligible	Negligible

10.2.1.1 Operational activities result in impacts to Ecological Vegetation Classes (EVCs), within and immediately adjacent to the operational easement area (risk B27)

No vegetation removal is expected to occur during the operational phase of the Project. Should any accidental removal occur, it is expected that this would be limited to minor works associated with maintenance, with little if any impact beyond individual plants or extremely small patches of vegetation and impacts will be avoided through EMM B12 (Vegetation management – operation). However, most of the Project is located in non-native vegetation.

Should operational activities result in accidental impacts to EVCs within or adjoining the operational easement area, accidental clearing will be addressed by EMM B12 (Vegetation management - operation), which includes the measures outlined below.

Any chance of accidental damage to vegetation during operation will be minimised by:

- Access and works areas being limited to the easement and designated access routes
- Any vegetation to be protected is to be flagged on site ahead of conducting clearing activities
- No clearing within 10 m of banks of waterway without a Works on Waterway Permit
- Landholders are to be notified prior to any works and approval sought

If accidental damage to plants occurs within the easement during operation, the following measures will be followed:

- Complete due diligence assessment
- Inform APA environment team
- FFG/EPBC permits are to be obtained as required
- Remedial work will be carried out with consideration of the damaged vegetation composition as far as is practicable, and in consultation with the landholder and in accordance with any agreement made as part of easement negotiations

10.2.2 Spread of invasive weeds, pathogens, pests and waste

The following risk pathway is discussed under this impact category:

Risk pathways	Initial risk rating	Residual risk rating
Risk B28	Low	Low

10.2.2.1 Degradation of ecological values from introduction or spread of weeds, pest species, or pathogens (risk B28)

Activities associated with maintenance, such as vehicle movement may spread invasive weeds. However, there is an equally likely chance that regular easement management such as slashing is likely to prevent or control weed spread. The area is currently heavily infested with uncontrolled weed populations that are spread by vectors including human movement, stock, wind and vehicle movement. Hence, further impacts from the spread of invasive weeds, pests and pathogens during operation of the Project are considered potentially unlikely.

During operation, spread of weeds, pathogens, pests and waste will be managed with EMM B13 (Pest plant/animal/pathogen control - operation), which incorporates the following:

- Reasonable steps will be taken to prevent the growth and spread of regionally controlled weeds, eradicate regionally prohibited weeds, and prevent spread of established weed species from operation of the Project, pending consultation with landowners
- Targeted control of weeds will be undertaken by a qualified pest plant control contractor, where weeds are a direct consequence of the operation of the Project, pending consultation with landowners
- Access to works areas will be limited to easement and follow a designated access route to minimise potential for weed spread, pending consultation with landowners
- Routine inspections of easement and facilities will include reasonable steps to inspect the easement for establishment of new weed populations as a result of the Project operation, pending consultation with landowners

10.2.3 Disturbance of fauna through noise, vibration or lighting

The following risk pathways are discussed under this impact category:

Risk pathways	Initial risk rating	Residual risk rating
Risk B29, B30	Low	Low

10.2.3.1 Operational noise, vibration and/or lighting resulting in elevated disturbance to threatened fauna (risk B29) or non-threatened native fauna (risk B30)

Disturbance to threatened or non-threatened fauna as a result of noise and lighting are expected to be minimal during operation and largely associated with any ongoing maintenance requirements for the Project and operation of the Wollert Compressor Station.

As such, noise and lighting is expected to be highly localised.

Vibrations are not expected to impact on threatened fauna during the Project's operation.

See Section 10.1.9 for background information on this impact.

EMM B14 requires light impacts to fauna are minimised in sensitive habitats and turned off when not required to reduce impacts to fauna. As part of this EMM noise controls are also required.

10.3 Cumulative impacts

The Project would involve constructing a below-ground pipeline and connections within an area that is already agricultural and increasingly urbanised. It is located almost entirely on private property. Existing roads and intersections would be utilised during the construction and operation period, rather than created on previously undisturbed land.

In most cases, cumulative ecological impacts are exceedingly difficult to measure, particularly for an area that has been continually disturbed and urbanised over at least the past 150 years. Since the majority of the Project area is within areas of non-native vegetation where land is currently used for agriculture or planned to be converted to housing within the MSA, the Project is not expected to not have any consequential cumulative effect.

However, since native vegetation is planned to be cleared elsewhere during construction, including removal of large habitat trees, the Project will contribute to a cumulative loss of biodiversity within the region, as one of a number of infrastructure projects currently planned in the region. Some of these projects are in close proximity to the WORM Project and thus, cumulative impacts are not expected to be geographically widespread. Four other projects have been identified as potentially generating cumulative impacts relating to removal of terrestrial and

aquatic species, and native vegetation and habitat within the Project Area (Figure 14). These four projects are:

- Outer Metropolitan Ring transport corridor
- Sunbury Road upgrade
- Melbourne Water Bald Hill to Yan Yean pipeline
- AusNet Western Victoria Transmission Network Project

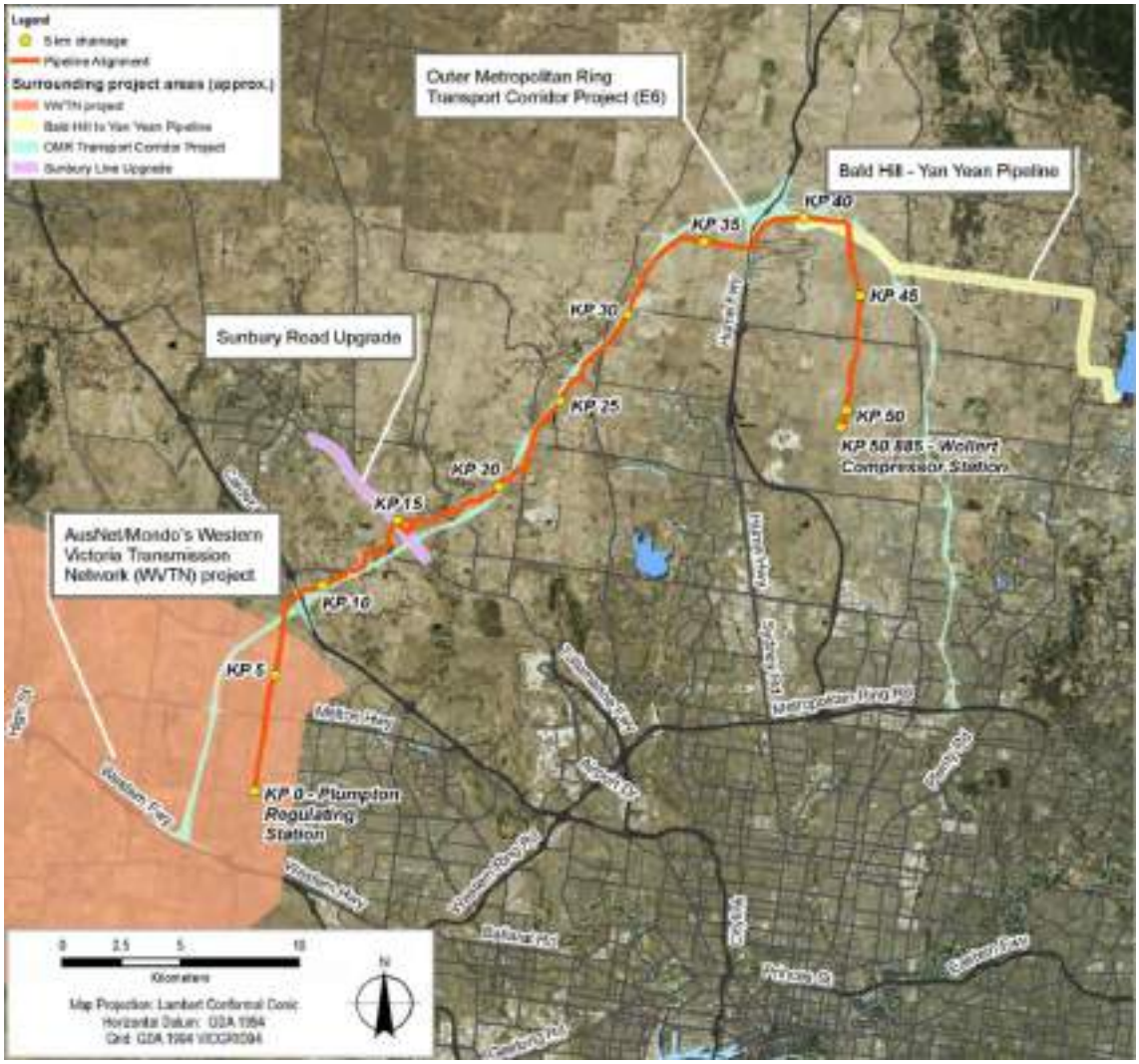


Figure 14 Location of four Projects identified with potential for cumulative impacts with the Project

10.3.1 Outer Metropolitan Ring Transport Corridor Project (OMR)

The OMR Project is unlikely to start until after 2023, with the length of the construction period currently not confirmed. Figure 15 shows the current location of the OMR Project. The OMR construction corridor is near much of the APA WORM Project and consequently, impacts to biodiversity are likely to be broadly within a geographically comparable area.

The OMR Project consists of:

- New road and rail transport links through Werribee, Melton, Tullamarine, Craigieburn / Mickleham and Epping / Thomastown areas
- Freeway standard road (four lanes in each direction)
- Four railway tracks in the median for interstate freight and high-speed passenger trains between Werribee and Kalkallo

No current information is available regarding impacts to flora and fauna. A preliminary desktop assessment conducted over ten years ago identified potential for 20 EVCs, including one TEC, two FFG threatened communities, and up to 25 species threatened flora and 24 threatened fauna to occur within the OMR / E6 ROW boundary (BLA, 2009).

Key impacts leading to cumulative impacts are likely to include native vegetation removal to facilitate clearing of the corridor, which covers an extensive area. Specifically, the current extent of grassland and grassy woodland vegetation communities and habitat for threatened grassland species in the broader area is likely to decrease as a result of native vegetation clearing.



Figure 15 Location of the Outer Main Ring / E6 transport corridor Project

10.3.2 Sunbury Road Upgrade

Construction of the Sunbury Road Upgrade Project (refer Figure 16) is scheduled from mid to late-2020 to 2025. The construction corridor is west of the APA WORM Project at Buller-Diggers Rest Road (KP 15). Consequently, impacts to biodiversity are in close proximity to the Project Area.

The Sunbury Road Upgrade Project consists of:

- Extra lane in each direction between Powlett Street and Bulla-Diggers Rest Road
- Traffic lights to replace the roundabouts at Francis Boulevard and Lancefield Road and at 600 Sunbury Road
- Upgrade the roundabout at Bulla-Diggers Rest Road
- Upgrade the existing bridge and build a new bridge over Jacksons Creek
- Build new walking and cycling paths
- Install safety barriers along the road

Key impacts leading to cumulative impacts may include removal of riparian woodland to facilitate the bridge upgrade/construction at Jacksons Creek (near KP 14). Otherwise native vegetation removal is expected to be minor or unlikely since construction will occur within the existing road corridor.



Figure 16 Location of the Sunbury Road Upgrade Project[8]

[8] https://roadprojects.vic.gov.au/projects/sunbury-road-upgrade [accessed October 2020]

10.3.3 Bald Hill – Yan Yean Pipeline

Construction of the Bald Hill – Yan Yean Pipeline Project (refer Figure 17) is scheduled to commence in 2021. The construction corridor is east of the Project Area at Merriang Road (around KP 45). Consequently, impacts to biodiversity are in close proximity to the Project Area.

The Bald Hill – Yan Yean Pipeline Project consists of a 20 km pipeline from Yan Yean Water Treatment Plant to Bald Hill, Kalkallo tank site

Key impacts leading to cumulative impacts may include removal of native grassland and grassy woodland vegetation, which would further reduce the extent of native vegetation in the Project Study Area. The loss of native vegetation may include listed communities and vegetation for threatened species.



Figure 17 Location of the Bald Hill to Yan Yean Pipeline Project[9]

10.3.4 AusNet/Mondo's Western Victoria Transmission Network (WVTN) Project

Stages of the WVTN Project will commence according to the following timelines:

- Planning design and approvals: early-2020 to mid-2022
- Construction: late-2022 to late-2024
- Operations and maintenance: late-2024 ongoing

Part of the southern section of the WVTN construction corridor is in close proximity to the APA WORM Project west of KP 0. Consequently, impacts to biodiversity are likely to be broadly within a geographically comparable area.

[9] https://www.melbournewater.com.au/building-and-works/all-projects/new-infrastructure-melbournes-north [accessed October 2020]

The WVTN Project (Figure 18) consists of:

- New road and rail transport links through Werribee, Melton, Tullamarine, Craigieburn / Approximately 190 km overhead electricity transmission line from Bulgana to Sydenham
- 220kV double circuit from new terminal station to Bulgana (via Waubra)
- 500kV double circuit from Sydenham to new terminal station
- Several minor upgrades to existing electricity infrastructure
- New terminal station to the north of Ballarat

Key impacts leading to cumulative impacts are likely to include native vegetation removal to facilitate clearing of the WVTN construction corridor, which covers an extensive area. Specifically, the current extent of grassland and grassy woodland vegetation communities in the broader area is likely to decrease because of native vegetation clearing. The WVTN construction period is unlikely to overlap unless the APA WORM construction is delayed.



Figure 18 Location of the Western Victoria Transmission Network Project[10]

[10] https://www.westvictnp.com.au/project-information [accessed October 2020]

11. Potentially threatening processes

Six key threatening processes listed under the EPBC Act and 19 potentially threatening processes listed under the FFG Act may apply to the Project. These are listed in Appendix AA, with an appraisal of their likelihood of occurrence during construction and operation of the Project. Those with a moderate to high likelihood of occurrence are discussed below.

One key threatening process listed under the EPBC Act, 'land clearing', will be exacerbated by the project, since clearing of up to 14.66 ha of native vegetation and 19 large trees, including TECs NTGVVP and GEWVVP are planned to be removed. Removal of these TECs meets the threshold for a significant impact under the EPBC Act.

One potentially threatening process listed under the FFG Act was identified as likely to occur − *Degradation of native riparian vegetation along Victorian rivers and streams*. The Project would impact native riparian vegetation where the Project crosses Merri, Deep and Jacksons Creeks.

Additional impacts are not expected to alter the ecological effectiveness of the waterways, given the extent of existing degradation. Although cofferdams or similar methods will be used during construction, it is anticipated that the relatively short duration or works (around two to four weeks), combined with the fact that barriers already exist downstream from the Project Area in both waterways, mean that impacts will be temporary and not cause long-term degradation of vegetation communities. The access track constructed over Merri Creek will be present for a longer period of approximately three months. However, the access track will be constructed to minimise obstructions to passage and impacts on the hydraulic conditions at the site. Culverts associated with the track will be checked for blockages as part of ongoing inspections and the culverts must provide passage for fish and other aquatic fauna when flow is present.

Two potentially threatening processes listed under the FFG Act were identified as with low potential to occur. These were *Invasion of native vegetation by Blackberry Rubus fruticosus spp. agg* and *Wetland loss and degradation as a result of change in water regime, dredging, draining, filling and grazing*.

Management of threatening processes will be addressed by adoption of EMMs (Section 12), including a CEMP that has been developed for the Project including measures to minimise weed invasion, and control sediment runoff and discharges during construction.

12. Matters of National Environmental Significance

12.1 Relevant matters for assessment

This section describes the potential for the construction and operation of the Project to impact ecological assets, values and uses in regard to MNES listed under the EPBC Act. Section 10 describes potential direct and indirect impact pathways. The impact assessment has considered the potential for significant impacts on the environment to occur as described by the criteria outlined in the *EPBC Act Matters of National Environmental Significance – Significant impact guidelines 1.1* (Department of Environment, 2013).

On 21 February 2020, the Project was determined to be a controlled action under Section 75 of the EPBC Act (referral submission 2019/8569). As a controlled action, the Project requires further assessment and approval under the EPBC Act before it can proceed.

The Project is being assessed in accordance with the bilateral agreement between the State of Victoria and the Commonwealth (Environmental Impact Assessment). The EES and subsequent assessment by the State of Victoria will inform a separate approval decision under the EPBC Act.

DAWE has accepted that the subject of the referral is a component of a larger proposed action under section 74A of the EPBC Act. As described in Section 1.3, two geographic sections of the Project Area with differing assessment and approvals pathways have been identified:

- Within the approved MSA areas (KP 0 - KP 3.15, KP 28.16 - KP 28.57 and KP 32.07 – KP 51.04)
- Outside the MSA area (KP 3.15 - KP 28.16 and KP 28.57 – KP 32.07)

Assessment of MNES under the EPBC Act is relevant to the area outside the MSA area only (see explanation in Section 5.2.1).

Of the nine MNES listed under the EPBC Act, one was identified as a controlling provision by the DAWE: listed threatened species and communities (sections 18 and 18A of the Act) Table 54. Relevant species and communities are listed in Table 55.

Table 54 MNES relevant to the Project

MNES	Is the Project likely to have any direct or indirect impacts on this MNES?
World heritage properties	No – not present
National heritage places	No – not present
Wetlands of international importance (listed under the Ramsar Convention)	No – discussed in Section 8.6.1
Listed threatened species and ecological communities	Yes – See Table 55
Migratory species protected under international agreements	No – discussed in Section 8.4.3.2 and Appendix L
Commonwealth marine areas	No – not present
The Great Barrier Reef Marine Park	No – not present
Nuclear actions (including uranium mines)	No – not a nuclear action
A water resource, in relation to coal seam gas development and large coal mining development	No – not a coal seam or coal mining development

Table 55 **Relevant listed species and communities put forward in DAWE's referral decision**

Species or community	EPBC Act status	Is MNES present or likely to be present?	Is the Project expected to have a direct or indirect impact on the MNES?	Is the Project expected to have a significant residual impact on the value?
Species and communities DAWE considers the Project will likely have a significant impact on				
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically Endangered	No – not recorded during targeted field surveys (Section 8.3.3)	No	No – not present in the Project Area
Natural Temperate Grassland of the Victorian Volcanic Plain	Critically Endangered	Yes - recorded during targeted field surveys (Section 8.3.3)	Yes	**Yes – see significant impact criteria Appendix S**
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	No – not recorded during targeted field surveys (Section 8.3.3)	No	No – not present in the Project Area
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	Critically Endangered	Yes - recorded during targeted field surveys (Section 8.3.3)	Yes	**Yes – see significant impact criteria Appendix S**
Growling Grass Frog (*Litoria raniformis*)	Vulnerable	Yes – Assumed present at two creeks (8.4.3.2 and Appendix Q)	Yes – Habitat removal (8.4.3.2 and 10)	No – see significant impact criteria (Appendix W) and thresholds (Appendix Y) assessments
Matted Flax-lily (*Dianella amoena*)	Endangered	Yes – one plant was recorded during targeted field surveys (Section 8.3.3)	No	No – the plant will be retained, see Appendix T
Golden Sun Moth (*Synemon plana*)	Critically Endangered	Yes – Detected during this assessment (8.4.3.2 and Appendix O)	Yes – Habitat removal (8.4.3.2 and 10)	**Yes – Greater than 0.5 ha habitat removal, see significant impact criteria (Appendix U) and thresholds (Appendix V) assessments**
Spiny Rice-flower (*Pimelea spinescens* subsp. *spinescens*	Critically Endangered	No – not recorded during targeted field surveys (Section 8.3.3)	No	No – not recorded in the Project Area, see Sections 8.3.3.3 and 8.3.3.4
Species and communities where DAWE considers that there is a real chance or possibility that the Project will likely have a significant impact upon				
Adamson's Blow-grass (*Lachnagrostis adamsonii*)	Endangered	No – not recorded during targeted field surveys (Sections 8.3.3.3, 8.3.3.4)	No	No – not recorded in the Project Area, see Sections 8.3.3.3 and 8.3.3.4

Species or community	EPBC Act status	Is MNES present or likely to be present?	Is the Project expected to have a direct or indirect impact on the MNES?	Is the Project expected to have a significant residual impact on the value?
Small Golden Moths (*Diuris basaltica*)	Endangered	No – not recorded during targeted field surveys (Sections 8.3.3.3, 8.3.3.4)	No	No – not recorded in the Project Area, see Sections 8.3.3.3 and 8.3.3.4
Maroon Leek-orchid (*Prasophyllum frenchii*)	Endangered	No – not recorded during targeted field surveys and assessed as highly unlikely to be present (Sections 8.3.3.3, 8.3.3.4))	No	No – not recorded in the Project Area, see Sections 8.3.3.3 and 8.3.3.4
Button Wrinklewort (*Rutidosis leptorhynchoides*)	Endangered	No – not recorded during targeted field surveys ((Sections 8.3.3.3, 8.3.3.4)	No	No – not recorded in the Project Area, see Sections 8.3.3.3 and 8.3.3.4
Hoary Sunray (*Leucochrysum albicans* subsp. *tricolor*)	Endangered	No – not recorded during targeted field surveys and assessed as highly unlikely to be present (Sections 8.3.3.3, 8.3.3.4))	No	No – not recorded in the Project Area, see Sections 8.3.3.3 and 8.3.3.4
Australasian Bittern (*Botaurus poiciloptilus*)	Endangered	No – Low likelihood of occurrence (8.4.3.2 and Appendix K).	No – Low likelihood of occurrence (8.4.3.2 and 10).	No – see significant impact criteria assessment (Appendix U).
Grassland Earless Dragon (*Tympanocryptis pinguicolla*)	Endangered	No – species considered regionally extinct (8.4.3.1, 8.4.3.2 and Appendix K).	No – species considered regionally extinct (8.4.3.1, 8.4.3.2).	No – see significant impact criteria assessment (Appendix U).
Large-headed Fireweed (*Senecio macrocarpus*)	Vulnerable	No – not recorded during targeted field surveys (Sections 8.3.3.4)	No	No – not recorded in the Project Area, see Sections 8.3.3.3 and 8.3.3.4
Clover Glycine (G*lycine latrobeana*)	Vulnerable	No – not recorded during targeted field surveys (Sections 8.3.3.3, 8.3.3.4)	No	No – not recorded in the Project Area, see Sections 8.3.3.3 and 8.3.3.4
Swamp Everlasting (*Xerochrysum palustre*)	Vulnerable	No – not recorded during targeted field surveys and assessed as highly unlikely to be present (Section 8.3.3.4)	No	No – not recorded in the Project Area, see Sections 8.3.3.3 and 8.3.3.4
River Swamp Wallaby-grass (*Amphibromus fluitans*)	Vulnerable	No – not recorded during targeted field surveys (Sections 8.3.3.3, 8.3.3.4)	No	No – not recorded in the Project Area, see Sections 8.3.3.3 and 8.3.3.4

Species or community	EPBC Act status	Is MNES present or likely to be present?	Is the Project expected to have a direct or indirect impact on the MNES?	Is the Project expected to have a significant residual impact on the value?
Painted Honeyeater (*Grantiella picta*)	Vulnerable	No – Low likelihood of occurrence (8.4.3.2 and Appendix K).	No – Low likelihood of occurrence (8.4.3.2).	No – see significant impact criteria assessment (Appendix X).
Grey-headed Flying-fox (*Pteropus poliocephalus*)	Vulnerable	Yes – forages widely (8.4.3.2 and Appendix K).	No – marginal losses to foraging habitat (8.4.3.1 and 8.4.3.2).	No – see significant impact criteria assessment (Appendix X).
Australian Grayling (*Prototroctes maraena*)	Vulnerable	Yes – Medium likelihood of occurrence in Deep Creek (8.5.1 and Appendix R).	No – HDD in Deep Creek reduces impacts to passage and habitat (8.5 and 10.1)	No – see significant impact criteria assessment (Appendix X).
Pink-tailed Work-lizard (*Aprasia parapulchella*)	Vulnerable	No – Low likelihood of occurrence (8.4.3.2 and Appendix K).	No – Low likelihood of occurrence (8.4.3.2).	No – see significant impact criteria assessment (Appendix W).
Striped Legless Lizard (*Delma impar*)	Vulnerable	Yes – Detected during this assessment (8.4.3.2 and Appendix N)	Yes – Habitat removal (8.4.3.2 and 10)	**Yes – see significant impact criteria assessment (Appendix W)**

12.2 Significance of Impact

12.2.1 Flora and vegetation

The significance of impact of the Project on flora and threatened ecological communities was assessed using the relevant significant impact criteria with respect to threatened status (Appendix S and Appendix T).

Nineteen species of EPBC Act-listed threatened flora were identified in the desktop study area (Table 22, Section 8.3.2) as possibly having potential to occur in the Project Area (Biosis, 2019; 2020). Of these species, nine were considered to have a medium or higher likelihood of occurring within the construction corridor and were selected for targeted surveys (Biosis 2019, 2020; Appendix B).

Targeted surveys were conducted for these nine species in winter (2019), spring (2019) and summer (2020), according to flowering time (for survey methods, refer 6.2.4). Additional surveys were conducted in the following autumn and winter and spring (2020) where access had not been available to parcels during the earlier survey period, to assess habitat suitability and confirm likelihood of absence (see survey methods in 6.2.4).

Three species considered by DAWE in their referral decision as likely to be significantly impacted by the Project were re-assessed at desktop level by GHD (2020), and subsequently confirmed with a high degree of confidence as having an extremely low likelihood of occurrence in the Project Area (see sections 6.2.2.4 and 8.3.3.4).

Only one EPBC Act-listed species, Matted Flax-lily, had previously been recorded in the desktop study area (Biosis, 2019) and was confirmed to be present as a single individual plant as a result of targeted surveys (Biosis, 2020).

No suitable habitat was identified by Biosis (2020) during field surveys in or near to the Project Area for any of the remaining EPBC Act threatened flora.

Four threatened ecological communities were predicted to occur or have potential to occur in the study area (Table 21, Section 8.3.2). Two of these, *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* and *Natural Temperate Grassland of the Victorian Volcanic Plain* were confirmed to be present and were mapped within the construction corridor during field surveys in 2019 (Section 8.3.3.5).

To determine the extent of potential impacts of the Project on MNES, Matted Flax-lily, and *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* and *Natural Temperate Grassland of the Victorian Volcanic Plain* within the Project Area were individually assessed against the relevant significant impact criteria (Department of the Environment, 2013).

Not assessed for significant impacts were 18 species that were identified by Biosis (2019; Appendix B) that were not found during targeted surveys, had not been recorded in the desktop study area, were deemed to have a low likelihood of occurrence, and for which no suitable habitat was identified in or close to the Project Area.

12.2.1.1 Matted Flax-lily

Matted Flax-lily is a small, perennial, tufted lily endemic to south-east Australia, occurring in grassland and grassy woodland habitats. Matted Flax-lily occurs in south of the Dividing Range in Victoria, and in Tasmania. Matted Flax-lily is confined to drier grassy woodland and grassland communities but multiple populations are known from the northern and western suburbs of Melbourne, typically within remnant vegetation alongside road or rail corridors, conservation reserves and in translocation sites (Carter, 2010; Vicflora, 2016).

Methods and results for targeted surveys for Matted Flax-lily are provided in Sections 6.2.4.2 and 8.3.3.4 respectively, and an assessment of the significance of impact is undertaken in Appendix T. The location of the plant is shown in Figure 7.

Summary

The single plant recorded will be retained during construction of the Project.

The section of the construction corridor where Matted Flax-lily occurs will be bored using HDD to avoid impacts to the plant. Additionally, the area around the plant will be clearly identified as a no go zone and all Project personnel will be required to attend an induction that outlines environmental management requirements.

Conclusion

The Project is unlikely to have a significant impact on the Matted Flax-lily. No other plants were identified anywhere in the Project Area during seasonal targeted surveys.

12.2.1.2 Grassy Eucalypt Woodland of the Victorian Volcanic Plain

Methods and results for targeted surveys for *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* are provided in Sections 6.2.4 and 8.3.3.5, respectively and an assessment of the significance of impact is undertaken in Appendix S. The distribution of the TEC within the construction corridor is provided in Figure 8.

Summary

Construction of the Project will require removal of 2.26 ha of the TEC, most of which occurs at a single location outside the MSA and is part of a larger patch spanning two properties. The TEC was assessed as in good condition at one property and was of poorer quality and lacking native species diversity in the groundlayer at the other property. Both patches include a number of large River Red Gum trees thought likely to provide valuable habitat.

The Project is likely to have a significant impact on *the Grassy Eucalypt Woodland of the Victorian Volcanic Plain* based on five criteria: 1) construction will result in further fragmentation of the TEC; 2), clearing for urban development in the Hume, Melton and Whittlesea urban growth zones was identified by the Threatened Species Scientific Committee (2009) as a serious threat and likely to lead to further loss of the TEC's critical habitat; 3), construction of the Project involves removal of topsoil within a 30 m wide corridor and construction techniques will include open trenching and will modify soils; 4), likely to cause a substantial change in the species composition through fragmentation of the community leading to increased vulnerability to threats, and loss of large trees will result in the loss of functionally important species; 5) the loss will also contribute to cumulative losses of GEWVVP across the Victorian Volcanic Plain Bioregion likely to interfere with the recovery of an ecological community.

Impacts causing the loss of *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* in the Project Area will be addressed through:

- Realignment at one property to avoid loss of 10 large trees and 1 ha of the TEC
- Clear demarcation of the construction area boundary
- Contractor awareness
- Topsoil management
- Offsetting, as required under the EPBC Act including offsetting of fragmented patches that no longer meet the area criteria
- Offsetting requirements for Plains Grassland and Plains Grassy Woodland EVCs under the *Guidelines*

- Site rehabilitation
- Weed management
- An arborist's assessment to manage potential impacts to trees during construction

Environmental management measures are outlined in Sections 10 and 13.

Conclusion

Despite a number of measures to avoid, minimise and manage impacts from weeds, and reinstate vegetation through the EMMs described above, the Project may meet the criteria for a significant impact. The TEC represents some of the highest quality vegetation in the Project Area and further disturbance and fragmentation are likely to lead to a loss of floristic diversity, a loss of structural intactness and through fragmentation, loss of EPBC Act conservation status (refer Section 10.1.1.1). In addition, impacts are still expected to large trees that are important functional components of the TEC and cannot be replaced through reinstatement. Residual impacts will be addressed through offsetting in accordance with the EPBC Act and the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a).

12.2.1.3 Natural Temperate Grassland of the Victorian Volcanic Plain

Methods and results for targeted surveys for *Natural Temperate Grassland of the Victorian Volcanic Plain* are provided in Sections 6.2.4 and 8.3.3.5, respectively and an assessment of the significance of impact is provided in Appendix S. The distribution of the TEC within the construction corridor is provided in Figure 8.

Summary

Removal of 4.16 ha of *Natural Temperate Grassland of the Victorian Volcanic Plain* is expected during construction.

The Project is likely to have a significant impact on *Natural Temperate Grassland of the Victorian Volcanic Plain* based on two criteria: 1) removal of existing patches will cause further fragmentation since the current extent of the TEC consists of a number of disjunct patches throughout its range and some of these will incur the loss of their EPBC Act conservation status through a reduction in size (refer Section 10.1.1.1); and 2) construction of the Project involves removal of topsoil within a 30 m wide corridor and construction techniques will include open trenching and will modify soils.

Impacts causing loss of *Natural Temperate Grassland of the Victorian Volcanic Plain* will be addressed through:

- Avoidance and minimisation
- Clear demarcation of the construction area boundary
- Contractor awareness
- Topsoil management
- Offsetting, as required under the EPBC Act including offsetting of fragmented patches that no longer meet the area criteria.
- Offsetting requirements for Plains Grassland and Plains Grassy Woodland EVCs under the *Guidelines*
- Site rehabilitation
- Weed management
- Environmental management measures are outlined in Sections 10 and 13

Conclusion

Despite a number of measures to avoid, minimise and manage impacts from weeds, and reinstate vegetation through the EMMs described above, the Project meets some of the criteria for a significant impact. Residual impacts are addressed through offsetting in accordance with the EPBC Act and the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a).

12.2.2 Fauna

Assessment of the significance of impact on fauna has been made for each species individually using the relevant significant impact criteria for each species' threatened status and any species specific significant impact criteria (Appendix U, Appendix V, Appendix W, Appendix X and Appendix Y).

Whilst all EPBC Act listed fauna were assessed against the relevant significant impact criteria the following four species warranted detailed investigation to determine the significance of impacts expected as a result of the Project because they are either known or assumed to occur within the Project Area and require mitigation in order to minimise impacts: Golden Sun Moth, Striped Legless Lizard, Growling Grass Frog, and Australian Grayling.

The remaining EPBC Act fauna species not discussed below are not expected to be impacted by the Project as they either have a low likelihood of occurrence within the Project Area or even if present the Project would result in negligible impacts.

12.2.2.1 Golden Sun Moth

Details of surveys undertaken for this species are presented in section 8.4.3.2 and an assessment of the significance of impact undertaken in Appendix U and Appendix V.

Summary

The Project would involve removal of a total of 19.93 ha of potential habitat for this species. This includes habitat that is known to support this species (11.85 ha) and habitat that is assumed to support this species (8.08 ha) (See Table 42).

Loss of vegetation and subsequent loss of some fauna habitat is unavoidable. However, by adhering to the Project EMMs, this clearing would be avoided as far as possible through design, and minimised within each site during construction.

The Project would avoid as far as practicable the removal of native vegetation and fauna habitat and impacts on habitat connectivity through the establishment of no-go-zones and clear works areas to protect vegetation and fauna habitat to be retained.

Areas that are considered known or potential Golden Sun Moth habitat will be rehabilitated and reinstated with consideration to native vegetation, habitat features, and topsoil management. A Golden Sun Moth Management Plan will detail the location and method for mitigation.

Land management along the alignment is largely managed at a parcel scale, consequently habitats within parcels tend to be fairly homogenous with regard to species composition, vegetation structure and land use. Consequently, habitat removal is expected to result in impacts to individuals within the Project Area rather than at a population scale which is more likely to occur at a parcel scale. Therefore, most habitat loss that is likely to, or that may, occur as a result of this Project, is small and localised, and for fauna, including Golden Sun Moth, is expected to result in the loss or displacement of individuals rather than populations or species.

Over time, the species is likely to recolonise the Project Area, but the species' ability to do this in areas of ground disturbance is not well understood and habitat within the Project Area is therefore assumed to be lost. As a result, the residual area of occupancy for this species will be reduced.

Conclusion

The Golden Sun Moth is currently listed as critically endangered. The Golden Sun Moth is currently being assessed by the Threatened Species Scientific Committee to be eligible for listing as Vulnerable largely driven by the increase in extent of occurrence and area of occupancy since it was first listed (DAWE 2021). This document is still in under review, consequently significant impacts to the Golden Sun Moth are considered against the thresholds outlined within the Significant impact guidelines for the species (DEWHA 2009).

The Project occurs in a landscape of contiguous habitat (i.e., >10 ha) where the impact threshold for a significant impact is "habitat loss, degradation or fragmentation >0.5 ha".

The Project meets this criterion for a significant impact.

Habitat degradation can generally be mitigated, managed and reversed through management actions. Adverse impacts to habitat or assumed habitat for this species are expected to be temporary, with habitats reinstated following works. However, it is possible that the species will not recolonise the Project Area following ground disturbance, which would mean that the residual area of occupancy for this species would be reduced.

Residual impacts on this species are expected to be highly localised and suitable habitat for populations to persist are available immediately adjacent to all known or assumed habitat patches within the Project Area.

12.2.2.2 Striped Legless Lizard

Details of surveys undertaken for this species are presented in section 8.4.3.2 and an assessment of the significance of impact undertaken in Appendix W.

Summary

Six individuals were detected from two grids on one property. This population is considered an important population. Removal of a total of 0.67 ha of habitat supporting this species is proposed - 0.49 ha of known habitat and 0.18 ha of immediately adjacent habitat (Table 36). This is considered the highest quality Striped Legless Lizard habitat within the Project Area.

Whilst there is considered to be a lower chance of the species occurring throughout the remainder of the Project Area, a conservative approach has been adopted that assumes that all areas containing suitable habitat for the species will be assumed to support the species. This includes areas where targeted surveys have been undertaken and areas where they have not. The total extent of habitat proposed to be impacted that contains known or potential habitat for this species is 39.34 ha.

The Striped Legless Lizard is confined to the grassy and grassy woodland habitats. Disturbance of these habitats within the Project Area is expected to be temporary with habitats reinstated following works. Impacts are also expected to be restricted to the narrow Project Area bisecting areas of habitat, which will allow the species to recolonise the area following reinstatement. However, given the species' susceptibility to ground disturbance, it is possible that individuals may not readily return to pre-construction use or any use of the Project Area. It is not known how effectively Striped Legless Lizards can utilise such areas as part of their foraging territory, but in the absence of cracking soils and rocks (which are not expected to be reinstated), impacts to these areas are may reduce the area of occupancy of the species.

It is feasible to consider that the species is capable of crossing the Project Area following rehabilitation, though the species' ability to do this is not well understood. Given the apparently sedentary or localised nature of the species, inability to cross the Project Area following rehabilitation could result in the fragmentation of a population if present within areas of assumed habitat. Fragmentation of a population is not expected within the area of confirmed habitat as the Project Area abuts a waterway that does not constitute habitat.

Loss of vegetation and subsequent loss of some fauna habitat is unavoidable. However, by adhering to the Project EMMs, this clearing would be avoided as far as possible through design, and minimised within each site during construction.

The Project will avoid as far as practicable the removal of native vegetation and fauna habitat and impacts on habitat connectivity through the establishment of no-go-zones and clear works areas to protect vegetation and fauna habitat to be retained.

EMMs are also in place to reduce the risk of death or injury to the Striped Legless Lizard by minimising the extent of habitat removal, implementation of inductions to all contractors covering measures to protect environmental values, reinstatement of habitat with consideration to native vegetation, habitat features and soil compaction and protection of topsoil in areas of temporary works.

In areas of known or assumed Striped Legless Lizard habitat, management of habitat to minimise risk of death or injury by initially making the habitat unsuitable, then tyning the area, then relocating any individuals found during tyning and installing fauna proof fences to prevent recolonisation attempts during construction will be undertaken. Details of these activities would be outlined within a Striped Legless Lizard Management Plan.

Land management along the alignment is largely managed at a parcel scale, consequently habitats within parcels tend to be fairly homogenous with regard to species composition, vegetation structure and land use. Consequently, habitat removal is expected to result in impacts on individuals within the Project Area rather than at a population scale which is more likely to occur at a parcel scale. Therefore, most habitat loss that is likely to, or that may, occur as a result of this Project, is small and localised, and for fauna is expected to result in the loss or displacement of individuals rather than populations or species.

Conclusion

The Striped Legless Lizard population within the Project Area may be considered an important population.

Habitat degradation can generally be mitigated, managed and reversed through management actions. Adverse impacts on habitat or assumed habitat for this species are, at best, expected to be temporary, with habitats reinstated following works, and at worst, having habitats not being recolonised, resulting in a reduction in the area of occupancy.

Any residual impacts to this species are expected to be highly localised and resulting in impacts to individuals within the Project Area rather than at a population scale.

The proposed removal of 39.34 ha of known and assumed habitat for this species is considered to trigger a significant residual impact on this species and may result in a reduction in the area of occupancy of the species and fragmentation of a population if present within areas of assumed habitat only.

12.2.2.3 Growling Grass Frog

Details of surveys undertaken for this species are presented in section 8.4.3.2 and an assessment of the significance of impact undertaken in Appendix W and Appendix Y.

Summary

The Growling Grass Frog is known or assumed to be present in two locations outside the MSA area: Deep and Jacksons Creeks (Table 38). The crossing at Deep Creek (where the species was recorded) is expected to be completed using the HDD method, therefore impacts on instream and near-bank habitat will be avoided and impacts on any adjacent terrestrial habitat minimised. Growling Grass Frogs have been assumed present at Jacksons Creek which is expected to be crossed via an open trench construction method. Here, the Project Area width has been reduced within the waterway to 20 m wide. Whilst individuals (If present) at these locations are expected to incur a small loss in available habitat, the impact will be temporary and impacted areas will be reinstated following works.

At three locations (2LP137651, 1LP137651, D16PP2761) dams are proposed for removal, these dams were dry at the time of initial assessment so at that time did not provide breeding, foraging or dispersal habitat (Biosis 2020). The dams were subsequently found to be wet during the 2020 breeding season, but the species was not found to occur as a result of nocturnal surveys. Dams that are ephemeral or that intermittently hold water over the spring/summer period are unlikely to provide core breeding habitat for the species, but may provide opportunistic dispersal opportunities between more permanent habitats.

Loss of vegetation and subsequent loss of some fauna habitat is unavoidable. However, by adhering to the Project EMMs, this clearing would be avoided as far as possible through design, and minimised within each site during construction.

The Project will avoid as far as practicable the removal of native vegetation and fauna habitat and impacts on habitat connectivity through the establishment of no-go-zones and clear works areas to protect vegetation and fauna habitat to be retained.

EMMs are also in place to reduce the risk of death or injury to the Growling Grass Frog by minimising the extent of habitat removal, implementation of inductions to all contractors covering measures to protect environmental values, reinstatement of habitat with consideration to native vegetation and habitat features.

At Jacksons Creek, construction will be restricted to outside the frog's peak active period (November to March). Whilst the chance of Growling Grass Frog individuals within the actual Project Area is considered low, impacts to individuals will be further mitigated through pre-clearance and salvage and relocation activities (relocation is required within adjacent habitat, preferably within 100 m). A salvage and relocation plan will be prepared for the Project for this species, to detail habitat removal, salvage and hygiene protocols (to minimise the spread of chytrid fungus) and locations of relocation.

Works within Jacksons Creek are proposed between March and May outside of the species active season and to minimise the risk of high flow events causing impacts to the waterway and riparian vegetation as a result of sedimentation. Waterway mitigation measures will minimise impacts to both habitat and individuals through management of the risk of sedimentation, run off, surface water contamination, leaks or spills and river bed or bank erosion.

Most habitat loss that is likely to, or that may, occur as a result of this Project, is small and localised, and for fauna is expected to result in the loss or displacement of individuals rather than populations or species.

Habitat degradation (direct or indirect) resulting from nearby land clearing can generally be mitigated, managed and reversed through management actions.

Conclusion

Any population present within the Project Area may be considered an important population. However, works are temporary and the Project Area will be reinstated following construction. Direct impacts to habitat known or assumed to support Growling Grass Frog outside of the MSA are restricted to Jacksons Creek. Direct impacts to individuals will be avoided or minimised through measures outlined with a salvage and relocation plan (section 13) and timing of works limited to outside of the peak movement period.

Any residual impacts on this species are expected to be highly localised and the species is expected to be able to readily recolonise disturbed areas following reinstatement and resume pre-construction habitat use.

The proposed removal of 0.03 ha of habitat for this species is not considered a significant impact on this species.

12.2.2.4 Australian Grayling

Details of surveys undertaken for this species are presented in section 6.2.6 and an assessment of the significance of impact undertaken in Appendix X.

Summary

Due to connectivity with waterways where this migratory species is known to exist, the likelihood of occurrence was considered in the three major waterways in the Project Area (i.e. Jacksons Creek, Merri Creek and Deep Creek). A lack of suitable habitat, the presence of barriers to migration and no historical records or sightings during targeted surveys resulted in the likelihood of occurrence in Jacksons Creek and Merri Creek being assessed as low.

No individuals were recorded in Deep Creek during targeted surveys. However, Deep Creek does contain suitable habitat for the species, and is also connected to the Maribyrnong River, where the species is known to occur. Given Australian Grayling are a migratory species, and are known to migrate many kilometres, this suggests that there is a potential for individuals to migrate through the Project Area. Taking this into account, the likelihood of occurrence in Deep Creek for the species is considered to be medium. However, the lack of records within 5-kilometres of the Project Area, and no detection during the targeted surveys suggests there are no resident individuals that may be impacted by the construction works.

The use of HDD across Deep Creek will mitigate any impacts due to the formation of barriers to migration and passage. Direct injury or death of individuals or indirect impacts through factors such fracking, loss of habitat, erosion and sedimentation, or contamination will be managed by measures including the management of drilling fluids and trenchless bores, limiting the loss of vegetation, erosion and sediment control, and rehabilitating the sites following the completion of the construction activities.

Conclusion

Any population that migrates through the Project Area may be considered an important population. However, HDD construction techniques are planned for Deep Creek so there will be no impacts due to the creation of barriers to migration. Overall, no residual significant impacts are expected on Australian Grayling.

13. Mitigation hierarchy

Whilst native vegetation removal cannot be entirely avoided due to the nature of the project, APA is aiming to have as small an environmental impact footprint as practicable. This is evidenced by the removal of the requirement for State species offsets as a result of accurate quantification of native vegetation extent derived from extensive field surveys (VQAs), where previously only modelled data were available, which addressed all gaps in survey effort (with the exception of two parcels), and through general revision of the Project Area between the current and previous pipeline alignments.

The Project is required to consider and apply design and mitigation measures according to the mitigation hierarchy:

1. Avoidance: measures taken to avoid creating adverse effects on the environment from the outset, such as careful spatial or temporal placement of infrastructure or disturbance
2. Minimisation: measures taken to reduce the duration, intensity and extent of impacts that cannot be avoided
3. Rehabilitation/restoration: measures taken to improve a degraded environment following exposure to impacts that cannot be completely avoided or minimised
4. Offsets: measures taken to compensate for any residual, adverse impacts after full implementation of the previous three steps of the mitigation hierarchy

Where practicable, steps have been taken through the design phase of the project and the EES process to avoid or minimise impacts to EPBC Act-listed flora and fauna, TECs and FFG Act-listed threatened species and communities, and flora, fauna and EVCs recognised as threatened in Victoria. Design refinements have included reducing the construction footprint, re-aligning the pipeline and boring to avoid sensitive areas. The construction methods are described in Section 4.3 and summarised below in relation to mitigation of impacts on biodiversity and habitats. Mitigation measures at locations within the construction area are summarised in Table 56. Details of mitigation measures applied and existing constraints to further mitigation measures are included in Appendix DD.

13.1 Avoidance

13.1.1 Alignment and corridor

Five route options for the WORM were identified by APA in 2018 and assessed in 2018-19. Through the MCA process, Option C was identified as the preferred route option and preliminary pipeline alignment (PPA) (EES Chapter 3 − Project Development). Despite being the longest route alignment identified (almost 12 kilometres longer than the shortest route proposed) and the second costliest option, Option C was assessed as being the optimum alignment for satisfying key criteria which the Project weighted with the greatest importance, being environment and heritage, and community and land considerations. Option C also scored well in terms of constructability and operability overall.

The option selected is considered by APA to be the preferable route option for WORM for the following reasons:

- It achieves strong alignment with the objectives of the *Pipelines Act*
- It avoids environmental impacts to the greatest extent possible, particularly to areas of high biodiversity value including the Mount Ridley Nature Conservation Reserve, adjoining MSA conservation areas and Merri Creek

- It avoids requiring land tenure or direct location on properties with established residential, industrial or conservation uses, and it traverses a lower number of properties than other options
- It minimises location within existing high-voltage transmission easements which would add design, construction and operational complexity to the Project

Through stakeholder consultation and engagement with landowners and VicRoads (now the Department of Transport) from early 2019 to present including through the process of preparing the EES, further route refinement was undertaken with a number of changes being incorporated as a result:

- Minor alignment changes at the crossings of Jacksons Creek, Sunbury Road and Deep Creek to better respond to terrain, more closely follow property boundaries and avoid impacts to urban growth land within the Sunbury South PSP area.
- Refinements to the alignment's position relative to the OMR corridor at various locations following further consultation with the Department of Transport in relation to the interface between the two projects including moving the pipeline alignment to the western side of the OMR and outside the MSA instead of the eastern side for approximately 3.5 kilometres near KP 30.
- Amendment of the alignment between Gunns Gully Road and the Hume Freeway to reduce the overall alignment length by following Gunns Gully Road rather than the OMR corridor further to the north to optimise the crossing location at the Hume Freeway.

The route was further refined in response to additional field surveys (including biodiversity and cultural heritage) and design/constructability assessments undertaken between mid 2019 and early 2021 including through the EES technical study assessments with adjustments in pipeline alignment to:

- Avoid established treelines along some property boundaries and scattered native trees
- Reduce the construction footprint impacts of the pipeline within private properties
- Avoid dams and wetlands
- Reduce pipeline crossing lengths/construction footprints across established roads or waterway crossings (requiring introduction of some right-angle bends in the pipeline)
- Avoid suitable habitat for protected fauna under state and federal legislation where possible

Additional meetings and workshops have been held between APA and ecologists to identify locations where the Project Area could be narrowed or bored to avoid impacts to ecological values, yet still meet constructability constraints and landowner considerations. For example micro alignments were made at KP 23 to avoid several large trees and the construction corridor narrowed also in the KP23 area to avoid native vegetation impacts.

13.1.1.1 Outer Metropolitan Ring

The Department of Transport (DoT) prepared a risk assessment in late August 2020 identifying over 50 risks associated with the co-location of the WORM alignment with the Outer Metropolitan Ring (OMR) Public Acquisition Overlay. The co-location of these two major projects pose a number of constraints to the location of pipeline alignment in some areas.

In response to this, APA identified some alternative alignments for the Project. There are four locations where alignment changes were adopted in late 2020, with three of these requiring additional botanical surveys. The fourth location is within the Melbourne Strategic Assessment (MSA) area and did not require a site assessment since time-stamped data are available.

13.1.2 Method of construction

The method of construction has the potential to influence the level of impact to vegetation/habitat and terrestrial and aquatic flora and fauna. In general, pipeline construction involves trenching or trenchless approaches. Trenchless construction is desirable where minimum surface disruption is to be achieved and to avoid the need for excavation. This may include under or through major transport corridors, some major watercourses, environmentally sensitive areas or where access may be restricted due to existing vegetation or infrastructure. There are three methods to construct the pipeline:

- Horizontal Directional Drilling (HDD)
- Horizontal boring (HB)
- Open trench

In some cases, due to the presence of areas of high ecological significance, existing assets or other constraints, the pipeline will be constructed using trenchless construction techniques such as horizontal directional drilling (HDD) or shallow horizontal boring, to avoid construction disturbance within the sensitive area.

Key areas where trenchless construction techniques will be used include:

- Selected watercourses
- Sealed road crossings, to avoid traffic disruption.

A number of factors contribute to the selection of the appropriate construction technique, in relation to pipeline safety, structural integrity and stability, the physical constraints posed by terrain, and the cost. Physical factors considered are geology, length of the pipeline crossing, hydrofracture risk, overbend requirements, and pipe stringing and pull back arrangements.

Comparative costs of different construction methods are highly variable. For example, the cost of open trench construction is approximately $300 per linear metre, while HDD costs are approximately three times the cost of open trench construction. Thus, the cost of using HDD over the length of the pipeline is substantial and in addition to terrain and other constraints may not be viable over long distances. Based on constructability, it was determined that the pipeline at Jacksons Creek and Merri Creek will be constructed using open trench construction methodologies and Deep Creek will be constructed using HDD. See EES Chapter 3 − Project Development for a summary of the relevant factors and how they contributed to determining construction method at the three creeks.

13.1.3 Avoidance summary

Impacts to biodiversity and habitats have been addressed throughout the design phase during route selection of a preferred pipeline alignment and subsequently eight revisions of the pipeline alignment to refine the location and corridor. Values have been avoided using HDD, boring, narrowing and re-alignment to the maximum extent possible, given constraints around constructability and costs to the Project (Table 56). Table 56 is not an exhaustive list but demonstrates the key changes in the last two revisions. Where key changes are older than this, they have been outlined in the text below. The key outcomes of measures to avoid impacts to biodiversity are:

- Threatened flora – Matted Flax-lily. HDD to avoid the removal of one plant.
- Threatened flora – Tough Scurf-pea. Reduction of the Project area by 1.25 ha to avoid the population at Wollert Compressor Station

- EPBC and FFG Act listed grassy woodland, and Plains Grassy Woodland EVC – Realignment of the pipeline to avoid 2.8 ha of grassy woodland including 10 large trees, at five locations (1PS733045, KP 22.6; Calder Freeway road reserve, KP 8.7; Sunbury Rd, KP 14.8; Mickleham Rd, KP 28; North Eastern rail line, KP 41)
- EPBC NTGVVP, FFG Act Western (Basalt) Plains Grasslands Community and Plains Grassland – HDD or horizontal boring to avoid 0.98 ha of native grassland at five locations (Melton Highway, KP 3.1 and 3.2; Duncan's Lane, KP 9.6; St John's Rd, KP 18.96; North Eastern rail line, KP 41)
- Groundwater Dependent Ecosystems – HDD at one site to avoid 0.05 ha of Riparian Woodland and four trees at Deep Creek (KP 16.8)
- Striped Legless Lizard – Reduction in the width of the Project Area by 0.20 ha within the parcel (KP 11, 12LP92520) that contains known Striped Legless Lizard from 0.69 ha to 0.49 ha; a reduction of almost 30% of known habitat. Overall reduction in impacts of 1.24 ha of known or assumed habitat outside of the MSA.
- Golden Sun Moth – An overall reduction in impacts through Project area removal and width reduction) of 4.08 ha from parcels containing known and assumed Golden Sun Moth habitat outside of the MSA
- Growling Grass Frog –
  - HDD at Deep Creek to avoid habitat within a waterway where the species is known to occur (KP 16.8)
  - Reduction in the width of the Project Area within Jacksons and Merri Creeks from the standard 30 m to 25 m (KP 13.7, KP 48)
  - Siting of the creek crossing within Merri Creek within the existing VNIE easement to avoid degradation of new areas (KP 48)
- A minor reduction in the extent of the Project Area within Conservation Area 34a – Northern Growth Corridor from 2.49 ha to 2.39 ha (KP 42-44)
- Platypus – Reduction in the width of the Project Area within Jacksons Creek where the species is most likely to occur from 30 m to 20 m (KP 13.7)
- Between KP 0 – KP 9: section of alignment within the existing APA Sunbury easement to minimise additional disturbanceand impacts to the environment and surrounding community. The asset will be co-located within the existing 20 m wide easement. Only an additional 10 m width beyond the existing easement is required for temporary construction space to work safely within the existing easement and live asset.
- Between KP 42 – KP 51: section of alignment within the existing APA VNIE easement to minimise additional disturbanceand impacts to the environment and surrounding community. The asset will be co-located within the existing 30 m wide easement. Only an additional 5 m width beyond the existing easement is required for temporary construction space to work safely within the existing easement and live asset.

Table 56 Areas where HDD, horizontal boring (HB) or realignment will avoid impacts to biodiversity and habitats

HDD, Horizontal directional drilling; HB, horizontal boring; N, Narrowing; AC, Alignment Change

To aid alignment with Appendix DD this table may list the same property more than once to capture avoidance to different native vegetation patches or demonstrate different avoidance measures. Fauna and flora values do not always match to the same native vegetation patch ID but do represent avoidance on the same parcel and the same mitigation measure.

Blank cells indicate no avoidance of an ecological value has been identified, cells where the value 0.00 is reported indicate avoidance that is below 0.00; these values have been left in as they contribute to the overall tallies but do not register at two decimal places for an individual patch or parcel.

Parcel ID	KP in	KP out	Location	Waterway crossing	Mitigation measure	MSA inside/ outside	Matted Flx-lily (n)	Tough Scurf-pea (n)	Grassy Woodland (ha)		Grassland (ha)		Native vegetation	EVC type	Patch ID #	Large trees (n)	Known or assumed Striped Legless Lizard habitat (ha)	Known or assumed Golden Sun Moth habitat (ha)	Assumed Growling Grass Frog habitat (ha)	GDE (ha)
									EPBC	FFG	EPBC	FFG								
AAPS746088	0	0	Donnybrook Road		AC	Inside											0.00	2.60		
10LP116565	2.37	3.148	Melton Highway		HDD	Outside					0.00	0.00	0.00	VVP_0132	1					
10LP116565	2.37	3.148	Melton Highway		HDD	Inside					0.00	0.00	0.00	VVP_0132	1					
425711870	3.148	3.178	Melton Highway		HDD	Outside					0.10	0.10	0.10	VVP_0132	1					
218160972	3.178	3.209	Melton Highway		HDD	Outside						0.01	0.01	VVP_0132	2					
1TP901066	4.812	6.405	Holden Road		N	Outside					0.01	0.01	0.01	VVP_0132	5					
1TP901066	4.812	6.405	Holden Road		N	Outside						0.02	0.02	VVP_0132	3					
2022PP3061	6.405	6.425	Holden Road		HB	Outside											0.01			
218162862	6.415	6.425	Holden Road		HB	Outside											0.00			
2LP119116	6.425	8.287	Holden Road		N	Outside					0.07	0.07	0.07	VVP_0132, VVP_0132	7,6		0.09			
1TP946706	8.287	8.325	Holden Road		HDD	Outside											0.00			
218257150	8.744	8.814	Calder Freeway		HDD	Outside				0.02			0.02	VVP_0132_61	9			0.00		
218257150	8.744	8.814	Calder Freeway		AC	Outside				0.00			0.00	VVP_0132_61	9			0.01		
1TP829278	8.814	9.085	Dillon Court		HDD	Outside											0.07	0.07		
1TP829278	8.814	9.085	Dillon Court		AC	Outside											0.06	0.06		
2015PP2761	9.596	9.617	Duncans Lane		HB	Outside					0.00	0.00	0.00	CVU_0132	12		0.00	0.00		
11LP215406	10.255	10.539	Morefield Court		N	Outside					0.06	0.06	0.06	VVP_0132	16		0.06	0.06		
12LP92520	10.586	10.774	Bulla-Diggers Rest Road		AC	Outside					0.13	0.13	0.13	VVP_0132	18		0.20			
218265274	10.774	10.798	Morefield Court		HB	Outside											0.00			
13LP92520	10.798	11.141	Bulla-Diggers Rest Road		N	Outside						0.01	0.01	VVP_0132	24		0.03			
D16PP2761	11.506	11.993	Bulla-Diggers Rest Road		AC	Outside				0.07			0.07	VVP_0055_61	28					
218261878	14.799	14.831	Sunbury Road		HDD	Outside				0.00			0.00	VVP_0055_61	34			0.00		
1LP200366	14.831	15.639	Sunbury Road		N	Outside				0.18			0.18	VVP_0055_61, VVP_0055_61	36,35			0.19		
4LP200366	16.411	16.695	Batey Court	Deep Creek	HDD	Outside							0.01	CVU_0641	39				0.00	0.02
2002PP2258	16.695	16.738	Deep Creek	Deep Creek	HDD	Outside							0.06	CVU_0641	39				0.06	0.03
1TP424528	16.738	16.949	Wildwood Road		HDD	Outside							0.02	CVU_0641	39					
2LP130112	17.554	17.873	St Johns Road		N	Outside					0.01	0.01	0.01	VVP_0132	41					
218264222	18.963	18.983	St Johns Road		HB	Outside					0.02	0.02	0.02	VVP_0132	43		0.00			
5LP88261	18.983	19.421	St Johns Road		AC	Outside					0.21	0.21	0.21	VVP_0132	43		0.38			

Parcel ID	KP in	KP out	Location	Waterway crossing	Mitigation measure	MSA inside/ outside	Matted Flx-lily (n)	Tough Scurf-pea (n)	Grassy Woodland (ha)		Grassland (ha)		Native vegetation	EVC type	Patch ID #	Large trees (n)	Known or assumed Striped Legless Lizard habitat (ha)	Known or assumed Golden Sun Moth habitat (ha)	Assumed Growling Grass Frog habitat (ha)	GDE (ha)
									EPBC	FFG	EPBC	FFG								
10LP110642	19.421	20.19	St Johns Road		AC	Outside					0.53	0.53	0.53	VVP_0132_61	45					
10LP110642	19.421	20.19	St Johns Road		AC	Outside						0.24	0.24	VVP_0132, VVP_0132, VVP_0132, VVP_0132, VVP_0132, VVP_0132_61	48,46,47, 50,51,44					
2LP218160	20.19	21.354	Oaklands Road		N	Outside											0.00			
2LP218160	20.19	21.354	Oaklands Road		AC	Outside					0.47	0.47	0.47	VVP_0132	53					
1TP212870	21.354	21.572	Oaklands Road		N	Outside				0.00			0.00	VVP_0055_61	58		0.06			
2LP68808	21.613	22.093	Oaklands Road		N	Outside			0.01	0.01			0.01	VVP_0055_61	59		0.00	0.00		
1PS733043	22.093	22.644	Oaklands Road		HDD	Outside			0.03	0.03			0.03	VVP_0055_61	59		0.03	0.03		
1PS733043	22.093	22.644	Oaklands Road		N	Outside			0.26	0.26			0.26	VVP_0055_61	59		0.26	0.26		
218266378	22.644	22.657	Craigeburn Road		HDD	Outside			0.02	0.02			0.02	VVP_0055_61	59					
218268306	22.657	22.665	Craigeburn Road		HDD	Outside	1											0.00		
1PS733045	22.665	24.164	Craigeburn Road		N	Outside			0.08	0.08			0.08	VVP_0055_61, VVP_0055_61	67,68			0.08		
1PS733045	22.665	24.164	Craigeburn Road		AC	Outside							0.07	VVP_0125	73	10		3.08		
1PS733045	22.665	24.164	Craigeburn Road		AC	Outside				0.45			0.45	VVP_0055_61	70					
1PS733045	22.665	24.164	Craigeburn Road		AC	Outside			1.20	1.20			1.20	VVP_0055_61, VVP_0055_61, VVP_0055_61	71,69,68					
1PS503800	24.533	26.13	Mt Ridley Road		N	Outside					0.04	0.04	0.04	VVP_0132	76					
1PS503800	24.533	26.13	Mt Ridley Road		N	Outside						0.35	0.35	VVP_0132	75					
32LP93445	27.007	27.35	Parkland Crescent		N	Outside						0.00	0.00	VVP_0132	79			0.23		
218271310	27.997	28.057	Mickleham Road		HDD	Outside				0.06			0.06	VVP_0055_61 VVP_0055_61	81,82					
GPS819168	28.398	29.137	Mickleham Road		AC	Inside						0.01	0.01	VVP_0132	84			0.01		
GPS806997	29.137	29.819	Donnybrook Road		AC	Inside						0.95	0.95	VVP_0132, VVP_0132	84,85			3.49		
GPS806997	29.137	29.819	Donnybrook Road		AC	Inside					0.30	0.30	0.30	VVP_0132	86					
426092500	30.219	30.238	Donnybrook Road		AC	Inside				0.01			0.01	VVP_0055_61	87			0.00		
1LP126752	31.143	31.325	Old Sydney Road		AC	Inside											0.49			
4LP126752	31.718	32.129	Old Sydney Road		AC	Inside						0.00	0.00	VVP_0132	89		0.73	0.00		
PPS814703	32.129	33.121	Donnybrook Road		AC	Inside												0.73		
PPS814703	32.129	33.121	Donnybrook Road		AC	Inside						0.11	0.11	VVP_0132, VVP_0132	89,90		0.00	0.00		
2LP123742	37.186	37.738	Hume Freeway		AC	Inside												0.00		
1LP221466	37.738	38.512	Hume Freeway		AC	Inside												0.41		
2LP221466	38.512	38.967	Hume Freeway		AC	Inside						0.02	0.02	VVP_0132	95				0.00	
10LP5364	38.967	39.796	Hume Freeway		AC	Inside												0.00	0.41	
1LP113763	39.796	40.167	Donovans Lane		AC	Inside												0.10		

Parcel ID	KP in	KP out	Location	Waterway crossing	Mitigation measure	MSA inside/ outside	Matted Flx-lily (n)	Tough Scurf-pea (n)	Grassy Woodland (ha)		Grassland (ha)		Native vegetation	EVC type	Patch ID #	Large trees (n)	Known or assumed Striped Legless Lizard habitat (ha)	Known or assumed Golden Sun Moth habitat (ha)	Assumed Growling Grass Frog habitat (ha)	GDE (ha)
									EPBC	FFG	EPBC	FFG								
2LP113763	40.167	41.091	Donovans Lane		AC	Inside							0.01	VVP_0649	96			0.45		
1TP599592	41.091	41.119	Donovans Lane		HDD	Inside												0.04		
1TP332315	41.119	41.125	Donovans Lane		HDD	Inside												0.00		
1TP332315	41.119	41.125	Donovans Lane		HDD	Inside												0.01		
6TP394032	41.125	42.687	Donovans Lane		AC	Inside				0.04			0.04	VVP_0055_61	97			0.49		
1TP709372	42.687	42.804	Donovans Lane		AC	Inside							0.02	VVP_0641	99			0.06	0.06	
1TP709372	42.687	42.804	Donovans Lane	Merri Creek	AC	Inside				0.03			0.03	VVP_0055_61	98					
2006PP3093	42.804	42.809	Merri Creek	Merri Creek	AC	Inside							0.01	VVP_0641	99		0.00	0.01	0.01	
2LP67181	42.809	44.743	Merriang Road	Merri Creek	AC	Inside							0.01	VVP_0641	99		0.06	0.06	0.06	
218359831	47.024	47.045	Donnybrook Road		HB	Inside												0.00		
2LP130336	50.716	51.045	Summerhill Road		AC	Inside		48	0.08	0.08			0.08	VVP_0055_61	103		0.15	0.15		
Total inside MSA							**0**	**48.00**	**0.08**	**0.17**	**0.30**	**1.39**	**1.61**				**1.45**	**8.61**	**0.53**	**0.00**
Total outside MSA							**1**	**0**	**1.60**	**2.37**	**1.66**	**2.30**	**4.84**			**10**	**1.24**	**4.08**	**0.07**	**0.05**
Total combined							**1**	**48.00**	**1.69**	**2.54**	**1.96**	**3.70**	**6.46**			**10**	**2.68**	**12.69**	**0.60**	**0.05**

13.2 Minimisation

Throughout much of the Project Area, direct impacts to biodiversity and habitat cannot be avoided owing to construction constraints or costs. Unavoidable impacts to biodiversity and habitats will be minimised through application of 23 Project-specific EMMS, described in detail in Section 14 below. These EMMs are a combination of the initial and additional mitigation measures for the design, construction and operation of the Project.

13.3 Rehabilitation and restoration

The pipeline will be located within the existing easement for 33% of its length, between KP 0-9 (Sunbury easement) and KP42-50 (VNIE easement) and a new easement will be created between KP 9 and KP 42. Easements provide protection of the pipeline and are of sufficient width (15 m for this Project) to allow for maintenance and operation requirements. A 3 m buffer area at each side of the pipe is legislated under the *Pipelines Act* that precludes deep excavation within that buffer.

Pipeline easements have pipeline markers installed along their entirety. The primary purpose of these pipeline markers is to identify and provide warning of the existence of underground assets. Thus, it is imperative that line of sight between markers is clearly visible and the pipeline alignment is clearly visible at ground level and not obstructed by vegetation.

The minimum cover of depth from the top of the pipeline to surface level is 750 mm as per Australian Standard AS 2885. This cover needs to be maintained at all times.

It is APA's preference that easements on public land are designed to be linear green spaces and that these spaces will ultimately become public reserves and open spaces. However, the easement and warning signage are statutory safety features pursuant to AS 2885. They are a fundamental tool in ensuring the safe operation of the gas network, compliance with the relevant safety standards and provide for the safety of the public and assets from implications of a pipeline failure. Thus, legislated requirements restrict post-construction revegetation to species that ensure unobstructed views between pipeline indicator markers and avoid any impact on subterranean pipe infrastructure and likely future pipeline routes. Trees are not permitted to be planted within the buffer.

APA would undertake rehabilitation in accordance with the environmental management measures described in Section 14.1, particularly EMM B7. Following completion of APA's rehabilitation requirements, developers and/or land owners in urban areas would undertake landscaping as required in accordance with the APA Site Planning and Landscape National Guidelines (APA 2020).

To promote establishment of native vegetation and habitat after construction, *in situ* regeneration is the preferred method of site rehabilitation. This has the advantage of preserving the genetic composition of indigenous vegetation and will maximise species diversity at sites, since many native species will regenerate from soil stored seed after soil disturbance. Habitat features removed during construction such as large hollow logs and large rocks or rock piles will be returned to the construction area during rehabilitation if consistent with rehabilitation objectives at a particular location. Some supplementary planting may occur if required and where statutory requirements allow. Landholder requirements will be considered prior to supplementary planting or returning habitat features to the construction area.

Special consideration will be given regarding known and assumed Golden Sun Moth habitat, which will be revegetated with appropriate native grasses that provide habitat and food sources.

Soil surfaces that have been compacted due to construction activities, such as those subject to traffic and/or storage areas within the site, will be ripped to allow the topsoil to bind with the subsoil and increase water filtration, as appropriate, prior to revegetation with indigenous native species (except in areas that are known or assumed Golden Sun Moth or Striped Legless Lizard habitat).

Specific topsoil management will also be employed in areas of Golden Sun Moth habitat where the topsoil will be removed and separated from the sub-soil and then the same topsoil replaced regardless of the pre construction vegetation species composition. This aims to return Golden Sun Moth larvae that may reside in the topsoil back into the Project Area.

13.4 Offset strategy

The construction of the Project will require the removal of surface vegetation including TECs, endangered EVCs, threatened flora and threatened fauna habitat, large trees and scattered trees. Unavoidable loss of TECs and threatened fauna will be managed through Commonwealth offsetting as required under the EPBC Act, while the removal of endangered EVCs and large trees will be managed through an offsetting arrangement in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a). Offsets for the loss of FFG Act-listed communities will be addressed through offsets for endangered EVCs Plains Grassland and Plains Grassy Woodland. An ecological offset strategy has been prepared (GHD, 2021).

Results of the VQAs are provided in Appendix E. An offset strategy has been prepared to address both Commonwealth requirements and State offsets policy objectives (GHD, 2021).

13.4.1 State offsets

Based on the current native vegetation removal report for the Project (Appendix BB), 14.775 ha of native vegetation will be removed during construction (Table 57). Removal takes into account the area occupied by tree canopies and excludes areas of native vegetation that will be removed in the approved MSA area. Offsets are required for native vegetation and 19 large trees but these losses do not currently trigger species offsets. An avoidance and minimisation strategy will aim to reduce offsets for large trees. Where greater than 10% of the tree protection zone falls within the construction corridor, an arborist's assessment will be conducted to determine actual expected actual losses for trees. Trees deemed not to be lost will be removed from the NVRR.

In Victoria, the levels of potential risk to biodiversity from removing native vegetation are assigned to mapping units known as ''location categories (DELWP, 2017a). These location categories are:

- Location 3 – includes locations where the removal of less than 0.5 hectares of native vegetation could have a significant impact on habitat for a rare or threatened species
- Location 2 – includes locations that are mapped as endangered EVCs and/or sensitive wetlands and coastal areas (section 3.2.1) and are not included in Location 3
- Location 1 – includes all remaining locations in Victoria

The construction corridor passes through all three location categories. However, the higher location category is used to determine the assessment pathway (DELWP, 2017a).

Identified offsets are currently readily available for purchase.

Table 57 Native vegetation removal report summary

Assessment pathway	Detailed
Extent including past removal	14.789 ha
Extent of past removal where past equals areas of native vegetation to be removed within the MSA program	0.013 ha
Extent of proposed removal	14.775 ha
Number of large trees to be removed	19
Location category of proposed removal	Location 3. The native vegetation is in an area where the removal of less than 0.5 ha could have a significant impact on habitat for one or more rare or threatened species. The native vegetation is also in an area mapped as an endangered EVC
General offset amount	5.521 general habitat units
Vicinity	Port Phillip and Westernport CMA or Hume City, Melton City, Mitchell Shire, Whittlesea City Council
Minimum strategic biodiversity value score	0.522
Species offset amount	None
Large trees	19 large trees

13.4.2 Commonwealth offsets

Offsets that are expected to be triggered under the EPBC Act based on residual impact to MNES are two species, the Golden Sun Moth and Striped Legless Lizard, and two threatened ecological communities: *Natural Temperate Grassland of the Victorian Volcanic Plain* and *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* (Table 58).

For patches of the threatened ecological communities: *Natural Temperate Grassland of the Victorian Volcanic Plain* and *Grassy Eucalypt Woodland of the Victorian Volcanic Plain where existing patches were* dissected by the construction footprint, resulting in remnant smaller patches that were less than 0.05 ha (the area needed to be classified as EPBC protected), the whole patch was considered a loss. Fragmented patches resulted in an additional 0.23 ha of vegetation removal.

Areas of habitat for the Striped Legless Lizard largely comprises areas of assumed habitat. Any reduction in this extent determined through surveys will be identified through the process of confirming offsets prior to construction and outlined within an Offset Management Plan. APA are currently investigating suitable offsets site options with offset brokers.

Table 58 MNES expected to trigger EPBC Act offsets

MNES	Extent of impact (ha)	Fragmented patches (ha)
Golden Sun Moth	19.93	n/a
Striped Legless Lizard	39.34	n/a
Natural Temperate Grassland of the Victorian Volcanic Plain	4.16	0.29
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	2.26	0.04

13.4.3 MSA Environment Mitigation Levy

The liability to pay an MSA levy is triggered when a levy event occurs within the levy area, where habitat compensation obligations have not been previously met. The Project has the potential to trigger two levy events:

- Issue of a Statement of Compliance for a plan of subdivision (i.e. subdivision of land)
- Construction of utility infrastructure on Crown land

The Project Area does not intercept any Crown land subject to the levy.

The Project Area intercepts 0.01 ha of the levy type Golden Sun Moth where land associated with MLV 3 (Gunn's Gully Road) will be acquired as a subdivision.

14. Environmental management

14.1 Environmental management measures

This section describes the measures to manage impacts to biodiversity and habitats, to assist with implementation of the mitigation hierarchy (refer Section 13).

Thirty-six risk pathways were identified for the Project of which 32 relate to the construction phase and four to the operation phase. Of these, two have a residual risk rating of very high, one is medium risk, 21 are low risk and 12 are considered a negligible residual risk.

Table 59 lists the recommended environmental management measures relevant to the biodiversity and habitats assessment.

Additionally, loss of native vegetation is addressed by offsetting of TECs where required under the EPBC Act, and by APA committing to offsetting policy objectives for all EVCs in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a) in-line with Victorian legislation. FFG Act-listed threatened communities will be captured under both of these offsetting arrangements.

APA is required to develop a Construction Environment Management Plan for the Project to accompany the Pipeline Licence Application for approval by the Minister for Energy, Environment and Climate Change prior to commencing construction. The CEMP must address the requirements of the Pipelines Act and Regulations and will include measures to implement the APA commitments described in the EES.

EMMs were developed in consultation with APA to ensure that mitigation measures were achievable, both in terms of construction methods and Project costs, alignment with EMMs proposed by other disciplines, and statutory or regulatory requirements. EMM development assumed that there would be no significant change in the existing conditions within the Project Area and EMMs are specific to the WORM Project. Thus, they do not take into account any indirect impacts from construction projects that may be initiated within the broader Study Area.

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Table 59 Recommended environmental management measures for the construction and operation stages

D – Design, C – Construction, O - Operation

EMM #	Risk	Environmental Management Measure	Stage D/C/O
B1	**Impacts to threatened flora** **Land clearance and vegetation loss** **Erosion / sedimentation, dust, litter or release of contaminants** **Accidental clearing** **Habitat loss and fragmentation**	**Vegetation management (construction)** • Confine all vegetation clearing works to the defined construction area. • Minimise loss of native vegetation, particularly the EPBC Act-listed communities, through detailed design and construction planning including reducing the width of the construction corridor where practicable, in particular at environmentally sensitive locations. • Clearly demarcate all buffer zones, no go zones, tree protection zones, and the boundary of the construction area prior to relevant works commencing • Install and maintain temporary fencing along the construction footprint boundary in areas adjacent to sensitive environmental values. The Matted Flax Lily and Tough Scurf-Pea would be protected by temporary fencing (e.g. star pickets and wire fencing or galvanized temporary construction fencing). For works within conservation areas of the MSA (ie near KP 43 and 49) fencing must be compliant with relevant DELWP guidelines specific to these areas. • Clearly demarcate and identify on site all environmental features to be retained within or directly adjacent to, the construction corridor, prior to relevant works commencing. • Any necessary trimming of tree branches located on the edge of the construction corridor and, overhanging into construction / activity areas must be carried out by a qualified arborist. • Develop and implement a Tree Management Plan (B23).	D, C
B2	**Spread of weeds/pest animals/pathogens** **Death or injury of Growling Grass Frog** **Erosion / sedimentation** **Habitat loss and fragmentation** **Accidental clearing**	**Pest plant/animal/pathogen control (construction)** Implement the following measures during construction to manage biosecurity risks and address *Catchment and Land Protection Act 1994* (CaLP Act) obligations: • Locate CaLP Act listed weeds in the construction corridor and assess the risk of additional spread prior to relocating topsoil. Implement measures to manage this risk during clear and grade, and reinstatement. • To a reasonable extent practicable during the clear and grade phase, ensure that vehicles and plant are free of soil clumps and sods prior to entry and exit from the construction corridor. • Evaluate disturbed areas post-construction and implement remedial measures as required within a reasonable time frame. • Manage waste in accordance with EMM C7. Pathogen control • All vehicles and plant undertaking construction works directly in the watercourse (Merri and Jacksons Creeks) must be cleaned, free of soil sods and sprayed with bleach prior to entrance of each waterway and on exit if working between multiple waterways (excluding vehicles and plant using the constructed access route).	C

EMM #	Risk	Environmental Management Measure	Stage D/C/O
B3	**Impacts to threatened flora** **Land clearance and vegetation loss** **Accidental clearing** **Death or injury of Striped Legless Lizard** **Death or injury of Growling Grass Frog** **Death or injury of fauna** **Erosion/sedimentation** **Habitat loss and fragmentation**	**Contractor awareness** Before commencing site work, all Project personnel must attend an induction that outlines environmental management requirements including: • No-go zones • Biodiversity values of the construction corridor, specifically areas of native vegetation and threatened species habitat • Habitat and fauna awareness • Location of other environmentally sensitive areas • Native vegetation removal regulations and penalties for non-compliance • EPBC Act and FFG Act regulations and penalties for non-compliance.	C

EMM #	Risk	Environmental Management Measure	Stage D/C/O
B4	**Dewatering (terrestrial and aquatic GDEs)**	**GDE mitigation** • Engage an arborist to assess the potential for long-term impacts on native trees based on the expected timeframe for dewatering, depth to which water is modelled to be drawn down, and the proximity of the trees to identified and potential GDEs • Develop and implement a Tree Management Plan (B23) • Salvage aquatic and terrestrial fauna during open cut dewatering activities within Jacksons and Merri creeks. Measures are to include salvage and relocation protocol which must be outlined within the CEMP and include details regarding: – Within waterways, undertake checks for the species during dewatering to remove any individuals found. – Install fauna-proof fencing along the edge of the terrestrial works area once habitat has been made unsuitable and cleared of individuals to prevent individuals recolonising for the period between clearing and construction – Handling and relocation protocols, e.g. animal storage, hygiene controls – Locations of suitable habitat (within 100 m for terrestrial fauna and 200 m for fish) to relocate any individuals found – A protocol for any individuals found where appropriate release habitat is not available within 100 m or 200 m of capture (dependent on species) – Means of treatment or disposal for any individuals injured or killed by works. Measures to manage impacts to GDEs are described in EMM GW1 and EMM GW2.	C
B5	**Noise, vibration, lighting**	**Lighting impacts to fauna** Design and manage lighting in accordance with best practice lighting design as outlined within the National Pollution Guidelines for Wildlife (DAWE 2020) where these do not conflict with construction safety. Where lighting is required, avoid unnecessary light spill into surrounding areas that provide habitat for threatened fauna as far as reasonably practicable.	C
B6	**Noise, vibration, lighting**	**Noise impacts to fauna** Construction noise and vibration must be managed in accordance with the requirements identified in EMM NV1 and NV2.	C
B7	**Land clearance and vegetation loss** **Accidental clearing during construction**	**Site rehabilitation after construction** • Reinstate the construction corridor with consideration of native vegetation composition indigenous to the area as applicable to site conditions, adjacent ground surface levels, and in consultation with the landholder and in accordance with any agreement made as part of easement negotiations • In known and assumed Golden Sun Moth and Striped Legless Lizard habitat that contain native patches of grassland, revegetate areas with appropriate native grass seed mix (e.g. Wallaby Grass, Spear Grass, Kangaroo Grass) that provide habitat and food sources. On private property this will be in	C

EMM #	Risk	Environmental Management Measure	Stage D/C/O
	Erosion / sedimentation, dust, litter or release of contaminants **Death or injury of Striped Legless Lizard** **Death or injury of Growling Grass Frog** **Death or injury of fauna** **Habitat loss and fragmentation** **Soil compaction**	consultation with land owners • Rehabilitation of construction areas and all temporary facilities, temporary access tracks and extra works areas would begin as soon as practicable after the completion of the construction activities, with the aim of restoration of ground cover within six months. Rehabilitation activities are estimated to take approximately three months. Any applicable replanting will be undertaken within 12 months of construction completion (subject to seasonal requirements). Subject to landholder agreement the following requirements to return habitat features to the construction area will be considered: • Return habitat features removed during construction such as large hollow logs and large rocks or rock piles to the construction area during rehabilitation if consistent with rehabilitation objectives at a particular location. • Rip soil surfaces that have been compacted due to construction activities, such as those subject to traffic and/or storage areas within the site, to allow the topsoil to bind with the subsoil and increase water filtration, as appropriate, prior to revegetation with indigenous native species. Do not rip areas that are either known or assumed Golden Sun Moth or Striped Legless Lizard habitat and/or contained patches of native vegetation prior to construction • Measures to rehabilitate Jacksons Creek set out in EMM SW7 (Develop appropriate control measures as part of the CEMP for open cut construction) and EMM SW8 (Site rehabilitation (Jacksons Creek)) will be implemented. Subject to Melbourne Water works on waterway permit conditions rehabilitation of Jacksons Creek and Merri Creek will take into consideration appropriate instream and terrestrial reinstatement of habitat with regard to Platypus and Growling Grass Frog habitat.	

EMM #	Risk	Environmental Management Measure	Stage D/C/O
B8	**Land clearance and vegetation loss** **Erosion / sedimentation, dust, litter or release of contaminants** **Habitat loss and fragmentation** **Death or injury of Striped Legless Lizard** **Death or injury of fauna** **Soil compaction**	**Topsoil management** Topsoil imported to site from external locations must be free of weeds and pathogens. Stockpiled topsoil removed from weed-infested sites for the Project must only be re-used, as far as reasonably practicable, in the location that it was originally sourced from. Stockpiled topsoil from weed-infested sites may be reused where soil is sourced from sites supporting Golden Sun Moth where larvae may be present. Stockpiled topsoil from weed-infested sites must not be re-spread over threatened species habitat or where native vegetation is to be reinstated. For impacted areas that are Golden Sun Moth habitat: • In areas that are to be disturbed temporarily (i.e., reinstated after construction) and that require topsoil removal, the period between pre-trenching topsoil removal and post-trenching topsoil replacement must be minimised to the extent practicable. • Where the removal of topsoil is unavoidable appropriate measures to remove, separate (from sub-soils) and replace topsoils in the construction corridor must be undertaken. As far as reasonably practicable, topsoil will be progressively reinstated. • Manage dust during the Golden Sun Moth flying season (November to January) in properties that are known or assumed Golden Sun Moth habitat to minimise impacts of dust on flying individuals as per requirements in EMM AQ 1	C
B9	**Habitat loss and fragmentation** **Death or injury of Striped Legless Lizard** **Death or injury of Growling Grass Frog** **Death or injury of fauna**	**Fauna management** Measures to mitigate impacts on native fauna must be developed and will be incorporated into a Fauna Management Plan This must include the following requirements: • Woody vegetation, trees and hollows to be removed must be inspected for fauna by a suitably qualified wildlife handler immediately prior to removal. Measures to mitigate impacts on fauna must include: - A walk-through/visual inspection of habitat to be removed immediately prior to clearance to flush out fauna and capture and relocate - Wildlife handler to be present during hollow-bearing tree removal and habitat removal for Growling Grass Frog and Striped Legless Lizard - Wildlife handler to provide advice, which must be implemented that minimise fauna impact, and detailing appropriate measures to manage injured wildlife. • Keep records of all fauna interactions, listing the species encountered, date, nature and outcome of the interaction and GPS coordinates. All fauna records will be submitted to the Victorian Biodiversity Atlas. • Trench management: Work areas, particularly excavations and trenches left open overnight, must be visually inspected by a suitably qualified wildlife handler for fauna at the start of each work day. Any trapped fauna to be removed prior to work commencing. Measures are to include egress points along the trench to allow fauna to escape the trench when unattended, protocols for trapped fauna removal and provision of in-trench shelters for sections left open overnight • Native fauna are to be captured, handled and relocated only by a qualified and authorised fauna	D/C

EMM #	Risk	Environmental Management Measure	Stage D/C/O
		handler. All fauna handling must be in line with a Wildlife Act Permit Management Authorisation and any conditions within. It is an offence under the Wildlife Act 1975 to handle or disturb fauna without authorisation. • Records of all fauna relocations must be kept • Records of all fauna deaths or injuries to be kept and reported to DELWP • Exposed pipe ends must be capped each night to prevent fauna entry. • Prepare and implement Kangaroo management for areas where connectivity for fauna movement will be restricted during construction. • Temporary strainer assemblies and gateways must be installed at every fence line that is intersected by the construction corridor in agreement with the landowner and in accordance with construction specifications. This must provide security for farm-stock during construction. Temporary security fencing must be installed around the construction site in all public open spaces to prevent unauthorised access to the right of way (ROW) and for public safety. When it is determined that there is no further safety risk to members of the public all security fencing will be removed **For all threatened fauna:** Any threatened species found within the construction site and needing relocation to avoid harm or death must be relocated to the nearest available suitable habitat. Details of suitable locations and a protocol for release for any locations where this is expected to be in excess of 100 m from the point of capture is required	

EMM #	Risk	Environmental Management Measure	Stage D/C/O
B10	**Erosion / sedimentation, dust, litter or release of contaminants** **Habitat loss** **Death or injury of Growling Grass Frog** **Death or injury of fauna**	**Surface water sedimentation and runoff** Manage surface water sedimentation and runoff risks and impacts in accordance with EMM SW4 and EMM SW5.	C
B11	**Erosion / sedimentation** **Death or injury of Growling Grass Frog** **Death or injury of fauna** **Waterway / wetland habitat**	**Surface water contamination** Manage chemicals, fuels and hazardous materials in accordance with EMM C6 to mitigate impacts on ecological values.	C
B12	**Accidental clearing (operation)**	**Native vegetation management - operation** Minimise any chance of accidental damage to vegetation during operation by complying with the requirements in the VTS OEMP and obtaining state and federal permits and approvals as required, if accidental damage to native vegetation occurs within the easement during construction.	O

EMM #	Risk	Environmental Management Measure	Stage D/C/O
B13	**Spread of terrestrial weeds and pests (operation)**	**Pest plant / animal / pathogen control - operation** Develop and implement weed and pest management in accordance with the VTS OEMP.This must include: • Taking reasonable steps to prevent the growth and spread of regionally controlled weeds and diseases including Weeds of National Signficance (WoNS) toeradicate regionally prohibited weeds, and to prevent spread of established pest species within the construction corridor. • Targeted control of weeds undertaken by a qualified pest plant control contractor pending consultation with landowners • Limiting access to works areas to the easement and following a designated access route to minimise potential for weed spread, pending consultation with landowners • Routine inspections of the easement and facilities including vegetation and weed inspection, in consultation with landowners.	O
B14	**Noise, vibration, lighting during operation**	**Noise, vibration, lighting (operation) impacts on threatened and non-threatened fauna** Minimise noise, dust and lighting impacts on sensitive habitats and fauna by: • Turning off lighting when not required • Setting speed limits and drive conditions to minimise noise and dust impacts • Limiting access to easement and designated access routes to minimise erosion and associated dust. Design and manage lighting in accordance with best practice lighting design as outlined within the National Light Pollution Guidelines for Wildlife (DAWE 2020) where these do not conflict with safety. Where lighting is required, consideration will be given to avoid unnecessary light spill into surrounding areas that provide habitat for threatened fauna	O
B15	**Land clearance and vegetation loss** **Accidental clearing** **Soil compaction**	**Reinstate native vegetation** Where natural regeneration of species in situ is not feasible, revegetate the area utilising seed or nursery stock obtained from within the local area, to support preservation of native vegetation values within the broader area.	C

EMM #	Risk	Environmental Management Measure	Stage D/C/O
B16	**Accidental clearing during construction**	**Additional site assessment and management (construction)** Any vegetation clearing or damage to plants outside the construction corridor that occurs accidently or without prior approval must be reported as an incident and works must cease immediately. The accidental clearing area must be subject to: • Botanical surveys to assess and map the condition and extent of native vegetation • If site based information of the native vegetation can no longer be observed, DELWP mapped data must be used to determine offset requirements. • The extent and condition of accidental vegetation removal must be reported to the relevant authority as soon as reasonably practicable. • A qualified arborist must assess any damage to trees and must identify tree protection zones (TPZs) and SRZs. • All native vegetation to be retained must be demarcated via fencing, so no-go zones are clearly delineated and noted by workers, and any further accidental loss of vegetation is avoided. • Install and maintain temporary fencing along the construction footprint boundary in areas adjacent to sensitive environmental values. For works within conservation areas of the MSA (ie near KP 43 and 49) fencing must be compliant with relevant DELWP guidelines specific to these areas.	C
B17	**Works on waterways creating a barrier that impedes fish passage and / or migration**	**Barriers to fish passage and / or migration** Minimise the creation of a barrier that impedes native fish passage and /or migration, and the time required for installation of the pipeline during open cut trenching across Jacksons Creek and Merri Creek by using the following approaches: • Assemble and prepare the pipeline so it can be installed as soon as reasonably practicable once trenching through the watercourse is complete • Remove all obstructions to flow and passage as soon as reasonably practicable after the pipeline has been laid and backfilled. That is, with the exception of the flume pipe at Merri Creek, which may not be immediately removed after the pipe has been laid. • Reinstate the exposed trench within the watercourse and riparian zones as soon as reasonably practicable following the installation of the pipeline. • Works on a designated watercourse must have a permit for Works on Waterways from Melbourne Water. All works must be completed in accordance with permit requirements.	C

EMM #	Risk	Environmental Management Measure	Stage D/C/O
B18	**Removal of threatened ecological communities and threatened EVCs**	**Value-specific mitigation** Develop and implement specific measures to protect EPBC Act and/or FFG Act communities that are impacted, including: • Measures required by EMM B1 • Establishing no-go areas around plant populations • Install and maintain temporary fencing along the construction footprint boundary in areas adjacent to sensitive environmental values. For works within conservation areas of the MSA (ie near KP 43 and 49) fencing must be compliant with relevant DELWP guidelines specific to these areas. • Marking any significant values such as large old trees on site plans • An arborist's assessment to establish no-go areas around retained large old trees close to the construction corridor • On-site supervision by a botanist and/or arborist to avoid accidental damage to retained native vegetation during construction works in GEWVVP • Retention of stockpiled vegetation to be used for site rehabilitation • Rehabilitating disturbed areas as soon as reasonably practicable • A Tree Management Plan must be prepared based on detailed construction drawings and surveyed tree locations (EMM B23)	C
B19	**Loss of habitat (threatened fauna)** **Death or injury of fauna**	**Fauna Mitigation – Golden Sun Moth** Prepare and implement a Golden Sun Moth Management Plan and obtain approval for the plan from DELWP. The plan must include details regarding: • Location of Golden Sun Moth habitat and method for mitigation measures in these areas, • Topsoil management (including as outlined within EMM B8) • Rehabilitation measures • Ongoing management and/or monitoring.	C

EMM #	Risk	Environmental Management Measure	Stage D/C/O
B20	**Noise, vibration, lighting** **Loss of habitat (threatened fauna)** **Death or injury of Striped Legless Lizard** **Death or injury of fauna**	**Fauna Mitigation – Striped Legless Lizard** Prepare and implement a Striped Legless Lizard Management Plan and obtain approval for the plan from DELWP. The plan must include the following measures: • Undertake active searching of areas identified as Striped Legless Lizard habitat (including rock rolling and lifting debris) prior to slashing • Slash areas of known and assumed habitat one week prior to tyning, to make them less suitable for lizards and encourage lizards to vacate the construction area. Slashing heights to be limited to no lower than 50 mm to minimise risk to individuals • If tyning is delayed, areas may need to be re-slashed to keep the grass short. • Tyne areas of known and assumed habitat immediately prior to trenching to salvage and relocate individuals to immediately adjacent suitable habitat. • A suitably qualified wildlife handler would be present during all tyning activities to undertake salvage and relocation activities • Once habitat has been made unsuitable and tyning has been completed, install lizard-proof fencing along the construction site boundary (where it meets lizard habitat) to prevent individuals from recolonising the site during construction. Fencing must be a solid material (e.g. polyethylene sheeting or plastic) that is 400 mm high and dug into the ground at a depth of 100 mm. • Develop a record-keeping, storage, treatment and/or disposal protocol for killed or injured individuals, in accordance with DELWP advice. All such records will be reported to DELWP. • Management of topsoil as per EMM B7 and B8 is also required.	C

EMM #	Risk	Environmental Management Measure	Stage D/C/O
B21	**Noise, vibration, lighting** **Loss of habitat (threatened fauna)** **Death or injury of Growling Grass Frog** **Death or injury of fauna**	**Fauna Mitigation – Growling Grass Frog** Schedule construction within Jacksons Creek outside the species' peak active period (November to March). Prepare and implement a salvage and relocation plan for areas identified as habitat for the Growling Grass Frog, and obtain approval for the plan from DELWP. The salvage and relocation plan must include details regarding: • Making habitat unsuitable for Growling Grass Frog by slashing bank vegetation one week prior to construction to discourage individuals from remaining within the site. • Undertaking checks for the species immediately prior to construction to remove any individuals found • For dams proposed for removal that have been identified as habitat, install fauna-proof fencing around the waterbodies once habitat has been made unsuitable and cleared of individuals to prevent individuals recolonising for the period between clearing and construction • For waterways identified as habitat, install fauna-proof fencing along the edge of the terrestrial works area once habitat has been made unsuitable and cleared of individuals to prevent individuals recolonising for the period between clearing and construction • Install fauna proof-fencing within 100 m of areas with habitat known or assumed to support Growling Grass Frog • Handling and relocation protocols e.g. animal storage, hygiene controls • Locations of suitable habitat (within 100 m) to relocate any individuals found • A protocol for any individuals found where appropriate release habitat is not available within 100 m of capture • Means of treatment or disposal for any individuals injured or killed by works. All deaths or injuries to be recorded and reported to DELWP. • Fauna-proof fencing for Growling Grass Frog will be of a suitable structure and material to prevent frog movement from one side of the fence to the other • Minimise the risk of high flow events on Growling Grass Frog habitat through site-specific measures outlined in EMM SW7 and EMM SW9 including but not limited to timing of works, Flood Management Plan and Response Plans.	C

EMM #	Risk	Environmental Management Measure	Stage D/C/O
B22	**Death or injury of fauna**	**Fauna Mitigation – Platypus** Protect Platypus in accordance with the Platypus Management Guidelines (Australian Platypus Conservancy https://platypus.asn.au/management-guidelines/). This must include: • A pre-construction survey for the presence of burrows within the construction corridor at Jacksons Creek where open cut trenching is to occur. • If the presence of burrows can't be ruled out, the construction works at Jacksons Creek waterway/banks will be timed to avoid the peak juvenile nesting period between September and beginning of March. • If burrows are observed or can't be ruled out, excavations should proceed carefully using a non-toothed excavator bucket (e.g. mud or batter bucket) in order to allow any individuals present to escape. • Minimise where practicable activities that involve excavating or driving over banks with heavy machinery, and limit these to areas within the construction corridor • To avoid disturbing active platypus, schedule work activities during daylight hours in Jacksons Creek. This excludes the use of pumps to extract water from the construction footprint overnight. Locate pumps as far from the waterway as reasonably practicable with use of noise deflectors to minimise noise impacts • All pumps and pipes to include exclusion grill to prevent Platypus becoming trapped, injured or killed • Egress points should be installed to allow any trapped individuals to escape coffer dams. • Install exclusion fencing around coffer dams to reduce risks of predation on Platypus travelling around the coffer dams overland. • Manage loose soil from moving from the banks to the channel while works are underway.Areas of bare or disturbed soil are to be replanted as soon as reasonably practicable once works are completed and in accordance with landowner agreements • Implement measures to prevent chemicals or litter associated with work activities from entering waterways and drainage lines • To maintain natural foraging substrates for platypus, concrete must not be substantially used as a binding agent along surface areas of the channel or banks. This does not include the subsurface concrete encasement of slab protection considered for pipe protection as part of EMM SW7. • Develop and implement a contingency plan for dealing with any platypus that may be accidentally injured or displaced during work activities.	C

EMM #	Risk	Environmental Management Measure	Stage D/C/O
B23	**Land clearance and vegetation loss** **Dewatering (terrestrial and aquatic GDEs)**	**Remnant Tree Management Plan** Develop and implement a Tree Management Plan t**o** identify all remnant native (non-planted) trees within 15 m of the c**onstruction corridor** boundary, deemed “lost” through encroachment of their TPZs and specifies: • Trees to be impacted as part of the construction activities • The condition and arboricultural value of the trees. Maximise tree retention to the extent practicable through detailed design and selection of construction methods to minimise canopy loss including by retaining trees where practicable and minimising potential impacts to trees. Arboricultural assessments must inform the Tree Management Plan in order to maximise tree retention and long-term viability of individual trees including those deemed “lost” through encroachment of their TPZs or groundwater changes. The Tree Management Plan must be informed by a pre-construction site assessment to confirm the area and number of trees proposed to be impacted. The area and number of trees actually removed are to be confirmed through a post-construction **arborist** assessment.	C, O

In addition to the biodiversity EMMs outlined in Table 59, other disciplines' EMMs are also relevant including those outlined in Table 60. These measures are described in detail in the relevant Technical Reports.

Table 60 Relevant EMMS from other technical reports

Discipline	EMM reference	Issue	Technical report
Air Quality	AQ1	Construction dust management	Techincal Report – G Air Quality
Contamination	C4	Minimise risks from contaminated groundwater	Technical report E - Contamination
Contamination	C5	Minimise risks from vapour and ground gas intrusion	Technical report E - Contamination
Contamination	C6	Manage chemicals, fuels and hazardous materials	Technical report E - Contamination
Contamination	C9	Management of drilling fluids	Technical report E - Contamination
Ground water	GW1	Minimising dewatering rates and impact to groundwater levels and flows	Technical report C – Groundwater
Ground water	GW2	Minimise impact to groundwater bore users	Technical report C – Groundwater
Noise and vibration	NV1	Construction noise	Technical report F - Noise and vibration
Noise and vibration	NV2	Construction noise (out of hours)	Technical report F - Noise and vibration
Surface water	SW1	Managing runoff from adjacent construction areas, discharge from dewatering activities and spills / leaks	Technical report B – Surface water
Surface water	SW2	Waterway and floodplain function (construction)	Technical report B – Surface water
Surface water	SW3	Site Rehabilitation measures for disturbance caused by open cut trench construction	Technical report B – Surface water
Surface water	SW4	Control measures for open cut trenching construction	Technical report B – Surface water
Surface water	SW5	Implement a Monitoring Program	Technical report B – Surface water
Surface water	SW6	Periodic Visual monitoring	Technical report B – Surface water
Surface water	SW7	Design and Construction Management (Jacksons Creek)	Technical report B – Surface water
Surface water	SW8	Site rehabilitation (Jacksons Creek)	Technical report B – Surface water
Surface water	SW9	Develop and implement a Flood Management and Response Plan (FMRP) for Jacksons Creek, Deep Creek, Kalkallo Creek and Merri Creek	Technical report B – Surface water
Ground Movement and Stability	GM5	HDD trenchless bore management	Technical report D – Land stability and ground movement

Discipline	EMM reference	Issue	Technical report
Ground Movement and Stability	GM6	Confirmation of ground risk	Technical report D – Land stability and ground movement

14.2 Performance criteria

14.2.1 Botanical values

The key residual impact of the Project is the loss of threatened native vegetation and ecological communities.

Offset Strategy

An offset strategy has been prepared that complies with the EPBC Act Environmental Offsets Policy (DSEWPAC 2012) and will meet policy objectives of the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a) (refer Section 13.4 and GHD, 2021d). The offset strategy describes how the offsets will be secured, managed and monitored, including management actions, responsibility, timing, performance measures and the specific environmental outcomes to be achieved.

The Offset Management Plan (OMP) for site(s) obtained to meet EPBC Act offsets will be finalised prior to construction. State offsets will be purchased general units and no OMP will be required.

Residual Impacts within the Project area

A comprehensive body of baseline survey data exists that will be used as a benchmark to evaluate the residual impact of the Project on botanical values. The performance of EMMs will be evaluated by development and implementation of a monitoring program that will:

- Set objectives for vegetation recovery using baseline data from 2019/2020 field surveys. These objectives will consider the extent to which reinstatement of native vegetation meets or exceeds the structure, floristic diversity and condition of impacted native vegetation. ie reinstated vegetation should meet or exceed the condition of pre-construction vegetation.
- Assess the population of Tough Scurf-pea to determine the likelihood of any adverse impacts from construction and operation, or any other changed conditions that may impact its survival
- Confirm survival of Matted Flax-lily and evaluate the effectiveness of protection during construction
- Evaluate the progress of reinstatement toward achieving objectives and report the results annually to relevant state government and municipal authorities (within the MSA and pending landowner agreement)
- At the end of the 12 month monitoring period evaluate whether monitoring should be extended (pending landowner agreement)
- Provide recommendations for management or contingency measures as required, which may not be addressed by operational EMMs

14.2.2 Fauna values

The key residual impact of the Project on fauna is the loss of habitat for fauna. In particular, the initial loss of habitat for the EPBC Act listed Golden Sun Moth meets the criterion for a significant impact under the Act by meeting the threshold of “habitat loss, degradation or fragmentation >0.5 ha”. Disturbance of these habitats within the Project Area is expected to be temporary, with habitats reinstated following works, but there is no certainty that the Golden Sun Moth will recolonise the rehabilitated areas. Impacts are also expected to be restricted to the narrow Project Area bisecting areas of habitat which will allow the species to more easily cross the impacted area and avoid long-term habitat fragmentation. Any reduction in the area of occupancy is expected to be temporary, but the timeframe for recolonisation is unknown. The residual impacts of habitat removal on these species are expected to be negligible.

Using a conservative approach, an offset strategy has been prepared that complies with EPBC Act Environmental Offsets Policy (DSEWPAC 2012) and also meets policy objectives of the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a) (refer Section 13.4). The offset strategy describes how the offsets will be secured, managed and monitored, including management actions, responsibility, timing, performance measures and the specific environmental outcomes to be achieved.

An Offset Management Plan (OMP) will be finalised prior to construction.

14.2.3 Aquatic ecology values

Monitoring of waterways where open trench construction is planned are recommended as part of EMM SW5 and EMM SW6 to monitor the performance of management measures in protection of waterways health and biodiversity values. In general, this requires:

- Undertaking biological and water quality monitoring of Jacksons Creek and Merri Creek prior to construction based on EPA publication 793.2 Biological Objectives for Rivers and Streams - Ecosystem Protection (2004). This will be undertaken at sites upstream and downstream of the waterway crossings to establish background conditions.
- During construction monitoring would occur based on EPA publication 1834 Civil Construction, Building and Demolition Guide (2020), SEPP (Waters) and ANZG (2018). This will be undertaken at sites upstream and downstream of the waterway crossings to determine if there are impacts due to construction
- Following completion of the construction, the biological and water quality monitoring will be repeated to determine if there are ongoing or residual impacts

Should the monitoring determine adverse residual impacts on biodiversity values, contingency measure will be implemented. These may include:

- Identifying, repairing or redesigning failed management measures aimed at reducing impacts due to erosion and sedimentation
- Further stabilising banks and beds at waterway crossings to reduce erosion potential and sedimentation

14.2.4 Contingency measures

In the event of adverse residual effects on flora, fauna and ecological community values requiring further management, these will be assessed on a case by case basis and responses developed to address specific issues. Accidental clearing of vegetation or habitat during construction is primarily addressed by EMM B16 (Additional site assessment and management – construction), as well as EMM B7 (Site rehabilitation after construction) and EMM B15 (Reinstate native vegetation). During operation, accidental clearing or damage to vegetation or habitat is addressed by EMM B12 (Vegetation management – operation).

A majority of the EMMs employed for the Project are standard construction measures used on typical projects with expected or known likely outcomes. Where uncertainty in the effectiveness of any given measures lies additional mitigation has been recommened to reduce risk of such uncertainty to bioiveristy values or values have been assumed to be impacted and offset accordingly. Some of the key areas of uncertainty include:

- The ability to elimate the risk of erosion and sedimentation in waterways that are proposed to be open trench to minimse impacts to habitat during a high flow event. This is mitigated by targeteing the low flow period (January to May) and then further restricting works to March to May (where other constraints allow) where variability in flow is at it's lowest. Further waterway specific EMMs have then been developed including flow management, timing alignment with long term weather forecasts and Flood Management and Response Plans to reduce the risk to the lowest possible.
- Disturbance of understorey habitats within the Project Area in areas of Golden Sun Moth and Striped Legless Lizard habitat are expected. These habitats are expected to be reinstated following works. However, Golden Sun Moth and Striped Legless Lizard in particular are very susceptible to ground disturbance and may not successfully recolonise these areas. With a majority of the Project Area comprising grassland habitats, it is the Golden Sun Moth and Striped Legless Lizard that are expected to experience the greatest impacts of land clearance. The uncertainty in the effectiveness of any mitigation to prevent residual habitat loss for these species has led the Project to fully offset all vegetation that is know or assumed to support the species.
- It is assumed that all HDD and HB will be successful, and fracking is not expected
- The effectiveness of topsoil management for the purpose of reinstating soil that contain the larvae of Golden Sun Moth is not well understood. It is acknowledged that this may not be an effective EMM, consequently all known and assumed habitat for the Golden Sun Moth has been considered lost.

Avoidance of native vegetation and habitat is not entirely possible and is addressed to the maximum extent practicable in the recommended EMMs. Additionally, the CEMP for the Project includes a procedure and contingency plans for identifying and managing any unexpected impacts to biodiversity and habitats, including contingency measures when HDD activities are in the vicinity of waterway zones. Assessment and management of any unexpected impacts must be conducted in accordance with relevant legislation, regulations, policies and guidelines.

15. Environmental effects conclusion

The purpose of this report is to provide a biodiversity and habitat impact assessment to inform the preparation of the EES required for the Project. Thirty-two construction risks and four operation risks were identified and assessed.

Two risks to biodiversity and habitats had a residual risk rating of very high and one risk had a residual risk rating of medium. There were twenty-one low residual risks and 12 negligible residual risks. These risks are expected to trigger both direct and indirect impacts to biodiversity and habitats in the Project Area.

This section outlines the findings of this assessment on the residual impacts following implementation of the mitigation measures described in Section 14.

15.1 Impact assessment – very high and medium risks

15.1.1 Loss of EPBC Act and FFG Act listed communities and endangered EVCs

Very high risks for this Project are direct loss of EPBC Act and FFG Act listed threatened communities and endangered EVCs. Neither of these risks can be further avoided or minimised. These risks are expected to result in the largest biodiversity impacts from the Project, with total direct vegetation loss within the Project Area expected to include up to:

- 15.32 ha of native vegetation in patches from six EVCs; 12 large trees within patches; 16 large scattered trees, and 16 small scattered trees
- 4.16 ha of EPBC Act listed threatened community *Natural Temperate Grassland of the Victorian Volcanic Plain* (0.73 ha inside the approved MSA area and 3.43 ha outside the MSA area)
- 2.26 ha of EPBC Act listed threatened community *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* (0.06 ha inside the approved MSA and 2.20 ha outside the MSA area)
- 10.36 ha of FFG Act listed threatened community Western (Basalt) Plains Grasslands Community (1.38 ha inside the approved MSA area and 8.98 ha outside the MSA area)
- 4.62 ha of FFG Act listed threatened community Western Basalt Plains (River Red Gum) Grassy Woodland (4.30 ha outside the MSA area; 0.32 ha within the approved MSA area)

The Project is likely to have a significant impact (based on EPBC Act significance criteria) on EPBC Act TEC *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* based on five criteria, and is also likely to have a significant impact on TEC *Natural Temperate Grassland of the Victorian Volcanic Plain* based on two criteria (refer Section 12.2.1).

Habitat for Arching Flax-lily is expected to be removed during construction. However, since the population consists of only a single plant, the population is likely to be unviable in the longer term and the overall impact to the species is considered minor.

These impacts have been minimised as far as practicable. However, since vegetation removal will occur, any further reduction to the residual impacts has not been achievable. Areas that are disturbed during construction where these communities occur will be reinstated.

Unavoidable loss of TECs will be managed through Commonwealth offsetting as required under the EPBC Act, APA are currently investigating suitable offsets site options with offset brokers. Removal of endangered EVCs and large trees will be managed through an offsetting arrangement in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a) suitable offsets have been identified and are available. Offsets for the loss of FFG Act-listed communities will be addressed through offsets for endangered EVCs Plains Grassland and Plains Grassy Woodland. An ecological offset strategy has been prepared and identified offsets are currently readily available for purchase (GHD, 2021).

15.1.2 Loss of fauna habitat

Medium risks for this Project are planned actions which involve direct and indirect loss of fauna habitat (risk B13). This risk cannot be avoided. The risk assessment concluded that actions associated with this risk have only a minor consequence, but are expected to occur.

Construction of the pipeline and associated infrastructure requires land to be cleared of its vegetation and fauna habitat. Some of these impacts are expected to be permanent (e.g. at the MLV and compressor locations) but a majority of losses would be shorter term and sites would be reinstated after construction (e.g. access, laydown, spoil storage, parking, trenching) and many fauna would be able to continue to use these areas.

Some of the habitats that would be affected are known to or may support threatened fauna. Habitats within the Project Area that support threatened terrestrial fauna are mainly confined to the higher quality grassland areas and waterways. Impacts to threatened fauna are expected to be limited to four species: Golden Sun Moth, Striped Legless Lizard, Growling Grass Frog and Tussock Skink.

Disturbance of understorey habitats within the Project Area is expected to be temporary, with habitats reinstated following works. However, Golden Sun Moth and Striped Legless Lizard in particular are very susceptible to ground disturbance and may not successfully recolonise these areas. With a majority of the Project Area comprising grassland habitats, it is the Golden Sun Moth and Striped Legless Lizard that are expected to experience the greatest impacts of land clearance in the Project Area, with respective totals of 19.93 and 39.34 ha of known or assumed habitat expected to be impacted.

Impacts have been minimised as far as practicable. However, since habitat removal will occur, any further reduction to the residual impacts has not been achievable.

The Project is likely to have a significant impact (based on EPBC Act significance criteria) on EPBC Act listed Striped Legless Lizard and Golden Sun Moth (refer Section 12.2.2). Unavoidable loss of habitat for Striped Legless Lizard and Golden Sun Moth will be managed through Commonwealth offsetting as required under the EPBC Act. An ecological offset strategy has been prepared (GHD, 2021). APA are currently investigating suitable offsets site options with offset brokers.

EMMs will be applied to minimise immediate and long-term impacts to individuals and their habitat. Impacts within MSA area are offset through the Environment Mitigation Levies.

Loss of vegetation and consequential loss of some fauna habitat is unavoidable. However, Project EMMs, would be implemented to minimise clearing through design, and within each site during construction.

EMM B1 (land clearance and vegetation loss) requires the Project to avoid as far as practicable the removal of native vegetation and fauna habitat and impacts on habitat connectivity through the establishment of no-go-zones and clear works areas to protect vegetation and fauna habitat to be retained.

EMM B3 (contractor awareness) requires all contractors to be inducted so that they are aware of their requirements to comply with measures to protect environmental values.

EMM B7 (Site rehabilitation) requires the Project Area to be reinstated with consideration to native vegetation, habitat features and soil compaction.

EMM B8 (topsoil management) requires the Project to minimise the risk of spread of weeds and manage topsoil for rehabilitation and reinstatement with management of Golden Sun Moth and Striped Legless Lizard habitat considered. Topsoil management will take into account the duration of displacement, separation and replacement of original topsoils and revegetation with Golden Sun Moth food source species.

EMM B10 (surface water sedimentation and runoff) requires implementation of measures to minimise the risk of sedimentation and run off into waterways.

The mitigation measures would minimise impacts, but as they relate to planned events that are known/certain to occur, the residual impacts cannot be further reduced.

15.2 Impact assessment – other risks

15.2.1 Botanical values

Indirect impacts to botanical values are expected to be minor and temporary during the construction and operation phases of the Project. Mitigation measures developed for the Project have avoided or minimised risks to the maximum extent possible.

EPBC Act or FFG Act-listed threatened flora and their habitat have been avoided through use of HDD and pipeline realignment and impacts to populations are not expected to occur.

Impacts to non-threatened flora are likely to entail only a temporary reduction of populations since the majority of these are expected to regenerate during reinstatement.

Indirect impacts to threatened flora and ecological communities or non-threatened flora may occur from erosion / sedimentation, dust, litter, release of contaminants or soil compaction. A range of EMMs developed with other relevant disciples has been recommended to maximise the likelihood of these impacts being temporary and minor.

Noxious weeds are ubiquitous throughout the Study Area, including within the construction corridor. Further spread of weeds / pest animals / pathogens during construction and operation will be managed through EMMs incorporated into the CEMP for the Project.

Dewatering drawdown is likely to be temporary, minor and localised and impacts to GDEs are likely to be insignificant. These will be managed through EMMs for construction dewatering impacts to groundwater and development and implementation of a tree management plan that have been included in the CEMP for the Project.

The risk of accidental removal of native vegetation during construction or operation is negligible. In the event of accidental damage occurring, it is expected to be localised and minor.

15.2.2 Fauna values

Other impacts to fauna may be both direct and indirect but are typically minor and temporary during the construction and operation phases of the Project. Mitigation measures developed for the Project have avoided or minimised risks to the maximum extent possible.

Impacts to non-threatened fauna are likely to entail only a temporary reduction of habitat since most of the non-threatened native fauna that persist in the Project Area are mobile and/or adaptable, and are persisting within a fragmented and degraded habitat landscape. These species are able to use remaining habitats or even a degraded form of the same habitat.

Indirect impacts to fauna habitat may occur from erosion / sedimentation, dust, litter or release of contaminants into wetland and waterways. A range of EMMs recommended by other relevant disciples would maximise the likelihood of these impacts being temporary and minor.

One known pathogen that affects fauna is the Amphibian Chytrid Fungus, which causes the disease chytridiomycosis, which can result in high mortality of frogs. The risk to frogs from the Amphibian Chytrid Fungus as a result of the Project is expected to be low. Potential spread or introduction of the pathogen will be managed through EMMs incorporated into the CEMP including the regulation of movement around waterways and appropriate hygiene protocols.

Project construction at night would require adequate lighting, which may disturb or displace native or non-native fauna. Efforts would be made to minimise the escape of light during the Project's construction with measures developed to minimise light spillage to protect significant native fauna habitat to the extent practicable. Disturbance of some fauna by light is unavoidable but is expected to be minor and localised. Lighting during the operation phase is restricted to the Wollert Compressor Station where lighting is not on permanently but only when necessary for activities occurring at night.

Similarly noise and vibration impacts are expected to be highly localised and short term, moving with the construction front. The implementation of noise and vibration EMMs requires that noise and vibration be managed and outlined within the CEMP.

Project construction may result in the injuring or killing of fauna, mainly through land clearing (habitat removal) or fauna straying into a construction area. Death or injury of some fauna may occur, but is expected to be localised, and most likely to affect individuals rather than populations or species. The risk assessment found that risks to Golden Sun Moth, Striped Legless Lizard and Growling Grass Frog were initially relatively high due both to their listed status and that impacts on fewer individuals could have a greater impact than it might for common widespread species. However, by adhering to the fauna mitigation measures residual risks to all these species can be reduced to low. Management plans will detail the measures to minimise the risk of death or injury to both common and threatened species including where relevant undertaking pre-clearing surveys and inspections to confirm the on-site location of fauna immediately prior to habitat removal, and assisting fauna to safety as necessary.

The risk of habitat fragmentation is low. The loss of habitat connectivity associated with this Project is expected to be temporary, localised, and minimal for most species. Habitat fragmentation would be minimised through Project design, and measures to avoid accidental loss of habitat, and contractor awareness. Reinstatement of vegetation and topsoil management within the Project Area would allow continued passage of fauna and help to reduce the long-term effect of additional habitat fragmentation.

There is no indication that any location within the Project Area supports or attracts an ecologically significant proportion of any Migratory species, or would be considered important habitat for any Migratory species, consequently the risk of impacts to Migratory species and/or important habitat is considered negligible.

15.2.3 Aquatic ecology values

Indirect impacts to aquatic ecology values are expected to be minor and temporary during the construction and operation phases of the Project. The majority of aquatic habitats intersected by the pipeline were deemed highly unlikely to support EPBC Act or FFG Act-listed species. While there was a medium likelihood of Australian Grayling being present in Deep Creek, impacts to the species are largely avoided through the use of HDD as a construction technique.

The recently FFG Act listed Platypus is known to exist in Jacksons Creek and have been observed in close proximity to the Project Area. Although there is a direct risk of injury or death of Platypus due to open trench construction, the risk has been minimised or avoided through the implementation of an EMM specific to Platypus. Furthermore, a range of EMMs have also been developed to manage risks from indirect impacts that may occur due to impacts to water quality and habitat conditions.

With the exception of Australian Grayling and Platypus, aquatic biodiversity values throughout the Project Area comprise common and generally abundant species, along with the general functioning of aquatic ecosystems. Impacts to non-threatened common species are likely to be temporary during construction and over a small spatial scale (i.e. within the Project Area or adjacent river reach) and populations are expected to regenerate post construction. Although some impacts on aquatic ecosystem are expected due to issues such as erosion or sedimentation, a range of EMMs have been developed to avoid or minimise risks, or to maintain ecosystem health and variability within the current natural range.

In addition to aquatic values associated with surface water driven ecosystems, consideration was also given to potential impacts to GDEs. Changes in groundwater depths are likely to be temporary, minor and localised and impacts to GDEs are likely to be insignificant. Refuge pools in Merri Creek, considered GDEs and considered to provide important habitat during low flow or drought conditions, are outside the expected area where groundwater drawdown will occur and not likely to be impacted.

Ultimately, a range of biodiversity developed EMMS, coupled with those developed to manage risks associated with surface water, groundwater, land stability and contamination, will avoid or minimise risks to aquatic biodiversity values to the maximum extent possible.

15.3 Regional and cumulative impacts

The Project is one of as number of major infrastructure projects planned for construction in the region that will require vegetation removal and/or disruption to biodiversity through removal of or disturbance to habitat (refer Section 10.3).

The WORM is closely aligned with the Outer Metropolitan Ring and consequently impacts from the Project are not expected to be geographically widespread. The Project Area is also relatively narrow and impacts will be confined to within the construction corridor. Thus, no significant regional impacts are expected to occur as a result of the WORM.

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Appendices

Appendix A – Risk Assessment

The scoping requirements require a risk-based approach to be adopted during the design of EES studies, so that a greater level of effort is directed at investigating and managing those matters that pose relatively higher risk of adverse effects.

The risk assessment as part of the assessment framework for the EES, is described in EES Chapter 5 EES Evaluation and assessment framework.

The risk pathways define the cause and effect topics relevant to biodiversity and habitat based on an understanding of the existing conditions and the Project activities. The risk pathways are provided in Section 9. Each pathway shows the initial risk rating based on standard management measures, and a residual risk rating based on additional management measures (if required) developed during the impact assessment process.

The consequence of the risk occurring were assigned using a consequence guide specific for each technical discipline. The consequence guide is provided in Table A1.

The likelihood was assigned using a likelihood guide applied to all technical disciplines. The likelihood guide is provided in Table A2.

The risk rating was determined using the risk matrix developed for this EES. The risk matrix is shown in Table A3.

Table A1 Biodiversity and habitat consequence categories and criteria

Aspect	Insignificant	Minor	Moderate	Major	Severe
Native vegetation	Loss of any EVC (<5 ha) Or, The impact is localised at a single site and can be avoided through EMMs	Loss of any EVC (5-10 ha) Or, The impact occurs within continuous tracts of vegetation or at <25% of patches and can be minimised through EMMs	Loss of any EVC (10-20 ha) Or, The impact occurs within continuous tracts of vegetation or at least 25% of the known number of patches, cannot be avoided and can only be partly minimised through EMMs but can be offset	Loss of any EVC (20-250 ha) Or, The impact occurs within continuous tracts of vegetation or at least 50% of the known number of patches, cannot be avoided and can only be partly minimised through EMMs but can be offset	Loss of any EVC (>250 ha) Or, The impact occurs within continuous tracts of vegetation or at >75% of the known number of patches and cannot be avoided or minimised through EMMs and cannot be offset
Flora, fauna or aquatic species	No expected reduction in the number of populations of a State or Commonwealth listed threatened species within Victoria Or, No permanent loss of habitat for a threatened species within Victoria. Localised or temporary reduction of populations of any common species. The impact can be avoided through EMMs	Insignificant reduction in the number of population of a State or Commonwealth listed threatened species within Victoria Or, <0.05% permanent loss of habitat within Victoria. Minor but permanent reduction of populations of any common species within Victoria. The impact can be minimised through EMMs	A reduction in the number of populations that may lead to further decline or loss of viability in a State or Commonwealth listed threatened species within Victoria Or, Between 0.05% and 0.5% permanent loss of habitat within Victoria. Substantial reduction in the number of populations of any common species within Victoria The impact cannot be avoided and	Substantial reduction in the size of a viable population or in the number of populations that may lead to permanent loss of a State or Commonwealth listed threatened species within Victoria Or, Between 0.5% and 1% permanent loss of habitat within Victoria. Threat to the viability of any common species within the Project Area	Complete loss or loss of the viability of a population of State or Commonwealth listed species within Victoria Or, >1% permanent loss of habitat within Victoria. Permanent loss of a significant proportion of a population of any common species within Victoria The impact cannot be avoided or minimised through EMMs

Aspect	Insignificant	Minor	Moderate	Major	Severe
			can only be partly minimised through EMMs	The impact cannot be avoided and can only be partly minimised through EMMs.	
Threatened ecological communities	No loss or fragmentation of FFG / EPBC listed ecological communities The impact is localised at a single site and can be avoided through EMMs	Loss (<5 ha) of an FFG / EPBC listed ecological community and, Fragmentation does not lead to loss of conservation status The impact can be minimised through EMMs	Loss (5-10 ha) of an FFG / EPBC listed ecological community or Fragmentation leads to a loss of conservation status The impact cannot be avoided and can only be partly minimised through EMMs	Loss (10-20 ha) of an FFG / EPBC listed ecological community and Fragmentation leads to a loss of conservation status The impact cannot be avoided and can only be partly minimised through EMMs	Significant loss (>20 ha) of an FFG / EPBC listed ecological community The impact cannot be avoided or minimised through EMMs
Aquatic ecosystems [11]	No measurable decrease in aquatic ecosystem health.	Measurable decrease in aquatic ecosystem health within Project Area during construction period (2-4 weeks).	Measurable decrease in aquatic ecosystem health within Project Area and adjacent river reach during construction period (2-4 weeks).	Short-term (months or seasons) measurable decrease in aquatic ecosystem health throughout Study Area (i.e. river system).	Long-term and possible permanent decrease in aquatic ecosystem health throughout Study Area (i.e. river system).

[11] Measureable change in aquatic ecosystem may include changes in water quality with regard to background conditions and SEPP (Waters) and ANZG (2018) guideline values, changes in macroinvertebrate indicies outlined in SEPP (Waters), changes in the diversity and abundance of fish and macrophyte communities, and changes in the presence of important habitat physical features.

Table A2 Likelihood approach

Level		Description
1	Rare	The event is conceivable and may occur only in exceptional circumstances
2	Remote	The event could occur but is not anticipated and may occur if certain abnormal circumstances prevail
3	Unlikely	The event is unlikely but could occur if certain circumstances prevail
4	Likely	The event will probably occur in most circumstances
5	Almost certain	The event is expected to occur in most circumstances or is planned to occur

Table A3 Risk matrix

		Consequence rating				
		Insignificant	Minor	Moderate	Major	Severe
Likelihood rating	Almost certain	Low	Medium	High	Very high	Very high
	Likely	Low	Low	Medium	High	Very high
	Unlikely	Negligible	Low	Medium	High	High
	Remote	Negligible	Negligible	Low	Medium	High
	Rare	Negligible	Negligible	Negligible	Low	Medium

Appendix B – Likelihood of occurrence of threatened flora within the Project Area (Biosis 2019)

Key to table:

EPBC Act:

CR - Critically Endangered

EN - Endangered

VU – Vulnerable

PMST – Protected Matters Search Tool

FFG Act:

L - Listed as threatened under FFG Act

DELWP Advisory List

e - Endangered v - vulnerable

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
National significance											
Amphibromus fluitans	River Swamp Wallaby-grass	VU		L	2008	PMST	Swampy areas, mainly along the Murray River between Wodonga and Echuca with scattered records from southern Victoria.	Medium	Previously recorded from the local area. Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate.	Medium	Previously recorded from the local area. Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Dianella amoena	Matted Flax-lily	EN	e	L	2015	PMST	Lowland grassland and grassy woodland, on well-drained to seasonally waterlogged fertile sandy loam soils to heavy cracking clays.	Recorded	Previously been recorded from within the study area close to Merri Creek at Beveridge. Potential habitat in areas of Plains Grassland, Grassy Woodland and Plains Grassy Woodland and in uncultivated grassy paddocks and roadsides in the study area.	Medium	Potential habitat in areas of Plains Grassland, Grassy Woodland and Plains Grassy Woodland, and in uncultivated grassy paddocks and roadsides in the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Diuris basaltica	Small Golden Moths	EN	e	L	2009	PMST	Plains Grassland dominated by tussock-forming perennial grasses (including Kangaroo Grass); often with embedded surface basalt.	Medium	Previously recorded from the local area. Potential habitat in higher quality areas of Plains Grassland, particularly where Kangaroo Grass and embedded rock is present.	Medium	Previously recorded from the local area. Potential habitat in higher quality areas of Plains Grassland, particularly where Kangaroo Grass and embedded rock is present.
Diuris fragrantissima	Sunshine Diuris	EN	e	L	1912		Grassland dominated by *Themeda triandra*, on plains with heavy basalt soils and embedded boulders.	Low	Only known naturally occurring population is in Sunshine.	Low	Only known naturally occurring population is in Sunshine.
Dodonaea procumbens	Trailing Hop-bush	VU	v			PMST	Sandy or clay soils in low-lying, winter-wet areas in grasslands, woodlands, and low-open forest.	Low	No previous records within 5 km of the study area.	Low	No previous records within 5 km of the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Glycine latrobeana	Clover Glycine	VU	v	L	1995	PMST	Grasslands and grassy woodlands, particularly those dominated by Kangaroo Grass.	Medium	Previously recorded from the broader area. Potential habitat in higher quality areas of Plains Grassland, Grassy Woodland and Plains Grassy Woodland, particularly where Kangaroo Grass is present.	Medium	Previously recorded from the broader area. Potential habitat in higher quality areas of Plains Grassland, Grassy Woodland and Plains Grassy Woodland, particularly where Kangaroo Grass is present.
Lachnagrostis adamsonii	Adamson's Blown-grass	EN	v	L	1990	PMST	Low-lying, seasonally wet or swampy areas of plains communities, often in slightly saline conditions.	Medium	Previously recorded from the broader area. Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate.	Medium	Previously recorded from the broader area. Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Lepidium hyssopifolium s.s.	Basalt Peppercress	EN	e	L	1984		Basalt plains grassland and woodland communities.	Medium	Previously recorded close to the study area. Potential habitat in areas of Plains Grassland and Plains Grassy woodland and uncultivated grassy paddocks and roadsides in the study area.	Medium	Previously recorded close to the study area. Potential habitat in areas of Plains Grassland and Plains Grassy woodland and uncultivated grassy paddocks and roadsides in the study area.
Leucochrysum albicans subsp. *tricolor*	Hoary Sunray	EN	e	L		PMST	Grasslands of the Victorian Volcanic Plains, primarily on acidic clay soils derived from basalt, with occasional occurrences on adjacent sedimentary, sandy-clay soils.	Low	No previous records within 5 km of the study area.	Low	No previous records within 5 km of the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Pimelea spinescens subsp. *spinescens*	Spiny Rice-flower	CR	e	L	2014	PMST	Primarily grasslands featuring a moderate diversity of other native species and inter-tussock spaces, although also recorded in grassland dominated by introduced perennial grasses.	High	Previously recorded close to the study area south of Diggers Rest. Potential habitat in areas of Plains Grassland and uncultivated grassy paddocks and roadsides in the study area.	High	Previously recorded close to the study area south of Diggers Rest. Potential habitat in areas of Plains Grassland and uncultivated grassy paddocks and roadsides in the study area.
Pomaderris vacciniifolia	Round-leaf Pomaderris	CR	e	L		PMST	Endemic in Victoria. Largely confined to moist forest and scrubs in the upper catchment of the Yarra, Plenty and Yea Rivers in an area bounded by Healesville, Marysville and Whittlesea, but also in the Tyers-Walhalla areas.	Low	No previous records within 5 km of the study area.	Low	No previous records within 5 km of the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Prasophyllum frenchii	Maroon Leek-orchid	EN	e	L		PMST	Grassland and grassy woodland environments on sandy or black clay loam soils that are generally damp but well drained.	Low	No previous records within 5 km of the study area.	Low	No previous records within 5 km of the study area.
Pterostylis chlorogramma	Green- striped Greenhood	VU	v	L		PMST	Heathy woodland; more specific habitat requirements are poorly known.	Low	No previous records within 5 km of the study area. No suitable habitat likely to occur.	Low	No previous records within 5 km of the study area. No suitable habitat likely to occur.
Pterostylis cucullata	Leafy Greenhood	VU		L		PMST	Sand dune scrubs in coastal areas, and inland on slopes and river flats in moist foothill and montane forests.	Low	No previous records within 5 km of the study area.	Low	No previous records within 5 km of the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Rutidosis leptorhynchoides	Button Wrinklewort	EN	e	L	1982	PMST	Higher quality Plains Grassland and Grassy Woodland in Western Victoria, particularly those with fertile soil and light timber cover.	Medium	Previously recorded from the local area. Potential habitat in higher quality areas of Plains Grassland, Grassy Woodland and Plains Grassy Woodland.	Medium	Previously recorded from the local area. Potential habitat in higher quality areas of Plains Grassland, Grassy Woodland and Plains Grassy Woodland.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Senecio macrocarpus	Large-headed Fireweed	VU	e	L	2013	PMST	Grassland, shrubland and woodland habitats on heavy soils subject to waterlogging and/or drought conditions in summer.	Medium	Previously recorded close to the study area south of Diggers Rest. Potential habitat in areas of Plains Grassland and Plains Grassy woodland and uncultivated grassy paddocks and roadsides in the study area.	Medium	Previously recorded close to the study area south of Diggers Rest. Potential habitat in areas of Plains Grassland and Plains Grassy woodland and uncultivated grassy paddocks and roadsides in the study area.
Senecio psilocarpus	Swamp Fireweed	VU	v			PMST	Seasonally inundated herb-rich swamps, growing on peaty soils or volcanic clays.	Low	No previous records within 5 km of the study area.	Low	No previous records within 5 km of the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Thelymitra matthewsii	Spiral Sun-orchid	VU	v	L		PMST	Typically on well-drained soils on slightly elevated sites, but also on coastal sandy flats. Often in open situations following disturbance.	Low	No previous records within 5 km of the study area.	Low	No previous records within 5 km of the study area.
Xerochrysum palustre	Swamp Everlasting	VU	v	L		PMST	Sedge-swamps and shallow freshwater marshes and swamps in lowlands, on black cracking clay soils.	Low	No previous records within 5 km of the study area.	Low	No previous records within 5 km of the study area.
State significance											
Allocasuarina luehmannii	Buloke		e	L	2010		Non-calcareous soils in drier areas on slopes and plains; often in woodlands associated with Grey Box.	Medium	Recorded close to the study area. Potential to persist as scattered trees.	Medium	Recorded close to the study area. Potential to persist as scattered trees.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Amphibromus pithogastrus	Plump Swamp Wallaby-grass		e	L	1992		Seasonally damp depressions in grassland or grassy wetland.	Medium	Previously recorded from the broader area. Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate.	Medium	Previously recorded from the broader area. Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate.
Atriplex billardierei	Glistening Saltbush		x	L	1980		Scattered along sandy seashores from the western to eastern extremities of Victoria.	Low	Associated with coastal habitats.	Low	Associated with coastal habitats.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Calotis anthemoides	Cut-leaf Burr-daisy			L	2005		Scattered north and west of Melbourne (e.g. Sunshine, Camperdown, Moyston, Dunkeld, Numurkah regions) on heavy soils prone to waterlogging, but now rather rare due to habitat depletion.	Medium	Potential habitat in areas of Plains Grassland and Plains Grassy Wetland.	Medium	Potential habitat in areas of Plains Grassland and Plains Grassy Wetland.
Carex tasmanica	Curly Sedge		v	L	2009		Seasonally wet areas, such as around drainage lines and freshwater swamps, on fertile, clay soils derived from basalt.	Medium	Previously recorded from the broader area. Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate.	Medium	Previously recorded from the broader area. Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Chloris ventricosa	Plump Windmill Grass		v		2011		Woodlands. Mainly found on clay soils, sometimes in winter-wet depressions. Few records from Victoria. Previously recorded close to Jacksons Creek in Keilor.	Medium	Potential to occur in wooded areas.	Medium	Potential to occur in wooded areas.
Comesperma polygaloides	Small Milkwort		v	L	1995		Grasslands on the western basalt plains; less commonly in grassy woodlands between Bendigo and the Wimmera.	Medium	Previously recorded from the broader area. Potential habitat in higher quality areas of Plains Grassland.	Medium	Previously recorded from the broader area. Potential habitat in higher quality areas of Plains Grassland.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Coronidium gunnianum	Pale Swamp Everlasting		v		2010		Widespread throughout the state except for the north-west and the alpine and adjacent mountainous areas, and usually at low elevations (under c. 100 m) where mostly in grasslands and riverine woodland on soils that are prone to inundation.	Medium	Previously recorded from the broader area. Potential habitat in higher quality areas of Plains Grassland, Plains Grassy Woodland and Plains Grassy Wetland.	Medium	Previously recorded from the broader area. Potential habitat in higher quality areas of Plains Grassland, Plains Grassy Woodland and Plains Grassy Wetland.
Corymbia maculata	Spotted Gum		v		2014		In Victoria, naturally confined to a small population near Mt Tara in the east of the state.	Negligible	Planted within the local area	Negligible	Planted within the local area

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Cullen parvum	Small Scurf-pea		e	L	2011		Lowland grasslands, including pastures and occasionally in otherwise disturbed grassy areas.	High	Previously recorded close to the study area. Potential habitat in areas of Plains Grassland and uncultivated grassy paddocks and roadsides in the study area.	High	Previously recorded close to the study area. Potential habitat in areas of Plains Grassland and uncultivated grassy paddocks and roadsides in the study area.
Cullen tenax	Tough Scurf-pea		e	L	2015		Lowland grasslands, including pastures and occasionally in otherwise disturbed grassy areas.	High	Previously recorded close to the study area. Potential habitat in areas of Plains Grassland and uncultivated grassy paddocks and roadsides in the study area.	High	Previously recorded close to the study area. Potential habitat in areas of Plains Grassland and uncultivated grassy paddocks and roadsides in the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Dianella longifolia var. *grandis*	Arching Flax-lily		v		2014		Occurs in lowland plains grassland and grassy woodlands (e.g. Volcanic Plain and Riverina) as well as around rocky outcrops at higher altitudes than the var. *longifolia* (e.g. between Swifts Creek and Omeo, Benambra-Corryong district, Don River near Launching Place).	High	Previously recorded close to the study area. Potential habitat in areas of Plains Grassland and Plains Grassy Woodland and uncultivated grassy paddocks and roadsides in the study area.	High	Previously recorded close to the study area. Potential habitat in areas of Plains Grassland and Plains Grassy Woodland and uncultivated grassy paddocks and roadsides in the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Diuris palustris	Swamp Diuris		v	L	1979		Grasslands and open woodlands, often in swampy depressions; confined to the west of the State.	Medium	Previously recorded close to Jacksons Creek. Potential habitat in higher quality areas of Plains Grassland, Plains Grassy Woodland and Plains Grassy Wetland	Medium	Previously recorded close to Jacksons Creek. Potential habitat in higher quality areas of Plains Grassland, Plains Grassy Woodland and Plains Grassy Wetland

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Diuris punctata	Purple Diuris		v	L	1982		Fertile, loamy soils and periodically wet areas in lowland grasslands, grassy woodlands, heathy woodlands and open heathlands.	Medium	Previously recorded close to Jacksons Creek. Potential habitat in higher quality areas of Plains Grassland, Plains Grassy Woodland and Plains Grassy Wetland.	Medium	Previously recorded close to Jacksons Creek. Potential habitat in higher quality areas of Plains Grassland, Plains Grassy Woodland and Plains Grassy Wetland.
Eleocharis plana	Flat Spike-sedge		v		2011		Shallow freshwater pools and the margins of lakes and rivers.	Medium	Previously recorded from the broader area. Potential habitat along waterways, drainage lines and wetlands.	Medium	Previously recorded from the broader area. Potential habitat along waterways, drainage lines and wetlands.
Eucalyptus leucoxylon subsp. *connata*	Melbourne Yellow-gum		v	I	2016		Well-drained slopes in a restricted area around Melbourne and Geelong.	Medium	Potential to occur in wooded areas or on well- drained slopes.	Medium	Potential to occur in wooded areas or on well- drained slopes.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Eucalyptus X *studleyensis*	Studley Park Gum		e		2006		A morphologically variable hybrid between *Eucalyptus camaldulensis* subsp. *camaldulensis* and *E. ovata* subsp. *ovata* from the lower Yarra River north-east of Melbourne (Kew, Viewbank, Watsonia).	Medium	Potential to occur along waterways and low lying areas.	Medium	Potential to occur along waterways and low lying areas.
Geranium solanderi var. *solanderi* s.s.	Austral Crane's-bill		v		2013		Grasslands or grassy woodlands where hydrology is not a limiting factor.	Medium	Previously recorded from the broader area. Potential habitat in higher quality areas of Plains Grassland and Plains Grassy Woodland.	Medium	Previously recorded from the broader area. Potential habitat in higher quality areas of Plains Grassland and Plains Grassy Woodland.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Geranium sp. 1	Large- flower Crane's-bill		e	L	2012		Apparently endemic in Victoria. Known only from basaltic grassland (now generally weedy) in the Glenroy-Broadmeadows area, Riddells Creek and Malmsbury. It was presumed to be extinct, until rediscovered in 2000. Formally known from the far north east near Wodonga.	Medium	Previously recorded close to the study area. Potential habitat in areas of Plains Grassland within the VVP and uncultivated grassy paddocks and roadsides in the study area	Medium	Previously recorded close to the study area. Potential habitat in areas of Plains Grassland within the VVP and uncultivated grassy paddocks and roadsides in the study area.
Goodenia macbarronii	Narrow Goodenia		v	L	2009		Sandy to clay/silt soils in areas that are moist or wet year round, such as spring-soaks and alluvial fans of drainage lines, and including disturbed areas.	Medium	Previously recorded from the broader area. Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate.	Medium	Previously recorded from the broader area. Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Leiocarpa leptolepis	Pale Plover-daisy		e	L	1912		Grasslands and grassy woodlands, often in disturbed areas. In Victoria, confined to one known population approximately 4 km east of Mildura.	Low	No recent records close to study area.	Low	No recent records close to study area.
Lindsaea trichomanoides	Oval Wedge-fern		e	L	2000		Reported from a couple of isolated sites at Wilsons Promontory, but only one of them, near the headwaters of Chinaman Creek, has been confirmed recently.	Low	Species highly restricted in distribution to areas near Wilson's Promontory. A single record from Epping is likely erroneous.	Low	Species highly restricted in distribution to areas near Wilson's Promontory. A single record from Epping is likely erroneous.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Microseris scapigera s.s.	Plains Yam-daisy		v		2010		Damp depressions in grasslands, woodlands, stream banks, alpine herbfields and around the margins of saline lakes and flats.	Medium	Previously recorded from the broader area. Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate and in low lying areas within Plains Grassland.	Medium	Previously recorded from the broader area. Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate and in low lying areas within Plains Grassland.
Podolepis linearifolia	Basalt Podolepis		e		2015		Grasslands and grassy woodlands.	Medium	Previously recorded from the broader area. Potential habitat in higher quality areas of Plains Grassland and Plains Grassy Woodland.	Medium	Previously recorded from the broader area. Potential habitat in higher quality areas of Plains Grassland and Plains Grassy Woodland.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in Study Area	Rationale for likelihood ranking	Likely occurrence in areas outside the MSA area	Rationale for likelihood ranking
		EPBC	VIC	FFG							
Prasophyllum pyriforme s.s.	Silurian Leek-orchid		e		1983		Dry foothill forest with shrubby understorey.	Low	Study area unlikely to contain habitat.	Low	Study area unlikely to contain habitat.
Pterostylis pedoglossa	Prawn Greenhood		v		1883		Heath and heathy woodland near the coast.	Low	Study area unlikely to contain habitat.	Low	Study area unlikely to contain habitat.

Appendix C – Flora recorded within the Project Area (Biosis 2020, GHD 2020)

Key to table:

EPBC Act:

EN - Endangered

VU – Vulnerable

FFG Act:

L - listed as threatened under FFG Act

P - protected under the FFG Act (public land only) I - determined ineligible for listing

DELWP Advisory List

e - endangered v - vulnerable

r - rare

k - poorly known

Noxious weed status:

SP- State prohibited species

RP - Regionally prohibited species

RC - Regionally controlled species

R - Regionally restricted species

Other

- Native species outside natural range

Status	Scientific Name	Common Name
Indigenous species		
	Acacia melanoxylon	Blackwood
	Acacia paradoxa	Hedge Wattle
	Acaena echinata	Sheep's Burr
	Acaena novae-zelandiae	Bidgee-Widgee
	Alternanthera sp.	Joyweed
	Anthosachne scabra s.l.	Common Wheat-grass
	Asperula conferta	Common Woodruff
	Atriplex semibaccata	Berry Saltbush
	Austrostipa bigeniculata	Kneed Spear-grass
	Austrostipa rudis	Veined Spear-grass
	Austrostipa scabra subsp. *falcata*	Rough Spear-grass
	Austrostipa sp.	Spear Grass
	Azolla pinnata	Ferny Azolla
	Bolboschoenus medianus	Marsh Club-sedge
	Bothriochloa macra	Red-leg Grass
	Caesia calliantha	Blue Grass-lily
	Callistemon sp.	Bottlebrush

Status	Scientific Name	Common Name
	Carex breviculmis	Common Grass-sedge
	Cassinia aculeata subsp. *aculeata*	Common Cassinia
	Chloris truncata	Windmill Grass
	Clematis microphylla	Small-leaved Clematis
k	*Convolvulus angustissimus* subsp. *omnigracilis*	Slender Bindweed
	Crassula decumbens var. *decumbens*	Spreading Crassula
	Crassula sp.	Crassula
L, P, e	*Cullen tenax*	Tough Scurf-pea
	Cyperus gunnii subsp. *gunnii*	Flecked Flat-sedge
k	*Desmodium varians*	Slender Tick-trefoil
EN, L, P, e	*Dianella amoena*	Matted Flax-lily
v	*Dianella longifolia* var. *grandis* s.l.	Arching Flax-lily
	Dianella revoluta s.l.	Black-anther Flax-lily
	Dichelachne sp.	Plume Grass
	Dichondra repens	Kidney-weed
	Einadia nutans subsp. *nutans* s.s.	Nodding Saltbush
	Enchylaena tomentosa var. *tomentosa*	Ruby Saltbush
	Epilobium billardiereanum	Variable Willow-herb
	Epilobium sp.	Willow Herb
	Eucalyptus camaldulensis	River Red-gum
	Eucalyptus leucoxylon subsp. *leucoxylon*	Yellow Gum
	Eucalyptus melliodora	Yellow Box
	Eucalyptus microcarpa	Grey Box
	Eucalyptus ovata	Swamp Gum
	Eucalyptus viminalis	Manna Gum
	Euchiton spp.	Cudweed
	Geranium retrorsum s.s.	Grassland Crane's-bill
	Geranium spp.	Crane's Bill
	Hypnum spp.	Plait Moss
	Isolepis fluitans var. *fluitans*	Floating Club-sedge
	Juncus sp.	Rush
	Juncus subsecundus	Finger Rush
	Lachnagrostis spp.	Blown Grass
	Laphangium luteoalbum	Jersey Cudweed
	Liliaceae sp. s.l	Lily
	Lomandra filiformis	Wattle Mat-rush
	Lomandra multiflora subsp. *multiflora*	Many-flowered Mat-rush
	Lythrum hyssopifolia	Small Loosestrife

Status	Scientific Name	Common Name
	Melicytus dentatus s.l.	Tree Violet
	Microlaena stipoides var. *stipoides*	Weeping Grass
	Myriophyllum sp.	Water Milfoil
	Oxalis exilis	Shade Wood-sorrel
	Oxalis perennans	Grassland Wood-sorrel
	Persicaria decipiens	Slender Knotweed
	Phragmites australis	Common Reed
	Poa labillardierei var. *labillardierei*	Common Tussock-grass
	Poa sp.	
	Rhagodia candolleana subsp. *candolleana*	Seaberry Saltbush
	Rubus parvifolius	Small-leaf Bramble
	Rumex brownii	Slender Dock
	Rytidosperma caespitosum	Common Wallaby-grass
	Rytidosperma carphoides	Short Wallaby-grass
	Rytidosperma duttonianum	Brown-back Wallaby-grass
	Rytidosperma pilosum	Velvet Wallaby-grass
	Rytidosperma racemosum var. *racemosum*	Slender Wallaby-grass
	Rytidosperma setaceum var. *setaceum*	Bristly Wallaby-grass
	Schoenoplectus tabernaemontani	River Club-sedge
	Schoenus apogon	Common Bog-sedge
	Sclerolaena muricata	Black Roly-poly
	Senecio quadridentatus	Cotton Fireweed
	Themeda triandra	Kangaroo Grass
	Tricoryne elatior	Yellow Rush-lily
	Triglochin sp.	Arrowgrass
	Typha sp.	Bullrush
k	*Veronica grosseserrata*	Eastern Speedwell
	Wahlenbergia luteola	Bronze Bluebell
Introduced species		
	Aira sp.	Hair Grass
D	*Arctotheca* calendula	Cape weed
	Avena sp.	Oat
	Brassica sp.	Turnip
D	*Briza maxima*	Large Quaking-grass
	Bromus hordeaceus	Soft Brome
	Cerastium glomeratum s.l.	Common Mouse-ear Chickweed
RC	*Chrysanthemoides monilifera*	Boneseed
RC	*Cirsium vulgare*	Spear Thistle

Status	Scientific Name	Common Name
	Crataegus monogyna	Hawthorn
RC	*Cynara cardunculus* subsp. *flavescens*	Artichoke Thistle
	Dactylis glomerata	Cocksfoot
	Eleusine tristachya	American Crows-foot Grass
	Erodium cicutarium	Common Heron's-bill
	Eucalyptus cladocalyx	Sugar Gum
	Eucalyptus oleosa	Acorn Mallee
	Galenia pubescens var. *pubescens*	Galenia
	Gaudinia fragilis	Fragile Oat
	Geranium dissectum	Cut-leaf Crane's-bill
	Helminthotheca echioides	Ox-tongue
	Hordeum leporinum	Barley-grass
	Hypochaeris glabra	Smooth Cat's-ear
	Hypochaeris radicata	Flatweed
	Leontodon saxatilis subsp. *saxatilis*	Hairy Hawkbit
	Lepidium africanum	Common Peppercress
	Lolium rigidum	Wimmera Rye-grass
	Lolium sp.	Rye Grass
RC	*Lycium ferocissimum*	African Box-thorn
	Lysimachia arvensis	Pimpernel
	Malva sylvestris	Tall Mallow
RC	*Marrubium vulgare*	Horehound
SP	*Nassella charruana*	Lobed Needle-grass
R	*Nassella neesiana*	Chilean Needle-grass
RC	*Nassella trichotoma*	Serrated Tussock
R	*Opuntia* spp.	Prickly Pear
	Petrorhagia dubia	Velvety Pink
	Phalaris sp.	Canary Grass
	Plantago coronopus	Buck's-horn Plantain
	Plantago lanceolata	Ribwort
	Poa bulbosa	Bulbous Meadow-grass
	Polygonatum multiflorum	Common Soloman’s Seal
	Romulea rosea.	Onion Grass
	Romulea sp.	
RC	*Rosa rubiginosa*	Sweet Briar
RC	*Rubus fruticosus* spp. agg.	Blackberry
	Rumex crispus	Curled Dock
	Silybum marianum	Variegated Thistle

Status	Scientific Name	Common Name
	Sonchus oleraceus	Common Sow-thistle
	Trifolium angustifolium var. *angustifolium*	Narrow-leaf Clover
	Trifolium sp.	Clover
RC	*Ulex europaeus*	Gorse
	Vicia hirsuta	Tiny Vetch
	Vicia sp.	Vetch
	Vulpia bromoides	Squirrel-tail Fescue
	Xanthium spinosum	Bathurst Burr

Appendix D – Noxious CaLP listed weeds recorded and possibly occurring in the Study Area (Biosis 2020, GHD 2020)

Notes to table:

Noxious weed status:

SP - State prohibited species

RP - Regionally prohibited species RC - Regionally controlled species R - Regionally restricted species

Native species outside natural range

The following table includes the CaLP Act listed flora that have been recorded from within 5 km of the study area or have potential to occur within the Study Area. The list of species is sourced from the Victorian Biodiversity Atlas.

Scientific name	Common name	Recorded in Project Area (Biosis, GHD)?
Regionally controlled		
Ailanthus altissima	Tree of Heaven	
Carduus tenuiflorus	Winged Slender-thistle	
Carthamus lanatus	Saffron Thistle	Recorded
Chrysanthemoides monilifera	Boneseed	
Cirsium arvense	Perennial Thistle	
Cirsium vulgare	Spear Thistle	Recorded
Conium maculatum	Hemlock	
Convolvulus arvensis	Common Bindweed	
Crataegus monogyna	Hawthorn	Recorded
Cynara cardunculus subsp. *flavescens*	Artichoke Thistle	
Cytisus scoparius	English Broom	
Datura stramonium	Common Thorn-apple	
Diplotaxis tenuifolia	Sand Rocket	
Dipsacus fullonum	Wild Teasel	
Dittrichia graveolens	Stinkwort	
Echium plantagineum	Paterson's Curse	
Echium vulgare	Viper's Bugloss	
Eragrostis curvula	African Love-grass	
Genista linifolia	Flax-leaf Broom	
Genista monspessulana	Montpellier Broom	
Hypericum perforatum subsp. *veronense*	St John's Wort	
Juncus acutus subsp. *acutus*	Spiny Rush	Recorded
Lepidium draba	Hoary Cress	
Lycium ferocissimum	African Box-thorn	
Marrubium vulgare	Horehound	
Moraea miniata	Two-leaf Cape-tulip	

Scientific name	Common name	Recorded in Project Area (Biosis, GHD)?
Nassella trichotoma	Serrated Tussock	Recorded
Opuntia monacantha	Drooping Prickly-pear	
Opuntia stricta	Common Prickly-pear	
Physalis hederifolia	Sticky Ground-cherry	
Rosa rubiginosa	Sweet Briar	Recorded
Rubus fruticosus spp. agg.	Blackberry	
Scolymus hispanicus	Golden Thistle	
Senecio jacobaea	Ragwort	Recorded
Silybum marianum	Variegated Thistle	Recorded
Solanum linnaeanum	Apple of Sodom	
Ulex europaeus	Gorse	Recorded
Watsonia meriana var. *bulbillifera*	Bulbil Watsonia	
Xanthium spinosum	Bathurst Burr	
Restricted		
Allium triquetrum	Angled Onion	
Allium vineale	Crow Garlic	
Asparagus asparagoides	Bridal Creeper	Recorded
Foeniculum vulgare	Fennel	
Nassella neesiana	Chilean Needle-grass	
Opuntia puberula	Blind Prickly-pear	
Opuntia spp.	Prickly pear	Recorded
Oxalis pes-caprae	Soursob	
Reseda luteola	Weld	
Salix alba	White Willow	
Salix cinerea	Grey Sallow	
Salix fragilis	Crack Willow	
Salix spp.	Willow	
Salix X *rubens*	Basket Willow	
Salix X *sepulcralis* var. *sepulcralis*	Weeping Willow	
Verbascum thapsus subsp. *thapsus*	Great Mullein	
Regionally Prohibited		
Chondrilla juncea	Skeleton Weed	
Emex australis	Spiny Emex	
Onopordum acanthium subsp. *acanthium*	Scotch Thistle	
Opuntia robusta	Wheel Cactus	
Solanum elaeagnifolium	Silver-leaf Nightshade	
State prohibited		

Scientific name	Common name	Recorded in Project Area (Biosis, GHD)?
Alternanthera philoxeroides	Alligator Weed	
Eichhornia crassipes	Water Hyacinth	
Nassella charruana	Lobed Needle-grass	Recorded

Appendix E – Field survey data – vegetation (Biosis 2020, GHD 2020)

Table E1 VQA scores for patches of native vegetation mapped within the construction corridor, Biosis 2020

Habitat Zone ID			191010-1	191010-2	191022-1	191022-2	191118-1	191118-2	191118-3	191118-4
EVC #			55_61	55_61	132_61	132_61	132_61	132_61	132_61	132_61
Max Score			Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Trees	10	0	0	0	0	0	0	0	0
	Canopy Cover	5	0	0	0	0	0	0	0	0
	Lack of Weeds	15	0	0	4	4	7	2	2	4
	Understorey	25	5	5	5	5	5	5	5	5
	Recruitment	10	5	5	6	6	3	6	6	0
	Organic Matter	5	3	3	2	2	4	2	4	3
	Logs	5	0	0	0	0	0	0	0	0
	Total Site Score		13	13	23	23	26	20	23	16
Landscape Value	Patch Size	10	1	1	1	1	1	1	1	1
	Neighbourhood	10	2	2	2	2	0	0	0	1
	Distance to Core	5	1	1	1	1	1	1	1	1
	Total Landscape Score		4	4	4	4	2	2	2	3
Standardiser			1.00	1.00	1.36	1.36	1.36	1.36	1.36	1.36
HABITAT SCORE		100	17	17	27	27	28	22	25	19
Habitat points = #/100		1	0.17	0.17	0.27	0.27	0.28	0.22	0.25	0.19
Habitat Zone area (ha)			0.03	0.30	0.10	0.22	0.06	0.06	0.03	0.04
Habitat ha (Hha)			0.01	0.05	0.03	0.06	0.02	0.01	0.01	0.01

VQA scores for patches of native vegetation mapped within the construction corridor, Biosis 2020

Habitat Zone ID			191118-5	191118-6	191119-1	191119-2	191119-3	191119-4	191119-5	191119-6
EVC #			132_61	132_61	132_61	132_61	132_61	132_61	132_61	132_61
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Trees	10	0	0	0	0	0	0	0	0
	Canopy Cover	5	0	0	0	0	0	0	0	0
	Lack of Weeds	15	7	6	2	7	7	0	4	7
	Understorey	25	5	5	5	15	5	5	5	5
	Recruitment	10	0	3	3	6	6	6	3	6
	Organic Matter	5	3	2	5	5	3	4	5	5
	Logs	5	0	0	0	0	0	0	0	0
	Total Site Score		20	22	20	45	29	20	23	31
Landscape Value	Patch Size	10	1	1	1	1	1	1	1	1
	Neighbourhood	10	1	0	1	1	1	1	1	3
	Distance to Core	5	1	1	1	1	1	1	1	1
	Total Landscape Score	e	3	2	3	3	3	3	3	5
Standardiser			1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36
HABITAT SCORE		100	23	24	23	48	32	23	26	36
Habitat points = #/100		1	0.23	0.24	0.23	0.48	0.32	0.23	0.26	0.36
Habitat Zone area (ha)			0.10	0.10	0.05	0.52	0.12	0.03	0.05	0.27
Habitat ha (Hha)			0.02	0.02	0.01	0.25	0.04	0.01	0.01	0.10

VQA scores for patches of native vegetation mapped within the construction corridor, Biosis 2020

Habitat Zone ID			191119-7	191119-8	191126-1	191126-2	191126-3	191203-1	191203-2	191203-3
EVC #			132_61	641	125	132_61	132_61	55_61	55_61	55_61
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Trees	10	0	10	-	0	0	0	0	0
	Canopy Cover	5	0	5	-	0	0	0	0	0
	Lack of Weeds	15	7	0	-	7	7	6	7	7
	Understorey	25	5	15	-	5	5	15	5	5
	Recruitment	10	3	3	-	3	6	3	0	0
	Organic Matter	5	2	5	-	2	5	4	4	4
	Logs	5	0	0	-	0	0	0	0	0
	Total Site Score		23	38	-	23	31	28	16	16
Landscape Value	Patch Size	10	1	1	-	1	1	1	1	1
	Neighbourhood	10	2	3	-	3	3	1	1	1
	Distance to Core	5	1	1	-	1	1	1	1	1
	Total Landscape Score	e	4	5		5	5	3	3	3
Standardiser			1.36	1.00	1.36	1.36	1.36	1.00	1.00	1.00
HABITAT SCORE		100	27	43	20*	28	36	31	19	19
Habitat points = #/100		1	0.27	0.43	0.20	0.28	0.36	0.31	0.19	0.19
Habitat Zone area (ha)			0.44	0.07	0.26	0.09	0.03	0.03	0.03	0.03
Habitat ha (Hha)			0.12	0.03	0.05	0.02	0.01	0.01	0.01	0.01

* DELWP modelled condition score

VQA scores for patches of native vegetation mapped within the construction corridor, Biosis 2020

Habitat Zone ID			191203-4	191203-5	191203-6	191206-1	191206-2	191206-3	191206-4	191211-1
EVC #			132_61	55_61	132_61	132_61	55_61	132_61	132_61	132_61
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Trees	10	0	0	0	0	4	0	0	0
	Canopy Cover	5	0	3	0	0	3	0	0	0
	Lack of Weeds	15	0	0	4	2	4	7	9	6
	Understorey	25	5	5	5	5	5	10	5	5
	Recruitment	10	3	5	6	6	5	6	6	3
	Organic Matter	5	4	4	4	4	4	5	5	4
	Logs	5	0	0	0	0	0	0	0	0
	Total Site Score		16	17	26	23	25	38	34	24
Landscape Value	Patch Size	10	1	1	1	1	1	1	1	1
	Neighbourhood	10	0	1	1	1	2	1	1	0
	Distance to Core	5	1	1	1	1	1	1	1	1
	Total Landscape Score		2	3	3	3	4	3	3	2
Standardiser			1.36	1.00	1.36	1.36	1.00	1.36	1.36	1.36
HABITAT SCORE		100	18	20	29	26	29	41	37	26
Habitat points = #/100		1	0.18	0.20	0.29	0.26	0.29	0.41	0.37	0.26
Habitat Zone area (ha)			0.08	0.31	0.05	1.78	2.39	0.67	0.81	0.47
Habitat ha (Hha)			0.01	0.06	0.01	0.47	0.69	0.27	0.30	0.12

VQA scores for patches of native vegetation mapped within the construction corridor, Biosis 2020

Habitat Zone ID			191211-2	191211-3	191212-1	191212-2	191212-3	191212-4	191213-1	191213-2
EVC #			649	649	132_61	132_61	132_61	132_61	641	132_61
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Trees	10	0	0	0	0	0	0	10	0
	Canopy Cover	5	0	0	0	0	0	0	3	0
	Lack of Weeds	15	6	6	2	2	6	2	6	2
	Understorey	25	5	5	5	5	5	5	15	5
	Recruitment	10	6	6	3	3	3	3	3	3
	Organic Matter	5	4	4	2	4	5	4	2	2
	Logs	5	0	0	0	0	0	0	0	0
	Total Site Score		29	29	16	19	26	19	39	16
Landscape Value	Patch Size	10	1	1	1	1	1	1	1	1
	Neighbourhood	10	0	0	0	0	0	0	1	0
	Distance to Core	5	1	1	0	1	1	1	1	1
	Total Landscape Score		2	2	1	2	2	2	3	2
Standardiser			1.36	1.36	1.36	1.36	1.36	1.36	1.00	1.36
HABITAT SCORE		100	31	31	17	21	28	21	42	18
Habitat points = #/100		1	0.31	0.31	0.17	0.21	0.28	0.21	0.42	0.18
Habitat Zone area (ha)			0.02	0.04	0.03	0.06	0.08	0.23	0.10	0.18
Habitat ha (Hha)			0.01	0.01	0.01	0.01	0.02	0.05	0.04	0.03

VQA scores for patches of native vegetation mapped within the construction corridor, Biosis 2020

Habitat Zone ID			191213-3	191213-4	191214-1	191214-2	191214-3	191214-4	191214-5	191214-6
EVC #			132_61	132_61	132_61	653	132_61	132_61	132_61	132_61
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Trees	10	0	0	0	0	0	0	0	0
	Canopy Cover	5	0	0	0	0	0	0	0	0
	Lack of Weeds	15	4	4	6	9	6	6	7	6
	Understorey	25	5	5	5	5	5	5	5	5
	Recruitment	10	3	3	3	3	3	3	6	3
	Organic Matter	5	4	4	4	5	4	3	3	5
	Logs	5	0	0	0	0	0	0	0	0
	Total Site Score		22	22	24	30	24	23	29	26
Landscape Value	Patch Size	10	1	1	1	1	1	1	1	1
	Neighbourhood	10	1	1	3	0	3	1	1	1
	Distance to Core	5	1	1	1	1	1	1	1	1
	Total Landscape Score		3	3	5	2	5	3	3	3
Standardiser			1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36
HABITAT SCORE		100	25	25	29	32	29	26	32	29
Habitat points = #/100		1	0.25	0.25	0.29	0.32	0.29	0.26	0.32	0.29
Habitat Zone area (ha)			0.37	0.04	0.04	0.06	0.06	0.27	0.03	0.08
Habitat ha (Hha)			0.09	0.01	0.01	0.02	0.02	0.07	0.01	0.02

VQA scores for patches of native vegetation mapped within the construction corridor, Biosis 2020

Habitat Zone ID			191214-7	191214-8	191217-1	191217-2	191217-3	191217-4	191217-5	191218-1
EVC #			132_61	803	649	55_61	132_61	55_61	649	132_61
Max Score			Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Trees	10	0	10	0	0	0	6	0	0
	Canopy Cover	5	0	3	0	0	0	5	0	0
	Lack of Weeds	15	6	0	6	7	7	0	9	2
	Understorey	25	5	5	5	5	10	5	5	5
	Recruitment	10	3	10	3	0	10	5	6	3
	Organic Matter	5	5	2	2	5	4	5	4	4
	Logs	5	0	0	0	0	0	0	0	0
	Total Site Score		26	30	22	17	42	26	33	19
Landscape Value	Patch Size	10	1	1	1	1	1	1	1	1
	Neighbourhood	10	1	0	0	1	2	1	0	1
	Distance to Core	5	1	1	1	1	1	1	1	1
	Total Landscape Score		3	2	2	3	4	3	2	3
Standardiser			1.36	1.00	1.36	1.00	1.36	1.00	1.36	1.36
HABITAT SCORE		100	29	32	24	20	46	29	35	22
Habitat points = #/100		1	0.29	0.32	0.24	0.20	0.46	0.29	0.35	0.22
Habitat Zone area (ha)			0.04	0.07	0.09	0.01	1.50	0.10	0.06	0.39
Habitat ha (Hha)			0.01	0.02	0.02	0.00	0.69	0.03	0.02	0.09

VQA scores for patches of native vegetation mapped within the construction corridor, Biosis 2020

Habitat Zone ID			191218-2	191218-3	200109-1	200109-2	200128-1	200130-1	200214-1	200214-2
EVC #			132_61	132_61	132_61	132_61	641	132_61	132_61	132_61
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Trees	10	0	0	0	0	10	0	0	0
	Canopy Cover	5	0	0	0	0	5	0	0	0
	Lack of Weeds	15	2	9	4	7	4	6	4	4
	Understorey	25	5	5	5	5	15	10	5	5
	Recruitment	10	3	3	6	6	10	6	6	6
	Organic Matter	5	4	5	3	3	5	2	2	4
	Logs	5	0	0	0	0	0	0	0	0
	Total Site Score		19	30	24	29	49	33	23	26
_andscape Value	Patch Size	10	1	1	1	1	1	1	1	1
	Neighbourhood	10	1	1	0	0	2	3	0	0
	Distance to Core	5	1	1	1	1	1	1	1	1
	Total Landscape Score		3	3	2	2	4	5	2	2
Standardiser			1.36	1.36	1.36	1.36	1.00	1.36	1.36	1.36
HABITAT SCORE		100	22	33	26	31	53	38	25	28
Habitat points = #/100		1	0.22	0.33	0.26	0.31	0.53	0.38	0.25	0.28
Habitat Zone area (ha)			0.57	0.30	0.04	0.12	0.07	0.48	0.02	0.47
Habitat ha (Hha)			0.13	0.10	0.01	0.04	0.04	0.18	0.00	0.13

Table E2 VQA and modelled condition scores (where applicable) for patches of native vegetation mapped within the construction corridor, Biosis 2020

Habitat Zone ID			200214-3	1TP829278	10LP215406	1LP200366	1TP212870	6LP136262	9LP136262
EVC #			132_61	132_61	132_61	55_61	132_61	132_61	132_61
		Max Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Trees	10	0	-	-	-	-	-	-
	Canopy Cover	5	0	-	-	-	-	-	-
	Lack of Weeds	15	9	-	-	-	-	-	-
	Understorey	25	5	-	-	-	-	-	-
	Recruitment	10	6	-	-	-	-	-	-
	Organic Matter	5	5	-	-	-	-	-	-
	Logs	5	0	-	-	-	-	-	-
	Total Site Score		34	-	-	-	-	-	-
Landscape Value	Patch Size	10	1	-	-	-	-	-	-
	Neighbourhood	10	0	-	-	-	-	-	-
	Distance to Core	5	1	-	-	-	-	-	-
	Total Landscape Score		2	-	-	-	-	-	-
Standardiser			1.36	1.36	1.36	1.00	1.36	1.36	1.36
HABITAT SCORE/MODELLED CONDITION SCORE		100	36	75*	80*	75*	72*	63*	20*
Habitat points = #/100		1	0.36	0.75	0.80	0.75	0.72	0.63	0.20
Habitat Zone area (ha)			0.68	0.10	0.32	4.05	1.63	0.50	0.40
Habitat ha (Hha)			0.25	0.07	0.25	3.04	1.17	0.32	0.08

Table E3 GHD April and May 2020 VQA results

Habitat Zone ID			HZ_1	HZ_2
EVC #			132_61	55
		Max Score	Score	Score
Site Condition	Large Trees	10	N/A	0
	Canopy Cover	5	N/A	0
	Lack of Weeds	15	0	7
	Understorey	25	5	5
	Recruitment	10	3	0
	Organic Matter	5	0	3
	Logs	5	N/A	0
	Total Site Score		10.9	15
Landscape Value	Patch Size	10	1	1
	Neighbourhood	10	1	0
	Distance to Core	5	0	1
	Total Landscape Score		2	2
Standardiser			1.36	1
HABITAT SCORE		100	16.3	17
Habitat points = #/100		1	0.16	0.17
Habitat Zone area (ha)			0.08	0.39
Habitat ha (Hha)			0.013	0.07

Table E4 GHD July 2020 VQA results

Condition scores for HZ2 represent two parcels with differing landscape context scores

Habitat Zone ID			HZ_1	HZ_2
EVC #			55	55
		Max Score	Score	Score
Site Condition	Large Trees	10	10	0
	Canopy Cover	5	5	0
	Lack of Weeds	15	9	11
	Understorey	25	15	5
	Recruitment	10	1	1
	Organic Matter	5	5	3
	Logs	5	0	0
	Total Site Score		45	20
Landscape Value	Patch Size	10	6	1-6
	Neighbourhood	10	1.8	0-1.8
	Distance to Core	5	3	0-3
	Total Landscape Score		10.8	1-12.8
Standardiser			1	1
HABITAT SCORE		100	56	21-33
Habitat points = #/100		1	0.56	0.21-0.33
Habitat Zone area (ha)			0.14	0.04
Habitat ha (Hha)			0.08	0.01

Table E5 GHD November/December 2020 VQA results

Habitat Zone ID			HZ_1	HZ_2
EVC #			132_61	55
		Max Score	Score	Score
Site Condition	Large Trees	10	N/A	N/A
	Canopy Cover	5	N/A	N/A
	Lack of Weeds	15	4	6
	Understorey	25	10	5
	Recruitment	10	0	3
	Organic Matter	5	3	2
	Logs	5	N/A	N/A
	Total Site Score		17	28.56
Landscape Value	Patch Size	10	2	1
	Neighbourhood	10	0	1
	Distance to Core	5	1.3	0
	Total Landscape Score		2.3	2
Standardiser			1	1
HABITAT SCORE		100	21	31
Habitat points = #/100		1	0.21	0.31
Habitat Zone area (ha)			2	.3
Habitat ha (Hha)			0.41	.093

Table E6 GHD March 2021 VQA results

Habitat Zone ID			HZ_1	HZ_2
EVC #			132_61	125
		Max Score	Score	Score
Site Condition	Large Trees	10	N/A	N/A
	Canopy Cover	5	N/A	N/A 0
	Lack of Weeds	15	0	7
	Understorey	25	10	5
	Recruitment	10	3	3
	Organic Matter	5	5	5
	Logs	5	N/A	0
	Total Site Score		31	20
Landscape Value	Patch Size	10	1	1
	Neighbourhood	10	0	0
	Distance to Core	5	2.6	2.6
	Total Landscape Score		3.6	3.6
Standardiser			1.36	1.36
HABITAT SCORE		100	31	20
Habitat points = #/100		1	0.16	0.21.3
Habitat Zone area (ha)			0.1	0.01
Habitat ha (Hha)			0.013	0.07

Appendix F – Canopy trees and scattered trees recorded in the construction corridor (Biosis 2020, GHD 2020)

Table F1 Large canopy trees within patches impacted by the construction corridor (Biosis, 2020; GHD, 2020)

Scientific name	Common name	DBH	MSA
Eucalyptus camaldulensis	River Red Gum	85	Inside MSA
Eucalyptus camaldulensis	River Red Gum	81	Inside MSA
Eucalyptus camaldulensis	River Red Gum	110	Inside MSA
Eucalyptus microcarpa	Grey Box	87	Outside MSA
Eucalyptus camaldulensis	River Red Gum	125	Outside MSA
Eucalyptus camaldulensis	River Red Gum	89	Outside MSA
Eucalyptus camaldulensis	River Red Gum	94	Outside MSA
Eucalyptus microcarpa	Grey Box	122	Outside MSA
Eucalyptus camaldulensis	River Red Gum	87.5	Outside MSA
Eucalyptus camaldulensis	River Red Gum	80	Outside MSA
Eucalyptus camaldulensis	River Red Gum	90	Outside MSA
Eucalyptus camaldulensis	River Red Gum	90	Outside MSA

Table F2 Scattered trees impacted by construction of the Project (Biosis, 2020; GHD, 2020)

Scientific name	DBH (cm)	Size class	Type	MSA
Eucalyptus camaldulensis	10	Small	Scattered	Inside MSA
Eucalyptus camaldulensis	28	Small	Scattered	Inside MSA
Eucalyptus camaldulensis	37	Small	Scattered	Inside MSA
Eucalyptus camaldulensis	43	Small	Scattered	Inside MSA
Eucalyptus camaldulensis	30	Small	Scattered	Inside MSA
Eucalyptus camaldulensis	34	Small	Scattered	Inside MSA
Eucalyptus melliodora	65	Small	Scattered	Outside MSA
Eucalyptus leucoxylon subsp. leucoxylon	54	Small	Scattered	Outside MSA
Eucalyptus leucoxylon subsp. leucoxylon	54	Small	Scattered	Outside MSA
Eucalyptus leucoxylon subsp. leucoxylon	46	Small	Scattered	Outside MSA
Eucalyptus leucoxylon subsp. leucoxylon	20	Small	Scattered	Outside MSA
Eucalyptus leucoxylon subsp. leucoxylon	52	Small	Scattered	Outside MSA
Eucalyptus camaldulensis	5	Small	Scattered	Outside MSA
Eucalyptus leucoxylon subsp. leucoxylon	8	Small	Scattered	Outside MSA
Eucalyptus leucoxylon subsp. leucoxylon	13	Small	Scattered	Outside MSA
Eucalyptus Microcarpa	34	Small	Scattered	Outside MSA
Eucalyptus camaldulensis	113	Large	Scattered	Inside MSA
Eucalyptus camaldulensis	98	Large	Scattered	Inside MSA
Eucalyptus viminalis	122	Large	Scattered	Inside MSA
Eucalyptus viminalis	126	Large	Scattered	Inside MSA
Eucalyptus camaldulensis	125	Large	Scattered	Inside MSA
Eucalyptus camaldulensis	143	Large	Scattered	Inside MSA
Eucalyptus microcarpa	100	Large	Scattered	Outside MSA
Eucalyptus camaldulensis	90	Large	Scattered	Outside MSA
Eucalyptus camaldulensis	118	Large	Scattered	Outside MSA
Eucalyptus camaldulensis	141	Large	Scattered	Outside MSA
Eucalyptus melliodora	86	Large	Scattered	Outside MSA
Eucalyptus melliodora	131	Large	Scattered	Outside MSA
Eucalyptus melliodora	121	Large	Scattered	Outside MSA
Eucalyptus camaldulensis	93	Large	Scattered	Outside MSA
Eucalyptus camaldulensis	156	Large	Scattered	Outside MSA
Eucalyptus camaldulensis	118	Large	Scattered	Outside MSA

Appendix G – Spiny Rice-flower survey results (Biosis 2020, GHD 2020)

Table G1 Spiny Rice-flower survey results, Biosis 2020

Parcel identifier	KP Start to Finish	Survey date
APS709426	0.0 to 1.1	22/11/2019
8BPP3061	1.1 to 1.3	24/07/2019
218165707	2.3 to 2.4	24/07/2019
10LP116565	2.4 to 3.1	24/07/2019
425711870	3.1 to 3.2	24/07/2019
218160972	3.2 to 3.2	24/07/2019
1TP132544	3.2 to4.1	24/07/2019
1TP710684	3.2 to 4.8	24/07/2019
1TP901066	4.8 to 6.4	24/07/2019
218162378	6.4 to 6.4	24/07/2019
218162862	6.4 to 6.4	24/07/2019
2LP119116	6.4 to 8.3	24/07/2019
1TP946706	8.3 to 8.3	24/07/2019
2PS343496	8.3 to 8.7	24/07/2019
218166927	8.7 to 8.7	14/02/2020
218257150	8.7 to 8.8	14/02/2020
1TP829278	8.8 to 9.1	-
1TP710576	9.1 to 9.2	9/09/2019
2LP90878	9.2 to 9.6	24/07/2019
2015PP2761	9.6 to 9.6	18/12/2019
5LP92520	9.6 to 10.0	9/09/2019
6LP92520	10.0 to 10.1	9/09/2019
10LP215406	10.1 to 10.3	9/09/2019
11LP215406	10.3 to 10.5	14/12/2019
11LP92520	10.5 to 10.6	18/11/2019
12LP92520	10.6 to 10.8	24/07/2019
218265274	10.8 to 10.8	18/12/2019
13LP92520	10.8 to 11.1	24/07/2019
218260126	11.1 to 11.2	18/12/2019
2LP137651	11.2 to 11.3	14/12/2019
1LP137651	11.3 to 11.5	14/12/2019
D16PP2761	11.5 to 12.0	14/12/2019
3PS635728	12.4 to 12.9	19/11/2019
1TP333383	12.9 to 13.7	24/07/2019
2029PP2761	13.7 to 13.7	24/07/2019
2010PP2258	13.7 to 13.8	11/12/2019
1TP909157	13.8 to 14.8	11/12/2019
218261530	14.8 to 14.8	18/12/2019
218261878	14.8 to 14.8	18/12/2019
1LP200366	14.8 to 15.6	-
4LP200366	16.4 to 16.7	2/10/2019
3LP200366	15.7 to 16.4	22/10/2019
2002PP2258	16.7 to 16.7	28/01/2020
1TP424528	16.7 to 16.9	19/11/2019

SRF detected

\- No survey

Table G2 GHD 2020 winter surveys for Spiny Rice-flower

Parcel identifier	KP	Survey date
1TP829278	8.8 to 9.1	28/04/2020 and 29/05/2020
1LP200366	14.8 to 15.6	28/04/2020 and 29/05/2020
1LP137651	11.3 to 11.5	17/07/2020 and 28 – 29/07/2020
2LP137651	11.2 to 11.3	17/07/2020 and 28 – 29/07/2020
218260126	11.2	17/07/2020 and 28 – 29/07/2020
4LP200366	16.4 to 16.7	17/07/2020 and 28 – 29/07/2020
218261878	14.8	17/07/2020 and 28 – 29/07/2020
218261530	14.8	17/07/2020 and 28 – 29/07/2020
218260126	13.1	17/07/2020 and 28 – 29/07/2020
1TP333383	12.9 to 13.7	17/07/2020 and 28 – 29/07/2020
228868352	8.7	17/07/2020 and 28 – 29/07/2020
218166927	8.7	17/07/2020 and 28 – 29/07/2020
2PS343496	8.3 to 8.7	17/07/2020 and 28 – 29/07/2020
D16PP2761	11.5 to 12	17/07/2020 and 28 – 29/07/2020
1TP909157	13.8 to 14.8	17/07/2020 and 28 – 29/07/2020
3PS635728	12.4 to 12.9	17/07/2020 and 28 – 29/07/2020

Appendix H – Spring targeted flora survey results (Biosis 2020, GHD 2020)

Table H1 Biosis 2020 targeted spring flora surveys

Parcel identifier	KP Start to Finish	Survey date
APS709426	0.0 to 1.1	N/A
8BPP3061	1.1 to 1.3	N/A
218165707	2.3 to 2.4	N/A
10LP116565	2.4 to 3.1	N/A
425711870	3.1 to 3.2	N/A
218160972	3.2 to 3.2	N/A
1TP132544	3.2 to 4.1	N/A
1TP710684	3.2 to 4.8	N/A
1TP901066	4.8 to 6.4	N/A
218162378	6.4 to 6.4	N/A
218162862	6.4 to 6.4	N/A
2LP119116	6.4 to 8.3	30/09/2019
1TP946706	8.3 to 8.3	30/09/2019
2PS343496	8.3 to 8.7	30/09/2019
218166927	8.7 to 8.7	N/A
218257150	8.7 to 8.8	N/A
1TP829278	8.8 to 9.1	-
1TP710576	9.1 to 9.2	N/A
2LP90878	9.2 to 9.6	N/A
2015PP2761	9.6 to 9.6	N/A
5LP92520	9.6 to 10.0	N/A
6LP92520	10.0 to 10.1	N/A
10LP215406	10.1 to 10.3	N/A
11LP215406	10.3 to 10.5	-
11LP92520	10.5 to 10.6	-
12LP92520	10.6 to 10.8	30/09/2019
218265274	10.8 to 10.8	30/09/2019
13LP92520	10.8 to 11.1	30/09/2019
218260126	11.1 to 11.2	N/A
2LP137651	11.2 to 11.3	N/A
1LP137651	11.3 to 11.5	N/A
D16PP2761	11.5 to 12.0	N/A
3PS635728	12.4 to 12.9	30/09/2019
1TP333383	12.9 to 13.7	30/09/2019
2029PP2761	13.7 to 13.7	N/A
2010PP2258	13.7 to 13.8	N/A
1TP909157	13.8 to 14.8	N/A
218261530	14.8 to 14.8	N/A
218261878	14.8 to 14.8	N/A
1LP200366	14.8 to 15.6	-
4LP200366	16.4 to 16.7	2/10/2019
3LP200366	15.7 to 16.4	22/10/2019
2002PP2258	16.7 to 16.7	N/A
1TP424528	16.7 to 16.9	N/A
218265262	16.9 to 17.0	N/A
1TP107502	17.0 to 17.6	2/10/2019
2LP130112	17.6 to 17.9	2/10/2019
1LP130112	17.9 to 18.3	2/10/2019
218268694	18.3 to 18.3	2/10/2019
218261314	18.3 to 18.3	2/10/2019
B7PP2258	18.3 to 19.0	3/10/2019
218264222	19.0 to 19.0	N/A
5LP88261	19.0 to 19.4	2/10/2019
10LP110642	19.4 to 20.2	2/10/2019
2LP218160	20.2 to 21.4	2/10/2019
1TP212870	21.4 to 21.6	-
218271946	21.6 to 21.6	N/A
1TP104933	21.6 to 21.6	N/A
2LP68808	21.6 to 22.1	N/A
1PS733043	22.1 to 22.6	2/10/2019
218266378	22.6 to 22.7	2/10/2019
218268306	22.7 to 22.7	2/10/2019
1PS733045	22.7 to 24.2	2/10/2019

	Spring flora target species detected
-	No survey
N/A	No suitable habitat

Parcel identifier	KP Start to Finish	Survey date
2PS503800	24.2 to 24.4	2/10/2019
3PS503800	24.4 to 24.5	2/10/2019
1PS503800	24.5 to 26.1	2/10/2019
2LP218323	26.1 to 26.4	2/10/2019
218263730	26.4 to 26.4	2/10/2019
218260106	26.4 to 27.0	N/A
32LP93445	27.0 to 27.4	N/A
33LP93445	27.2	N/A
5LP92893	27.4 to 27.5	N/A
4LP92893	27.5 to 27.7	1/10/2019
1TP108439	27.7 to 28.0	1/10/2019
218271310	28.0 to 28.1	1/10/2019
1TP947284	28.1 to 28.4	1/10/2019
1LP211254	28.4 to 29.1	N/A
PPS816942	29.1 to 29.8	9/10/2019
426092500	30.2 to 30.2	9/10/2019
AAPS746088	30.7	N/A
1LP126752	31.1 to 31.3	9/10/2019
2PS714700	32.1 to 33.1	9/10/2019
2PS714688	32.1 to 33.1	9/10/2019
CPS805151	32.1 to 33.1	9/10/2019
4LP126752	31.7 to 32.1	9/10/2019
2TP215633	33.1 to 33.4	9/10/2019
1TP201330	33.4 to 34.0	1/10/2019
218258374	34.0 to 34.0	1/10/2019
29PP3100	34.0 to 35.5	1/10/2019
1LP136262	35.5 to 35.7	1/10/2019
2LP136262	35.7 to 35.8	1/10/2019
3LP136262	35.8 to 36.0	1/10/2019
4LP136262	36.0 to 36.1	1/10/2019
5LP136262	36.1 to 36.3	1/10/2019
6LP136262	36.3 to 36.4	1/10/2019
7LP136262	36.4 to 36.6	1/10/2019
8LP136262	36.6 to 36.8	1/10/2019
9LP136262	36.8 to 36.9	1/10/2019
10LP136262	36.9 to 37.1	1/10/2019
218299285	37.1 to 37.1	1/10/2019
218266966	37.1 to 37.1	N/A
218263378	37.1 to 37.2	N/A
2LP123742	37.2 to 37.7	N/A
1LP221466	37.7 to 38.5	-
2LP221466	38.5 to 39.0	N/A
10LP5364	39.0 to 39.8	N/A
1LP113763	39.8 to 40.2	8/10/2019
2LP113763	40.2 to 41.1	8/10/2019
1TP599592	41.1 to 41.1	N/A
1TP332315	41.1 to 41.1	N/A
6TP394032	41.1 to 42.7	10/10/2019
1TP709372	42.7 to 42.8	10/10/2019
2LP67181	42.8 to 44.7	1/10/2019
2TP843230	44.7 to 44.8	7/10/2019
1TP746632	44.8 to 45.3	7/10/2019
PC372952	45.3 to 45.4	7/10/2019
1LP208748	45.4 to 47.0	7/10/2019
218359831	47.0 to 47.0	7/10/2019
1LP38239	47.0 to 48.8	8/10/2019
1TP709759	48.8 to 49.6	8/10/2019
2LP133657	49.6 to 50.2	8/10/2019
218355271	50.2 to 50.3	8/10/2019
1TP168481	50.3 to 50.4	1/10/2019
1TP710356	50.4 to 50.7	1/10/2019
2LP130336	50.7 to 51.0	1/10/2019

	Spring flora target species detected
-	No survey
N/A	No suitable habitat

Table H2 GHD 2020 spring targeted flora surveys

Parcel	KP	Survey date
5LP92520	9.6 to 10.0	28/04/2020 and 29/05/2020
10LP215406	10.1 to 10.3	28/04/2020 and 29/05/2020
1TP829278	8.8 to 9.1	28/04/2020 and 29/05/2020

Appendix I – Late spring / summer flora targeted survey results (Biosis 2020, GHD 2020)

Table I1 Survey results from late spring / summer targeted flora surveys, Biosis 2020

Parcel identifier	KP Start to Finish	Survey date
APS709426	0.0 to 1.1	22/11/2019
8BPP3061	1.1 to 1.3	18/11/2019
218165707	2.3 to 2.4	9/01/2020
10LP116565	2.4 to 3.1	18/11/2019
425711870	3.1 to 3.2	9/01/2020
218160972	3.2 to 3.2	9/01/2020
1TP132544	4.1	9/12/2019
1TP710684	3.2 to 4.8	9/12/2019
1TP901066	4.8 to 6.4	18/11/2019
218162378	6.4 to 6.4	9/01/2020
218162862	6.4 to 6.4	9/01/2020
2LP119116	6.4 to 8.3	18/11/2019
1TP946706	8.3 to 8.3	18/11/2019
2PS343496	8.3 to 8.7	18/11/2019 (1 x D. longifolia var. grandis)
218166927	8.7 to 8.7	14/02/2020
218257150	8.7 to 8.8	14/02/2020
1TP829278	8.8 to 9.1	19/11/2020
1TP710576	9.1 to 9.2	14/12/2019
2LP90878	9.2 to 9.6	14/12/2019
2015PP2761	9.6 to 9.6	18/12/2019
5LP92520	9.6 to 10.0	19/11/2020
6LP92520	10.0 to 10.1	N/A
10LP215406	10.1 to 10.3	N/A
11LP215406	10.3 to 10.5	14/12/2019
11LP92520	10.5 to 10.6	19/11/2019
12LP92520	10.6 to 10.8	19/11/2019
218265274	10.8 to 10.8	18/12/2019
13LP92520	10.8 to 11.1	19/11/2019
218260126	11.1 to 11.2	18/12/2019
2LP137651	11.2 to 11.3	14/12/2019
1LP137651	11.3 to 11.5	14/12/2019
D16PP2761	11.5 to 12.0	14/12/2019
3PS635728	12.4 to 12.9	19/11/2019
1TP333383	12.9 to 13.7	19/11/2019
2029PP2761	13.7 to 13.7	19/11/2019
2010PP2258	13.7 to 13.8	11/12/2019
1TP909157	13.8 to 14.8	11/12/2019
218261530	14.8 to 14.8	18/12/2019
218261878	14.8 to 14.8	18/12/2019
1LP200366	14.8 to 15.6	20/11/2020
4LP200366	16.4 to 16.7	20/11/2019
3LP200366	15.7 to 16.4	20/11/2019
2002PP2258	16.7 to 16.7	28/01/2020
1TP424528	16.7 to 16.9	20/11/2019
218265262	16.9 to 17.0	18/12/2019
1TP107502	17.0 to 17.6	26/11/2019
2LP130112	17.6 to 17.9	26/11/2019
1LP130112	17.9 to 18.3	26/11/2019
218268694	18.3 to 18.3	26/11/2019
218261314	18.3 to 18.3	26/11/2019
B7PP2258	18.3 to 19.0	6/12/2019
218264222	19.0 to 19.0	18/12/2019
5LP88261	19.0 to 19.4	6/12/2019
10LP110642	19.4 to 20.2	14/02/2020
2LP218160	20.2 to 21.4	30/01/2020
1TP212870	21.4 to 21.6	20/11/2020
218271946	21.6 to 21.6	18/12/2019
1TP104933	21.6 to 21.6	18/12/2019
2LP68808	21.6 to 22.1	18/12/2019
1PS733043	22.1 to 22.6	18/12/2019
218266378	22.6 to 22.7	18/12/2019
218268306	22.7 to 22.7	18/12/2019 (1 x D. amoena)

	Late spring / summer flora target species detected
-	No survey
N/A	No suitable habitat

Parcel identifier	KP Start to Finish	Survey date
1PS733045	22.7 to 24.2	6/12/2019
2PS503800	24.2 to 24.4	30/01/2020
3PS503800	24.4 to 24.5	30/01/2020
1PS503800	24.5 to 26.1	6/12/2019
2LP218323	26.1 to 26.4	3/12/2019
218263730	26.4 to 26.4	17/12/2019
218260106	26.4 to 27.0	17/12/2019
32LP93445	27.0 to 27.4	3/12/2019
33LP93445	27.2	3/12/2019
5LP92893	27.4 to 27.5	3/12/2019
4LP92893	27.5 to 27.7	3/12/2019
1TP108439	27.7 to 28.0	3/12/2019
218271310	28.0 to 28.1	3/12/2019
1TP947284	28.1 to 28.4	3/12/2019
1LP211254	28.4 to 29.1	3/12/2019
PPS816942	29.1 to 29.8	18/12/2019
426092500	30.2 to 30.2	18/12/2019
AAPS746088	30.7	13/12/2019
1LP126752	31.1 to 31.3	18/12/2019
2PS714700	32.1 to 33.1	13/12/2019
2PS714688	32.1 to 33.1	13/12/2019
CPS805151	32.1 to 33.1	13/12/2019
4LP126752	31.7 to 32.1	18/12/2019
2TP215633	33.1 to 33.4	12/12/2019
1TP201330	33.4 to 34.0	12/12/2019
218258374	34.0 to 34.0	12/12/2019
29PP3100	34.0 to 35.5	12/12/2019
1LP136262	35.5 to 35.7	30/01/2020
2LP136262	35.7 to 35.8	30/01/2020
3LP136262	35.8 to 36.0	14/02/2020
4LP136262	36.0 to 36.1	14/02/2020
5LP136262	36.1 to 36.3	13/12/2019
	Late spring / summer flora target species detected	

Parcel identifier	KP Start to Finish	Survey date
6LP136262	36.3 to 36.4	-
7LP136262	36.4 to 36.6	13/12/2019
8LP136262	36.6 to 36.8	13/12/2019
9LP136262	36.8 to 36.9	-
10LP136262	36.9 to 37.1	12/12/2019
218299285	37.1 to 37.1	17/12/2019
218266966	37.1 to 37.1	17/12/2019
218263378	37.1 to 37.2	17/12/2019
2LP123742	37.2 to 37.7	12/12/2019
1LP221466	37.7 to 38.5	12/12/2019
2LP221466	38.5 to 39.0	12/12/2019
10LP5364	39.0 to 39.8	12/12/2019
1LP113763	39.8 to 40.2	18/12/2019
2LP113763	40.2 to 41.1	18/12/2019
1TP599592	41.1 to 41.1	13/12/2019
1TP332315	41.1 to 41.1	13/12/2019
6TP394032	41.1 to 42.7	13/12/2019
1TP709372	42.7 to 42.8	13/12/2019
2LP67181	42.8 to 44.7	11/12/2019
2TP843230	44.7 to 44.8	11/12/2019
1TP746632	44.8 to 45.3	11/12/2019
PC372952	45.3 to 45.4	11/12/2019
1LP208748	45.4 to 47.0	11/12/2019
218359831	47.0 to 47.0	17/12/2019
1LP38239	47.0 to 48.8	11/12/2019
1TP709759	48.8 to 49.6	11/12/2019
2LP133657	49.6 to 50.2	11/12/2019
218355271	50.2 to 50.3	17/12/2019
1TP168481	50.3 to 50.4	17/12/2019
1TP710356	50.4 to 50.7	17/12/2019
2LP130336	50.7 to 51.0	17/12/2019 (48 x Cullen tenax)

Parcel identifier	KP Start to Finish	Survey date
1PS733045	22.7 to 24.2	6/12/2019
2PS503800	24.2 to 24.4	30/01/2020
3PS503800	24.4 to 24.5	30/01/2020
1PS503800	24.5 to 26.1	6/12/2019
2LP218323	26.1 to 26.4	3/12/2019
218263730	26.4 to 26.4	17/12/2019
218260106	26.4 to 27.0	17/12/2019
32LP93445	27.0 to 27.4	3/12/2019
33LP93445	27.2	3/12/2019
5LP92893	27.4 to 27.5	3/12/2019
4LP92893	27.5 to 27.7	3/12/2019
1TP108439	27.7 to 28.0	3/12/2019
218271310	28.0 to 28.1	3/12/2019
1TP947284	28.1 to 28.4	3/12/2019
1LP211254	28.4 to 29.1	3/12/2019
PPS816942	29.1 to 29.8	18/12/2019
426092500	30.2 to 30.2	18/12/2019
AAPS746088	30.7	13/12/2019
1LP126752	31.1 to 31.3	18/12/2019
2PS714700	32.1 to 33.1	13/12/2019
2PS714688	32.1 to 33.1	13/12/2019
CPS805151	32.1 to 33.1	13/12/2019
4LP126752	31.7 to 32.1	18/12/2019
2TP215633	33.1 to 33.4	12/12/2019
1TP201330	33.4 to 34.0	12/12/2019
218258374	34.0 to 34.0	12/12/2019
29PP3100	34.0 to 35.5	12/12/2019
1LP136262	35.5 to 35.7	30/01/2020
2LP136262	35.7 to 35.8	30/01/2020
3LP136262	35.8 to 36.0	14/02/2020
4LP136262	36.0 to 36.1	14/02/2020
6LP136262	36.3 to 36.4	-
7LP136262	36.4 to 36.6	13/12/2019
8LP136262	36.6 to 36.8	13/12/2019
9LP136262	36.8 to 36.9	-
10LP136262	36.9 to 37.1	12/12/2019
218299285	37.1 to 37.1	17/12/2019
218266966	37.1 to 37.1	17/12/2019
218263378	37.1 to 37.2	17/12/2019
2LP123742	37.2 to 37.7	12/12/2019
1LP221466	37.7 to 38.5	12/12/2019
2LP221466	38.5 to 39.0	12/12/2019
10LP5364	39.0 to 39.8	12/12/2019
1LP113763	39.8 to 40.2	18/12/2019
2LP113763	40.2 to 41.1	18/12/2019
1TP599592	41.1 to 41.1	13/12/2019
1TP332315	41.1 to 41.1	13/12/2019
6TP394032	41.1 to 42.7	13/12/2019
1TP709372	42.7 to 42.8	13/12/2019
2LP67181	42.8 to 44.7	11/12/2019
2TP843230	44.7 to 44.8	11/12/2019
1TP746632	44.8 to 45.3	11/12/2019
PC372952	45.3 to 45.4	11/12/2019
1LP208748	45.4 to 47.0	11/12/2019
218359831	47.0 to 47.0	17/12/2019
1LP38239	47.0 to 48.8	11/12/2019
1TP709759	48.8 to 49.6	11/12/2019
2LP133657	49.6 to 50.2	11/12/2019
218355271	50.2 to 50.3	17/12/2019
1TP168481	50.3 to 50.4	17/12/2019
1TP710356	50.4 to 50.7	17/12/2019
2LP130336	50.7 to 51.0	17/12/2019 (48 x Cullen tenax)

-	No survey

Table I2 GHD 2020-21 Late spring/summer flora surveys

Parcel identifier	KP	Survey date
5LP92520	9.6 to 10.0	28/04/2020 and 29/05/2020
10LP215406	10.1 to 10.3	28/04/2020 and 29/05/2020
6LP136262	36.3 to 36.4	28/04/2020 and 29/05/2020
9LP136262	36.8 to 36.9	28/04/2020 and 29/05/2020
1TP829278	8.8 to 9.1	28/04/2020 and 29/05/2020
1TP212870	21.4 to 21.6	28/04/2020 and 29/05/2020
1LP200366	14.8 to 15.6	28/04/2020 and 29/05/2020
2LP68808	21.6 to 22.1	28/04/2020 and 29/05/2020
228868352	8.6	17/07/2020 and 28 – 29/07/2020
218166927	8.7 to 8.7	17/07/2020 and 28 – 29/07/2020
2PS343496	8.3 to 8.7	17/07/2020 and 28 – 29/07/2020
218260126	11.1 to 11.2	17/07/2020 and 28 – 29/07/2020
2LP137651	11.2 to 11.3	17/07/2020 and 28 – 29/07/2020
1LP137651	11.3 to 11.5	17/07/2020 and 28 – 29/07/2020
D16PP2761	11.5 to 12.0	17/07/2020 and 28 – 29/07/2020
3PS635728	12.4 to 12.9	17/07/2020 and 28 – 29/07/2020
218260126	11.1 to 11.2	17/07/2020 and 28 – 29/07/2020
1TP333383	12.9 to 13.7	17/07/2020 and 28 – 29/07/2020
218261878	14.8 to 14.8	17/07/2020 and 28 – 29/07/2020
218261530	14.8 to 14.8	17/07/2020 and 28 – 29/07/2020
218265262	16.9 to 17.0	17/07/2020 and 28 – 29/07/2020
1TP107502	17.0 to 17.6	17/07/2020 and 28 – 29/07/2020
2LP218160	20.2 to 21.4	17/07/2020 and 28 – 29/07/2020
1PS733043	22.1 to 22.6	17/07/2020 and 28 – 29/07/2020
218266378	22.6 to 22.7	17/07/2020 and 28 – 29/07/2020
218260106	26.4 to 27.0	17/07/2020 and 28 – 29/07/2020
218271310	28.0 to 28.1	17/07/2020 and 28 – 29/07/2020
1TP108439	27.7 to 28.0	17/07/2020 and 28 – 29/07/2020
2LP130336	50.7 to 51.0	17/07/2020 and 28 – 29/07/2020
1TP829278	8.8 to 9.1	19/11/2020 and 20/11/2020
2PS343496	8.3 to 8.7	19/11/2020 and 20/11/2020
218166159	8.6	19/11/2020 and 20/11/2020
1TP333383	12.9 to 13.7	19/11/2020 and 20/11/2020
1TP909157	13.8 to 14.8	19/11/2020 and 20/11/2020
2010PP2258	13.7 to 13.8	19/11/2020 and 20/11/2020
B7PP2258	18.3 to 19.0	19/11/2020 and 20/11/2020

Parcel identifier	KP	Survey date
10LP110642	19.4 to 20.2	19/11/2020 and 20/11/2020
2LP218160	20.2 to 21.4	19/11/2020 and 20/11/2020
5LP88261	19.0 to 19.4	19/11/2020 and 20/11/2020
1PS733045	22.7 to 24.2	19/11/2020 and 20/11/2020
218265906	23.6	19/11/2020 and 20/11/2020
1PS733043	22.1 to 22.6	19/11/2020 and 20/11/2020
1TP947284	28.1 to 28.4	19/11/2020 and 20/11/2020
G/PS819168	28.4 to 29.1	19/11/2020 and 20/11/2020
1/TP427446	29.8 to 30.2	19/11/2020 and 20/11/2020
A/PS702756	30.2 to 31.1	19/11/2020 and 20/11/2020
1/PS714700	32.1 to 33.1	19/11/2020 and 20/11/2020
1/PS714688	32.1 to 33.1	19/11/2020 and 20/11/2020
2PS343496	8.32 to 8.67	3/3/2021

Appendix J – Threatened communities recorded/ predicted to occur within the Project Area (Biosis 2020, GHD 2020)

Key to table:

EPBC Act:

CR - Critically Endangered EN - Endangered

VU - Vulnerable

PMST – Protected Matters Search Tool

FFG Act:

L - Listed as threatened under FFG Act

The following table includes the significant ecological communities that have been recorded from or have potential to occur within the study area. The list of communities is sourced from the DELWP Modelled FFG Act Community (NV2005_FFG_COMM) dataset, the Protected Matters Search Tool (DoE; accessed on 01.04.2019), a review of other relevant DELWP databases and a review of previous reports.

Scientific name	EPBC	FFG	Type of Presence	Vegetation associations	Likelihood of occurrence	Rationale for likelihood ranking
National significance						
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	CR		PMST - Known to occur within area Prior reports – known to occur within the search area	The Grassy Eucalypt Woodland of the Victorian Volcanic Plain correlates with the following EVCs or Floristic Communities identified from the Victorian Volcanic Plain bioregion (although the description and condition thresholds of the listed community must be met) (Threatened Species Scientific Committee 2009): • EVC 55_61 Plains Grassy Woodland • EVC 55-04 Western Basalt Plains Grassy Woodland • EVC 55_63 Higher Rainfall Plains Grassy Woodland • EVC 651 Plains Swampy Woodland • EVC 649 Stony Knoll Shrubland. • EVC 897 Plains Grassland/Plains Grassy Woodland Mosaic. • FFG Act listed Floristic Community 55-04 Western • Basalt Plains (River Red Gum) Grassy Woodland	High	Previously recorded from the broader area. Potential to correlate with higher quality Plains Grassy Woodland and Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland.

Scientific name	EPBC	FFG	Type of Presence	Vegetation associations	Likelihood of occurrence	Rationale for likelihood ranking
Grey Box (*Eucalyptus microcarpa)* Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	EN		PMST – May occur within area	Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South- eastern Australia most likely correlates with the following EVCs or Floristic Communities identified from the Victorian Volcanic Plain bioregion and/or Central Victorian Uplands Bioregion (although the description and condition thresholds of the listed community must be met) (Threatened Species Scientific Committee 2010): EVC 235 Plains Woodland/Herb-rich Gilgai Wetland Mosaic (CVU bioregion) EVC 803 Plains Woodland (CVU or VVP bioregion).	Low	No correlating EVCs or Floristic communities have been recorded or modelled within 5 km of the study area.
Natural Temperate Grassland of the Victorian Volcanic Plain	CR		PMST - Likely to occur within area Prior reports – known to occur within the search area	The Natural Temperate Grassland of the Victorian Volcanic Plain community correlates with the following EVCs or Floristic Communities identified from the Victorian Volcanic Plain and adjacent bioregions (although the description and condition thresholds of the listed community must be met) (Threatened Species Scientific Committee 2008): • EVC 132 Plains Grassland • EVC 654 Creekline Tussock Grassland • FFG Act listed *Western (Basalt) Plains Grasslands Community.*	High	Previously recorded from the broader area. Potential to correlate with Plains Grassland and the Western (Basalt) Plains Grasslands Community.

Scientific name	EPBC	FFG	Type of Presence	Vegetation associations	Likelihood of occurrence	Rationale for likelihood ranking
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	CR		PMST - Likely to occur within area Prior reports – known to occur within the search area	Wetland Ecological Vegetation Classes (EVCs) most likely to correspond to the Seasonal Herbaceous Wetland ecological community are listed below (this is an indicative list and the description and condition thresholds of the listed community must still be met) (Threatened Species Scientific Committee 2012): • EVC 125 Plains Grassy Wetland + complexes (Complexes may include EVCs 755, 767, 959, 960). • EVC 306 Aquatic Grassy Wetland • EVC 647 Plains Sedgy Wetland • EVC 678 Ephemeral Drainage-line Grassy Wetland • EVC 778 Gilgai Wetland • EVC 920 Sweet Grass Wetland • EVC 956 Herb-rich Gilgai Wetland	High	Previously recorded from the broader area. Potential to occur in areas of Plains Grassy Wetland, Grey Clay Drainage-line Aggregate and in gilgai systems along poorly defined drainage lines within natural temperate grassland.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CR		PMST - Likely to occur within area	The ecological community broadly equates to the following Ecological Vegetation Classes (EVC) in the Central Victorian Uplands Bioregion (although the description and condition thresholds of the listed community must be met) (Department of Environment, Climate Change and Water NSW 2010): • EVC 47 Valley Grassy Forest • EVC 175_62 Granitic Grassy Woodland • EVC 175_61 Grassy Woodland. It may also equate to Plains Grassy Woodland (EVC 55) (Threatened Species Scientific Committee 2006).	Medium	Potential to correlate with areas of Grassy Woodland / Plains Grassy Woodland.

Scientific name	EPBC	FFG	Type of Presence	Vegetation associations	Likelihood of occurrence	Rationale for likelihood ranking
State Significance						
Western (Basalt) Plains Grasslands Community		L		The Western (Basalt) Plains Grasslands Community is an open grassland community found mainly on undisturbed, poorly- drained heavy clay soils on the basalt plains of western Victoria. The vegetation is characteristically dominated by perennial native grasses, with very few eucalypts and shrubs (DSE 2003).	High	Previously recorded from the broader area. Correlates with Plains Grassland within the VVP and has potential to correlate with uncultivated grassy areas within paddocks and roadsides in the study area.
Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland		L		Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland is an endemic Victorian community restricted to an area approximately bounded by Whittlesea, Craigieburn and Epping. It forms part of the Plains Grassy Woodland Ecological Vegetation Class (EVC 55) but is distinguished ecologically by its occurrence on fertile clay soils derived from Quaternary basalts. It is floristically characterised by an overstorey of River Red-gum *Eucalyptus camaldulensis* with various wattles (e.g. *Acacia implexa*, *A. pycnantha*). The ground layer is dominated by grasses (SAC 2004)	High	Previously recorded from the broader area. Correlates with Plains Grassy Woodland within the VVP and has potential to correlate with areas on the basalt plain where River Red-gum is present within the study area.

Appendix K – Threatened terrestrial fauna – likelihood of occurrence assessment

EPBC Act	*DELWP*	*FFG Act*	*Record*
CR – Critically Endangered	*cr – Critically Endangered*	*L – Listed*	*PMST – Protected Matters Search Too*
EN – Endangered	*en – Endangered*		
VU – Vulnerable	*vu – Vulnerable*		
Mi – Migratory	*nt – Near Threatened*		
	rx – regionally extinct		

*Note: The descriptions of preferred habitat for threatened, migratory and/or marine species have been generated based on published species accounts – particularly from the Species Profile and Threats Database (SPRAT) database of DAWE (<*http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl*>) and reference books including, but not limited to, the Handbook of Australian and New Zealand and Antarctic Birds (HANZAB) Volumes 1 to 7 (1990-2006) and field guides to the mammals of Australia (Menkhorst & Knight, 2010), Birds of Australia (Morcombe, 2004; Pizzey & Knight, 2012), Frogs of Victoria (Hero et al., 1991) and Australia (Tyler & Knight, 2009) and Reptiles of Australia (Cogger, 2014; Wilson & Swan, 2013).*

Table K1 Threatened terrestrial fauna likelihood of occurrence within the Project Area (adapted from Biosis 2019, 2020)

Common name	Scientific name	EPBC	FFG	DELWP	Source	Habitat preference	Likelihood of Occurrence	Targeted survey Results (Biosis 2020)
National significance								
Mammals								
Spot-tailed Quoll	*Dasyurus maculatus*	EN	L	en	1910, PMST	Rainforest and wet and dry sclerophyll forests and woodlands.	Negligible. No suitable habitat and not present within outer metropolitan Melbourne.	N/A
Eastern Quoll	*Dasyurus viverrinus*	EN	L	rx	1930, PMST	The species is now restricted to Tasmania and is considered to be extinct from mainland Australia.	Negligible. Considered extinct from mainland Australia.	N/A
Eastern Barred Bandicoot	*Perameles gunnii*	VU	L	en	2002, PMST	Natural temperate grasslands and grassy woodlands.	Negligible. No naturally-occurring populations in the Melbourne region.	N/A
Southern Greater Glider	*Petauroides volans*	VU	L	vu	PMST	Wet and damp sclerophyll forest with large hollow-bearing trees.	Negligible. No suitable habitat.	N/A
Smoky Mouse	*Pseudomys fumeus*	EN	L	en	PMST	Coastal heath and heathy woodland, wet forest, sub-alpine heath and dry sclerophyll forest.	Negligible. No suitable habitat.	N/A
Grey-headed Flying-fox	*Pteropus poliocephalus*	VU	L	vu	PMST	Rainforest, wet and dry sclerophyll forest, woodland and urban areas.	High. Species likely to utilise flowering indigenous and planted trees within and adjacent to the Project Area for foraging.	N/A

Common name	Scientific name	EPBC	FFG	DELWP	Source	Habitat preference	Likelihood of Occurrence	Targeted survey Results (Biosis 2020)
Birds								
Plains-wanderer	*Pedionomus torquatus*	CR	L	en	1991, PMST	Native grassland with a sparse, open structure.	Low. Rarely recorded in southern Victoria, considered unlikely to make regular use of the Project Area	N/A
Australian Painted Snipe	*Rostratula australis*	EN	L	en	1977, PMST	Shallows of well- vegetated freshwater wetlands.	Low. Lack of suitable wetland habitat and no recent local records.	N/A
Australasian Bittern	*Botaurus poiciloptilus*	EN	L	en	1989, PMST	Shallow freshwater and brackish wetlands with abundant emergent aquatic vegetation.	Low. Lack of suitable wetland habitat and no recent local records.	N/A
Superb Parrot	*Polytelis swainsonii*	VU	L	en	1950	Red-gum and box-dominated forests and woodlands.	Negligible. Species does not occur in southern Victoria.	N/A
Orange-bellied Parrot	*Neophema chrysogaster*	CR	L	en	1977	Coastal vegetation including saltmarshes, dunes, pastures, shrublands, sewage plants, saltworks, islands, and beaches.	Negligible. No suitable habitat.	N/A
Swift Parrot	*Lathamus discolor*	CR	L	en	2009, PMST	A range of forests and woodlands, especially those supporting nectar-producing tree species. Also well- treed urban areas.	Medium. May make occasional use of scattered indigenous and planted eucalypts within or adjacent to the Project Area on rare occasions. The Project is unlikely to pose a significant risk to the species and the Project Area does not constitute critical habitat.	N/A
Eastern Curlew	*Numenius madagascariensis*	CR / Mi		vu	PMST	Large intertidal sandflats, banks, mudflats, estuaries, inlets, sewage farms, saltworks, harbours, coastal lagoons and bays.	Negligible. No suitable habitat.	N/A

Common name	Scientific name	EPBC	FFG	DELWP	Source	Habitat preference	Likelihood of Occurrence	Targeted survey Results (Biosis 2020)
Curlew Sandpiper	*Calidris ferruginea*	CR / Mi		en	1990, PMST	Large intertidal sandflats, banks, mudflats, estuaries, inlets, sewage farms, saltworks, harbours, coastal lagoons and bays.	Negligible. No suitable habitat.	N/A
Painted Honeyeater	*Grantiella picta*	VU	L	vu	PMST	Dry open woodlands and forests. Typically forages for fruit and nectar in mistletoes and in tree canopies.	Negligible. Species rare in southern Victoria.	N/A
White-throated Needletail	*Hirundapus caudacutus*	VU, Mi		vu	2014	An almost exclusively aerial species within Australia, occurring over most types of habitat, particularly wooded areas.	High. As an almost exclusively aerial species within Australia, it occurs over most types of habitat, particularly wooded areas. Potential to use the aerial space over much of the Project Area. Unlikely to have any association with terrestrial habitats.	N/A
Regent Honeyeater	*Anthochaera phrygia*	CR	L	en	1991, PMST	A range of dry woodlands and forests dominated by nectar- producing tree species.	Negligible. Species now very rare and present mostly within North East Victoria.	N/A
Hooded Plover	*Thinornis rubricollis ribricollis*	VU	L	vu	PMST	Coastal areas, particularly ocean beaches. Occasionally in saline lakes near the coast.	Negligible. No suitable habitat.	N/A
Reptiles								
Pink-tailed Worm-Lizard	*Aprasia parapulchella*	VU	L	en	PMST	Woodland and grassland with partially buried rocks.	Low. No known populations around Melbourne.	N/A
Striped Legless Lizard	*Delma impar*	VU	L	en	2012, PMST	Natural temperate grassland, grassy woodland and exotic grassland.	High. Recorded during current assessments. Known to occur in the Project Area.	Striped Legless Lizard were recorded in two tile survey grids within one parcel at

Common name	Scientific name	EPBC	FFG	DELWP	Source	Habitat preference	Likelihood of Occurrence	Targeted survey Results (Biosis 2020)
								approximately KP 11, outside of the approved MSA areas. Unlikely to occur in other areas surveyed or in parcels that were not surveyed (see section 8.4.3.2)
Grassland Earless Dragon	*Tympanocryptis pinguicolla*	EN	L	en	1990	Natural temperate grassland.	Negligible. Not detected in the area since 1990, and may be extinct from the Melbourne area.	N/A

Common name	Scientific name	EPBC	FFG	DELWP	Source	Habitat preference	Likelihood of Occurrence	Targeted survey Results (Biosis 2020)
Amphibians								
Growling Grass Frog	*Litoria raniformis*	VU	L	en	2017	Still or slow- flowing waterbodies and surrounding terrestrial vegetation.	High. Recorded during current assessments. Known to occur in the local area.	Growling Grass Frog were recorded within Deep Creek and also within an offline waterbody within the approved MSA area near KP 40. Growling Grass Frog have been previously recorded from the three major streams (Jacksons, Deep and Merri Creeks) crossed by the construction corridor. Presence is assumed in each of these waterways.
Invertebrate								
Golden Sun Moth	*Synemon plana*	CR	L	en	2017, PMST	Natural temperate grassland, grassy woodland and pasture supporting spear grasses and wallaby grasses and exotic grassland dominated by Chilean needle grass.	High. Recorded during current assessments. Known to occur in the Project Area.	Golden Sun Moth were recorded in areas within and outside the MSA area from approximately KP 22 through to KP 51.

Common name	Scientific name	EPBC	FFG	DELWP	Source	Habitat preference	Likelihood of Occurrence	Targeted survey Results (Biosis 2020)
State significance								
Mammals								
Common Bent-wing Bat (eastern spp.)	*Miniopterus schreibersii oceanensis*		L	vu	2013	A variety of treed and treeless habitats. Roosts in caves and man-made structures.	Medium. Likely to utilise habitat within the Project Area for foraging occasionally. Unlikely that any maternity caves occur within or immediately adjacent to the Project Area.	N/A
Brush-tailed Phascogale	*Phascogale tapoatafa*		L	vu	2017	Drier sclerophyll forests and woodlands.	Low. No suitable habitat.	N/A
Common Dunnart	*Sminthopsis murina murina*			vu	1988	Found in heathland areas, open forests and woodlands that have structurally complex microhabitats. Common dunnart prefer dry sclerophyll forest and mallee health with high rock and crevice density.	Low. Limited suitable habitat present.	N/A
Birds								
Bush Stone-curlew	*Burhinus grallarius*		L	en	1950	Open woodland, treed farmland.	Negligible. Not known to occur around Melbourne, generally confined to northern and western Victoria.	N/A
Little Egret	*Egretta garzetta*		L	en	1980	Swamps, billabongs, floodplain pools, mudflats, mangroves and channels; breeds in trees standing in water.	Medium. Potential wetland habitat located within and immediately adjacent to the Project Area.	N/A
Freckled Duck	*Stictonetta naevosa*		L	en	2009	Large freshwater wetlands, generally with dense vegetation.	Medium. Uncommon around Melbourne, and unlikely to make regular use of habitat in the Project Area	N/A

Common name	Scientific name	EPBC	FFG	DELWP	Source	Habitat preference	Likelihood of Occurrence	Targeted survey Results (Biosis 2020)
Blue-billed Duck	*Oxyura australis*		L	en	2015	Open or densely vegetated wetlands. Diving species that prefers deeper ponds.	Medium. Suitable wetland habitat located within and immediately adjacent to the Project Area.	N/A
Barking Owl	*Ninox connivens*		L	en	1991	Open woodland forest habitats often where forests adjoin open land. Barking Owl is now considered rare in many areas of Victoria. North East Victoria is the remaining stronghold area for this species.	Low. Not commonly recorded around Melbourne, unlikely to make regular use of habitat in the Project Area.	N/A
Grey-crowned Babbler	*Pomatostomus temporalis*		L	en	1950	Open forests and woodlands.	Negligible. No suitable habitat, considered locally extinct.	N/A
Intermediate (Plumed) Egret	*Ardea intermedia plumifera*		L	en	1980	Densely- vegetated freshwater wetlands including lakes, swamps and billabongs. Breeds in trees standing in water.	Medium. More commonly recorded in northern Victoria, however may utilise wetland habitat in the Project Area.	N/A
Diamond Dove	*Geopelia cuneata*		L	nt	1999	Drier woodlands and scrub, spinifex and mulga.	Low. Not commonly recorded around Melbourne, unlikely to make regular use of habitat in the Project Area	N/A
Caspian Tern	*Hydroprogne caspia*	Mi	L	nt	1981	Estuaries, inlets, bays, lagoons, inland lakes, flooded pasture, sewage ponds.	Negligible. No suitable habitat, but this species may occasionally fly over.	N/A
Hooded Robin	*Melanodryas cucullata*		L	nt	2002	Woodlands of eucalypt, mallee, semi-cleared farmland.	Low. Limited suitable habitat; not commonly recorded in local area.	N/A
Diamond Firetail	*Stagonopleura guttata*		L	nt	1991	Open forests and woodlands with a grassy ground layer	Low. Limited suitable habitat; not commonly recorded in local area.	N/A

Common name	Scientific name	EPBC	FFG	DELWP	Source	Habitat preference	Likelihood of Occurrence	Targeted survey Results (Biosis 2020)
Red-chested Button-quail	*Turnix pyrrhothorax*		L	vu	2010	Grassland, grassy woodland and crops.	Medium. Previously recorded within the Project Area near Donnybrook. Potentially utilises grassland, crop and pasture habitat throughout the Project Area. However, the species is very infrequently recorded in southern Victoria.	N/A
Lewin's Rail	*Lewinia pectoralis*		L	vu	1991	Swamps, dense riparian vegetation and saltmarsh. Often in brackish and saline areas.	Medium. Potentially occurs in any wetland in the Project Area supporting dense, fringing, emergent long or tussock-grass, reeds and rushes including well-vegetated farm dams.	N/A
Baillon's Crake	*Porzana pusilla*		L	vu	2006	Well- vegetated permanent and temporary fresh and brackish wetlands.	Medium. Potentially occurs in any wetland in the Project Area supporting dense, fringing, emergent long or tussock-grass, reeds and rushes including well-vegetated farm dams.	N/A
Brolga	*Grus rubicunda*		L	vu	2002	Shallow freshwater and brackish wetlands, crops, grassland and pasture.	Low. Unlikely to be present in wetlands or grasslands within or adjacent to the Project Area.	N/A

Common name	Scientific name	EPBC	FFG	DELWP	Source	Habitat preference	Likelihood of Occurrence	Targeted survey Results (Biosis 2020)
Grey Goshawk	*Accipiter novaehollandiae*		L	vu	1991	Rainforest, gallery forest, tall wet forest and woodland. Also partially cleared agricultural land.	Low. Limited suitable habitat; not commonly recorded in local area.	N/A
Black Falcon	*Falco subniger*		L	vu	2007	Woodlands, open country and around terrestrial wetlands areas, including rivers and creeks. Mostly hunts over open plains and undulating land with large tracts of low vegetation.	High. Suitable habitat present, but unlikely to be common within the Project Area.	N/A
Speckled Warbler	*Chthonicola sagittatus*		L	vu	1990	Eucalypt woodland with rocky gullies, ridges, tussock grasses and a sparse shrub understorey.	Low. Limited suitable habitat; not commonly recorded in local area.	N/A
Eastern Great Egret	*Ardea modesta*		L	vu	2014	Prefer shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands.	High. Known to occur within the local area and likely to utilise a range of wetlands within or immediately adjacent to the Project Area.	N/A
Australasian Shoveler	*Spatula rhynchotis*			vu	2005	Prefers large, permanent lakes and swamps with deep water, stable conditions and abundant aquatic vegetation.	Medium. Potential wetland habitat located within and immediately adjacent to the Project Area.	N/A

Common name	Scientific name	EPBC	FFG	DELWP	Source	Habitat preference	Likelihood of Occurrence	Targeted survey Results (Biosis 2020)
Hardhead	*Aythya australis*			vu	2015	A mainly aquatic diving species preferring large, deep freshwater environments with abundant aquatic vegetation, including slow moving areas of rivers. Also occurs in brackish wetlands and may be found in deep dams and water storage ponds.	Medium. Potential wetland habitat located within and immediately adjacent to the Project Area.	N/A
Musk Duck	*Biziura lobata*			vu	1996	A largely aquatic diving species preferring deep water on large, permanent swamps, lakes and estuaries.	Medium. Potential wetland habitat located within and immediately adjacent to the Project Area.	N/A
Common Sandpiper	*Actitis hypoleucos*	Mi		vu	1981, PMST	Migratory species from the northern hemisphere. Inhabits a wide variety of coastal and inland wetlands with muddy margins.	Low. Limited suitable wetland habitat present within or immediately adjacent to alignment and over 20 years since last recorded locally.	N/A
Common Greenshank	*Tringa nebularia*	Mi		vu	1994, PMST	Migratory species from the northern hemisphere. Uses a variety of ephemeral and permanent inland wetlands and sheltered coastal wetlands.	Low. Limited suitable wetland habitat present within or immediately adjacent to alignment and over 20 years since last recorded locally.	N/A
Marsh Sandpiper	*Tringa stagnatilis*	Mi		vu	1994	Migratory species from the northern hemisphere. Uses permanent or ephemeral wetlands, mudflats and saltmarshes in coastal and inland environments.	Low. Limited suitable wetland habitat present within or immediately adjacent to alignment and over 20 years since last recorded locally.	N/A

Common name	Scientific name	EPBC	FFG	DELWP	Source	Habitat preference	Likelihood of Occurrence	Targeted survey Results (Biosis 2020)
Reptiles								
Bearded Dragon	*Pogona barbata*			vu	1988	Woodlands, forests and heathlands with abundant cover of coarse woody debris. On the ground in a range of grasslands or sparse grassy woodlands from alps to coast.	Low. Limited suitable habitat and over 30 years since last recorded locally.	N/A
Tussock Skink	*Pseudemoia pagenstecheri*			vu	2016	On the ground in a range of grasslands or sparse grassy woodlands from alps to coast.	High. Recorded during current assessments. Known to occur in the local area.	Incidentally recorded during tile grid surveys. Recorded 93 times from 10 grids.
Amphibians								
Brown Toadlet	*Pseudophryne bibronii*		L	en	2010	A wide variety of woodland, forest and grassland habitats.	Medium. Woodland, forest and grassland habitats within the Project Area. It is likely that Brown Toadlet is now extinct in the Greater Melbourne area as the species has not been recorded for many years, despite targeted surveys at sites where it formerly occurred.	N/A
Southern Toadlet	*Pseudophryne semimarmorata*			vu	1962	A variety of habitats such as open forests, lowland woodlands and heathlands where adults shelter beneath leaf litter and other debris in moist soaks and depressions.	Low. Potentially suitable habitat present, however it has been over 50 years since last recorded locally.	N/A

Appendix L – Migratory species – likelihood of occurrence assessment

Source
PMST – Protected Matters Search Tool
XXXX – Year of last VBA record

Note: The descriptions of preferred habitat for threatened, migratory and/or marine species have been generated based on published species accounts – particularly from the Species Profile and Threats Database (SPRAT) database of DAWE (<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>) and reference books including, but not limited to, the Handbook of Australian and New Zealand and Antarctic Birds (HANZAB) Volumes 1 to 7 (1990-2006) and field guides to the Mammals of Australia (Menkhorst & Knight, 2010), Birds of Australia (Morcombe, 2004; Pizzey & Knight, 2012), Frogs of Victoria (Hero et al., 1991) and Australia (Tyler & Knight, 2009) and Reptiles of Australia (Cogger, 2014; Wilson & Swan, 2013).

Table L1 Migratory fauna likelihood of occurrence within the Project Area

Scientific name	Common name	Source	Habitat preference	Likelihood of occurrence within the construction corridor	Likelihood of important habitat occurring within construction corridor
Migratory species					
Gallinago hardwickii	Latham's Snipe	2006	Non-breeding migrant to Australia during the austral summer. Uses a wide variety of permanent and ephemeral wetlands, generally freshwater wetlands with cover. Also recorded along creeks, rivers and floodplains. Forages in soft mud at edge of wetlands and roosts in a variety of vegetation around wetlands including tussock grasslands, reeds and rushes, tea-tree scrub, woodlands and forests.	Medium. Likely to occur in seasonal wetlands supporting tussock-grasses and rushes as well as vegetated farm dams. Important habitat for Latham's snipe is described as areas that have previously been identified as internationally important for the species, or areas that support at least 18 individuals of the species.	Low
Pandion cristatus	Osprey	PMST	Primarily a coastal bird of prey around most of Australia. Least common along, and perhaps absent from, central Victorian coast.	Low	Low
Hirundapus caudacutus	White-throated Needletail	2014	Almost exclusively aerial within Australia, occurring over most types of habitat, particularly wooded areas. Less often seen over open farm paddocks but has been recorded in vineyards flying between the rows of trees.	High Previously recorded from Project Area. Likely to use the aerial space over the Project Area.	Low
Apus pacificus	Fork-tailed Swift	2007	Aerial species, occurring over a wide range of environments, predominately over open countryside but sometimes over forests and urban landscapes.	Medium. May use the aerial space over the Project Area occasionally or rarely	Low
Motacilla flava	Yellow Wagtail	PMST	Primarily a rare coastal visitor. Prefers open country, such as those near airfields, swamps, sewage ponds.	Low	Low
Chlidonias leucopterus	White-winged Black Tern	2014	Coastal areas and large inland wetlands and rivers. Seasonal migrant to Australia. Uses coastal, subcoastal and terrestrial wetlands including bays, estuaries, swamps and floodplains. Most Victorian records are from Gippsland Lakes and western shoreline of Port Phillip Bay.	Low	Low
Hydroprogne caspia	Caspian Tern	1981	Estuaries, inlets, bays, lagoons, inland lakes, flooded pasture, sewage ponds.	Negligble	Low
Thalasseus bergii	Crested Tern	1978	Coastal and marine species.	Low	Low

Scientific name	Common name	Source	Habitat preference	Likelihood of occurrence within the construction corridor	Likelihood of important habitat occurring within construction corridor
Charadrius bicinctus	Double-banded Plover	1990	Breeds in New Zealand. Regular winter migrant to Victoria. Occurs in a variety of habitats including bays, mudflats, and saltmarshes.	Low	Low
Numenius madagascariensis	Eastern Curlew	PMST	Non-breeding migrant to Australia during the austral summer. Coastal. Sheltered coastal habitats, usually with large sand flats or intertidal mudflats with seagrass, estuaries, open sandy beaches. Occasionally on coastal rock platforms.	Low	Low
Actitis hypoleucos	Common Sandpiper	1981	Migrates to Australia for austral summer. In Australia, inhabits a wide variety of coastal and inland wetlands with muddy margins, including lakes, rivers, and sewage ponds.	Low	Low
Tringa nebularia	Common Greenshank	1994	Non-breeding migrant to Australia during the austral summer. Coastal mudflats, estuaries, salt marshes, mangroves, lakes and swamps.	Low	Low
Tringa stagnatilis	Marsh Sandpiper	1994	Non-breeding migrant to Australia during the austral summer. Estuaries and coastal and inland shallow wetlands.	Low	Low
Calidris ferruginea	Curlew Sandpiper	1990	Regular summer migrant to Victoria. Occurs in a variety of wetland habitats with fringing mudflats including bays, coastal lagoons, lakes, swamps, creeks, inundated grasslands, saltmarshes and artificial wetlands.	Low	Low
Calidris ruficollis	Red-necked Stint	1990	Regular summer migrant to Victoria. Occurs in a variety of wetland habitats with fringing mudflats including bays, coastal lagoons, lakes, swamps, creeks, inundated grasslands, saltmarshes and artificial wetlands.	Low	Low
Calidris acuminata	Sharp-tailed Sandpiper	1997	Non-breeding migrant to Australia during the austral summer. Prefers muddy edges of shallow fresh or brackish wetlands with inundated or emergent low vegetation.	Low	Low

Scientific name	Common name	Source	Habitat preference	Likelihood of occurrence within the construction corridor	Likelihood of important habitat occurring within construction corridor
Calidris melanotos	Pectoral Sandpiper	1990	Non-breeding migrant to Australia during the austral summer. Occurs in a variety of wetland habitats with fringing mudflats including bays, coastal lagoons, lakes, swamps, creeks, inundated grasslands, saltmarshes and artificial wetlands. Mostly recorded from Port Phillip Bay and Murray River Valley region.	Low	Low
Rhipidura rufifrons	Rufous Fantail	2014	Uncommon summer visitor to forests, particularly densely vegetated gullies.	Low	Low
Myiagra cyanoleuca	Satin Flycatcher	1989	Uncommon summer migrant in forests, particularly densely vegetated gullies.	Low	Low
Monarcha melanopsis	Black-faced Monarch	PMST	Summer migrant to rainforests, forests, denser woodlands and densely vegetated gullies.	Low	Low

Appendix M – Observed fauna within the Project Area (Biosis 2020)

Legend:

EPBC Act: CR – Critically Endangered; VU – Vulnerable
FFG Act: L – Listed
DELWP advisory list: en – Endangered; vu – Vulnerable

Status	Scientific Name	Common Name
Indigenous species		
	Cherax destructor destructor	Common Yabby
	Vanellus miles	Masked Lapwing
	Chenonetta jubata	Australian Wood Duck
	Trichoglossus haematodus	Rainbow Lorikeet
	Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo
	Podargus strigoides	Tawny Frogmouth
	Cisticola exilis	Golden-headed Cisticola
	Artamus cyanopterus	Dusky Woodswallow
	Anthochaera carunculata	Red Wattlebird
	Anthus novaeseelandiae	Australasian Pipit
	Cracticus tibicen	Australian Magpie
	Corvus coronoides	Australian Raven
	Macropus giganteus	Eastern Grey Kangaroo
	Lerista bougainvillii	Bougainville's Skink
	Tiliqua scincoides	Common Blue-tongued Lizard
	Pseudonaja textilis	Eastern Brown Snake
	Parasuta flagellum	Little Whip Snake
	Ctenotus spaldingi	Spalding’s Skink
	Limnodynastes peronii	Striped Marsh Frog
	Limnodynastes tasmaniensis	Spotted Marsh Frog (race unknown)
	Crinia signifera	Common Froglet
	Litoria peroni	Peron’s Tree Frog
	Limnodynastes dumerilii dumerilii	Pobblebonk Frog
CR, L, en	*Synemon plana*	Golden Sun Moth
VU, L, en	*Delma impar*	Striped Legless Lizard
VU, L, en	*Litoria raniformis*	Growling Grass Frog
vu	*Pseudemoia pagenstecheri*	Tussock Skink
Introduced species		
	Gambusia holbrooki	Eastern Gambusia
	Sturnus vulgaris	Common Starling
	Mus musculus	House Mouse
	Oryctolagus cuniculus	European Rabbit
	Lepus europaeus	European Brown Hare
	Vulpes vulpes	Red Fox

Appendix N – Survey Results from Striped Legless Lizard Tile Grids (Biosis 2020)

Evidence of Striped Legless Lizard


No survey

KP Kilometre Point

Parcel identifier	KP Start to finish	Grid Count	Grid Reference	Check 1	Check 2	Check 3	Check 4	Check 5	Check 6	Check 7
Western section										
2LP119116	6.4 to 8.3	4	1	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
			2	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
			3	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
			19	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
2PS343496	8.3 to 8.7	1	4	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
North-western section										
2LP90878	9.2 to 9.6	1	5	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
12LP92520	10.6 to 10.8	2	6	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
			7	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
13LP92520	10.8 to 11.1	1	8	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
1TP333383	12.8 to 13.7	2	9	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
			10	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
B7PP2258	18.3 to 19.0	3	16	6/09/2019	13/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	18/10/2019
			17	6/09/2019	13/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	18/10/2019
1PS733043	22.1 to 22.6	1	18	6/09/2019	13/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	18/10/2019
			20	6/09/2019	13/09/2019	19/09/2019	26/09/2019	3/10/2019	8/10/2019	18/10/2019
Northern Section										
2LP67181	42.8 to 44.7	3	13	6/09/2019	13/09/2019	19/09/2019	26/09/2019	3/10/2019	8/10/2019	18/10/2019
			14	6/09/2019	13/09/2019	19/09/2019	26/09/2019	3/10/2019	8/10/2019	18/10/2019
			15	6/09/2019	13/09/2019	19/09/2019	26/09/2019	3/10/2019	8/10/2019	18/10/2019
2LP130336	50.7 to 51.0	2	11	6/09/2019	13/09/2019	19/09/2019	26/09/2019	3/10/2019	8/10/2019	18/10/2019
			13	6/09/2019	13/09/2019	19/09/2019	26/09/2019	3/10/2019	8/10/2019	18/10/2019

Parcel identifier	Grid Reference	Check 8	Check 9	Check 10	Check 11	Check 12	Check 13	Check 14	Check 15
Western section									
2LP119116	1	25/10/2019	31/10/2019	6/11/2019	14/11/2019	21/11/2019	27/11/2019	5/12/2019	19/12/2019
	2	25/10/2019	31/10/2019	6/11/2019	14/11/2019	21/11/2019	27/11/2019	5/12/2019	19/12/2019
	3	25/10/2019	31/10/2019	6/11/2019	14/11/2019	21/11/2019	27/11/2019	5/12/2019	19/12/2019
2PS343496	19	25/10/2019	31/10/2019	6/11/2019	14/11/2019	21/11/2019	27/11/2019	5/12/2019	19/12/2019
	4	25/10/2019	31/10/2019	6/11/2019	14/11/2019	21/11/2019	27/11/2019	5/12/2019	19/12/2019
North-western section									
2LP90878	5	25/10/2019	31/10/2019	6/11/2019	14/11/2019	22/11/2019	27/11/2019	5/12/2019	19/12/2019
12LP92520	6	25/10/2019	31/10/2019	6/11/2019	14/11/2019	22/11/2019	27/11/2019	5/12/2019	19/12/2019
	7	25/10/2019	31/10/2019	6/11/2019	14/11/2019	22/11/2019	27/11/2019	5/12/2019	19/12/2019
13LP92520	8	25/10/2019	31/10/2019	6/11/2019	14/11/2019	22/11/2019	27/11/2019	5/12/2019	19/12/2019
1TP333383	9	24/10/2019	1/11/2019	6/11/2019	14/11/2019	22/11/2019	27/11/2019	5/12/2019	19/12/2019
	10	24/10/2019	1/11/2019	6/11/2019	14/11/2019	22/11/2019	27/11/2019	5/12/2019	19/12/2019
B7PP2258	16	25/10/2019	-	-	-	-	29/11/2019	6/12/2019	-
	17	25/10/2019	-	-	-	-	29/11/2019	6/12/2019	-
	18	25/10/2019	-	-	-	-	29/11/2019	6/12/2019	-
1PS733043	20	24/10/2019	1/11/2019	7/11/2019	13/11/2019	22/11/2019	27/11/2019	5/12/2019	19/12/2019
Northern section									
2LP67181	13	24/10/2019	1/11/2019	7/11/2019	13/11/2019	22/11/2019	27/11/2019	6/12/2019	19/12/2019
	14	24/10/2019	1/11/2019	7/11/2019	13/11/2019	22/11/2019	27/11/2019	6/12/2019	19/12/2019
	15	24/10/2019	1/11/2019	7/11/2019	13/11/2019	22/11/2019	27/11/2019	6/12/2019	19/12/2019
2LP130336	11	24/10/2019	1/11/2019	7/11/2019	13/11/2019	22/11/2019	27/11/2019	6/12/2019	19/12/2019
	12	24/10/2019	1/11/2019	7/11/2019	13/11/2019	22/11/2019	27/11/2019	6/12/2019	19/12/2019

Appendix O – Survey Results for Golden Sun Moth Biosis 2020 and GHD 2020

	Golden Sun Moth recorded
	Golden Sun Moth assumed
	Survey conditions invalid
N/A	No suitable habitat
KP	Kilometre Point
^	Wholly within the MSA
*	Not intercepted by assessed version of the Project Area

NB presence not presented as assumed in parcels that are wholly within the MSA or which are not intercepted by the assessed version of the Project Area.

Parcel identifier	KP Start to Finish	Survey 1	Survey 2	Survey 3	Survey 4	# Valid Surveys	Total # GSM recorded
APS709426^	0 to 1.05	22/11/2019	N/A	N/A	N/A	No suitable habitat	NA
8BPP3061^	1.05 to 2.2	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218165707^	2.29 to 2.37	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
10LP116565^	2.37 to 3.14	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
425711870	3.14 to 3.17	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218160972	3.17 to 3.20	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1TP132544	3.2 to 4.2	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1TP710684	3.20 to 4.81	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1TP901066	4.81 to 6.40	18/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218162378	6.40 to 6.41	18/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218162862	6.41 to 6.42	18/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
2LP119116	6.42 to 8.28	18/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1TP946706	8.28 to 8.32	18/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
2PS343496	8.32 to 8.67	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218166159	8.6 to 8.6	N/A	N/A	N/A	N/A	No suitable habitat	NA
218166927	8.67 to 8.74	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0

Parcel identifier	KP Start to Finish	Survey 1	Survey 2	Survey 3	Survey 4	# Valid Surveys	Total # GSM recorded
218257150	8.74 to 8.81	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1TP829278	8.81 to 9.08	No access	No access	No access	No access	0 (No access)	0
1TP710576	9.08 to 9.15	N/A	N/A	N/A	N/A	No suitable habitat	NA
2LP90878	9.15 to 9.59	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
2015PP2761	9.59 to 9.61	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
5LP92520	9.61 to 9.95	27/11/2020	14/12/2020	13/01/2021	No access	3 (No further access)	0
6LP92520	9.95 to 10.1	N/A	N/A	N/A	N/A	No suitable habitat	NA
10LP215406	10.1 to 10.2	27/11/2020	14/12/2020			2 (No further access)	0
11LP215406	10.2 to 10.5	27/11/2020	14/12/2020			2 (No further access)	2
11LP92520	10.5 to 10.5	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
12LP92520	10.5 to 10.7	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218265274	10.7 to 10.7	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
13LP92520	10.7 to 11.1	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218260126	11.1 to 11.1	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
2LP137651	11.1 to 11.3	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1LP137651	11.3 to 11.5	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
D16PP2761	11.5 to 11.9	N/A	N/A	N/A	N/A	No suitable habitat	NA
1PS635728	11.9 to 12.2	N/A	N/A	N/A	N/A	No suitable habitat	NA
2PS635728	12.2 to 12.3	N/A	N/A	N/A	N/A	No suitable habitat	NA

Parcel identifier	KP Start to Finish	Survey 1	Survey 2	Survey 3	Survey 4	# Valid Surveys	Total # GSM recorded
3PS635728	12.3 to 12.8	N/A	N/A	N/A	N/A	No suitable habitat	NA
1TP333383	12.8 to 13.7	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
2029PP2761	13.7 to 13.7	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
2010PP2258	13.7 to 13.7	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1TP909157	13.7 to 14.7	27/11/2020	No access	No access	No access	1 (No further access)	0
218261530	14.7 to 14.7	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218261878	14.7 to 14.8	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1LP200366	14.8 to 15.6	25/11/2019	17/12/2019	No access	No access	2 (No further access)	0
3LP200366	15.6 to 16.4	20/11/2019				1	0
		27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0
4LP200366	16.4 to 16.6	20/11/2019				1	0
		27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0
2002PP2258	16.6 to 16.7	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1TP424528	16.7 to 16.9	20/11/2019	N/A	N/A	N/A	No suitable habitat	NA
218265262	16.9 to 16.9	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1TP107502	16.9 to 17.5	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
2LP130112	17.5 to 17.8	20/11/2019	25/11/2019			2	0
		27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0
1LP130112	17.8 to 18.2	20/11/2019	25/11/2019			2	0
		27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0
218268694	18.2 to 18.2	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0

Parcel identifier	KP Start to Finish	Survey 1	Survey 2	Survey 3	Survey 4	# Valid Surveys	Total # GSM recorded
218261314	18.3 to 18.3	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
B7PP2258	18.3 to 18.9	27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0
218264222	19.0 to 19.1	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
5LP88261	18.9 to 19.4	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
10LP110642	19.4 to 20.1	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
2LP218160	20.1 to 21.3	27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0
1TP212870	21.3 to 21.5	20/11/2019				1	0
		27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0
218271946	18.9 to 18.9	20/11/2019				1	0
		27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0
1TP104933	21.5 to 21.5	20/11/2019				1	0
		27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0
2LP68808	21.6 to 22.0	20/11/2019	N/A	N/A	N/A	No suitable habitat	NA
1PS733043	22.0 to 22.6	20/11/2019	25/11/2019	5/12/2019	9/12/2019	4	18
218266378	22.6 to 22.6	20/11/2019	25/11/2019	5/12/2019	9/12/2019	4	0
218268306	22.6 to 22.6	20/11/2019	25/11/2019	5/12/2019	9/12/2019	4	0
1PS733045	22.6 to 24.1	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	1
218265906	23.5	27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0
2PS503800	24.1 to 24.3	N/A	N/A	N/A	N/A	No suitable habitat	NA
3PS503800	24.3 to 24.5	N/A	N/A	N/A	N/A	No suitable habitat	NA
218259318	25.9 to 25.9	27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0

Parcel identifier	KP Start to Finish	Survey 1	Survey 2	Survey 3	Survey 4	# Valid Surveys	Total # GSM recorded
1PS503800	24.5 to 26.1	20/11/2019	29/11/2019	9/12/2019	17/12/2019	4	0
2LP218323	26.1 to 26.3	20/11/2019	3/12/2019	9/12/2019	17/12/2019	4	1
218263730	26.3 to 26.3	20/11/2019	3/12/2019	9/12/2019	17/12/2019	4	0
218260106	26.3 to 27.0	20/11/2019	3/12/2019	9/12/2019	17/12/2019	4	0
32LP93445	27.0 to 27.3	3/12/2019				1	1
		27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0
33LP93445	27.2 to 27.5	3/12/2019	N/A	N/A	N/A	No suitable habitat	NA
5LP92893	27.3 to 27.4	2/12/2019	N/A	N/A	N/A	No suitable habitat	NA
4LP92893	27.4 to 27.7	20/11/2019	N/A	N/A	N/A	No suitable habitat	NA
1TP108439	27.7 to 27.9	20/11/2019	N/A	N/A	N/A	No suitable habitat	NA
218271310	27.9 to 28.0	20/11/2019	N/A	N/A	N/A	No suitable habitat	NA
1TP947284	28.0 to 28.3	20/11/2019	N/A	N/A	N/A	No suitable habitat	NA
1LP211254	28.4 to 29.1	20/11/2019	N/A	N/A	N/A	No suitable habitat	NA
GPS806997/ PPS816942	29.1 to 29.8	14/12/2019	17/12/2019	23/12/2019		2	2
		27/11/2020	14/12/2020	13/01/2021	21/01/21	4	0
1TP427446	29.8 to 30.2	27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0
426092500	30.2 to 30.2	14/12/2019	18/12/2019	23/12/2019		2	0
	30.2 to 31.1	27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0
APS702756	30.3 to 31.1	27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0
AAPS746088*^	31.1 to 31.3	14/12/2019	18/12/2019	23/12/2019		2	0
1LP126752		14/12/2019	18/12/2019	23/12/2019		2	0

Parcel identifier	KP Start to Finish	Survey 1	Survey 2	Survey 3	Survey 4	# Valid Surveys	Total # GSM recorded
	31.1 to 31.3	27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0
1PS714700	31.3 to 31.5	27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0
2PS714700*^	31.3 to 31.4	18/12/2019	N/A	N/A	N/A	No suitable habitat	NA
2PS714688*^	31.4 to 31.6	18/12/2019	N/A	N/A	N/A	No suitable habitat	NA
1PS714688	31.5 to 31.6	27/11/2020	14/12/2020	09/01/2021	21/01/21	4	41
2PS714701	31.6 to 31.7	27/11/2020	14/12/2020	09/01/2021	21/01/21	4	0
4LP126752	31.7 to 32.1	14/12/2019	18/12/2019	23/12/2019		2 (No further access)	0
CPS805151^	31.6 to 32.9	13/12/2019	18/12/2019	23/12/2019		3	1
2TP215633^	33.1 to 33.4	14/12/2019	18/12/2019	23/12/2019		2	0
1TP201330^	33.4 to 33.9	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
218258374^	33.9 to 33.9	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
29PP3100^	33.9 to 35.5	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
1LP136262^	35.5 to 35.6	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
2LP136262^	35.6 to 35.8	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
3LP136262^	35.8 to 35.9	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
4LP136262^	35.9 to 36.1	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
5LP136262^	36.1 to 36.2	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
6LP136262^	36.2 to 36.4	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
7LP136262^	36.4 to 36.5	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0

Parcel identifier	KP Start to Finish	Survey 1	Survey 2	Survey 3	Survey 4	# Valid Surveys	Total # GSM recorded
8LP136262^	36.5 to 36.7	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
9LP136262^	36.7 to 36.8	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
10LP136262^	36.8 to 37.0	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
218299285^	37.0 to 37.1	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
218266966^	37.1 to 37.1	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
218263378^	37.1 to 37.1	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
2LP123742^	37.1 to 37.7	18/12/2019	N/A	N/A	N/A	No suitable habitat	NA
1LP221466^	37.7 to 38.5	18/12/2019	23/12/2019			2	0
2LP221466^	38.5 to 38.9	18/12/2019	N/A	N/A	N/A	No suitable habitat	NA
10LP5364^	38.9 to 39.7	18/12/2019	N/A	N/A	N/A	No suitable habitat	NA
1LP113763^	39.7 to 40.1	17/12/2019				1	0
2LP113763^	40.1 to 41.0	17/12/2019				1	0
1TP599592^	41.0 to 41.1	9/12/2019	23/12/2019			2	0
1TP332315^	41.1 to 41.1	9/12/2019	23/12/2019			2	0
6TP394032^	41.1 to 42.6	9/12/2019	23/12/2019			2	2
1TP709372^	42.6 to 42.8	9/12/2019	23/12/2019			2	0
2LP67181^	42.8 to 44.7	9/12/2019	18/12/2019	23/12/2019		3	0
2TP843230^	44.7 to 44.8	9/12/2019	18/12/2019	23/12/2019		3	0
1TP746632^	44.8 to 45.3	9/12/2019	18/12/2019	23/12/2019		3	1

Parcel identifier	KP Start to Finish	Survey 1	Survey 2	Survey 3	Survey 4	# Valid Surveys	Total # GSM recorded
PC372952^	45.3 to 45.3	9/12/2019	18/12/2019	23/12/2019		3	0
1LP208748^	45.3 to 47.0	9/12/2019	18/12/2019	23/12/2019		3	0
218359831^	47.0 to 47.0	25/11/2019	9/12/2019	17/12/2019	23/12/2019	4	0
1LP38239^	47.0 to 48.8	25/11/2019	9/12/2019	17/12/2019	23/12/2019	4	0
1TP709759^	48.8 to 49.6	25/11/2019	9/12/2019	17/12/2019	23/12/2019	4	0
2LP133657^	49.6 to 50.2	25/11/2019	9/12/2019	17/12/2019	23/12/2019	4	1
218355271^	50.2 to 50.2	25/11/2019	9/12/2019	17/12/2019	23/12/2019	4	0
1TP168481^	50.2 to 50.3	25/11/2019	9/12/2019	17/12/2019	23/12/2019	4	4
1TP710356^	50.3 to 50.7	25/11/2019	9/12/2019	17/12/2019	23/12/2019	4	11
2LP130336^	50.7 to 51.0	25/11/2019	9/12/2019	17/12/2019	23/12/2019	4	4
Total							90

Appendix P – Survey Condition Data for Golden Sun Moth

Survey conditions invalid

Parameter	18/11/2019	20/11/2019	25/11/2019	29/11/2019	3/12/2019	5/12/2019	9/12/2019
GSM observed during survey	N	N	Y	N	Y	Y	N
GSM observed at reference site	Y	Y	Y	Y	Y	N	Y
Reference site	Broadmeadows Valley Park	Broadmeadows Valley Park	Parcel 1PS733043 Craigieburn Grassland	Parcel 2LP130336	Parcels 2LP218323 & 32LP93445	Parcel 1PS733043	Broadmeadows Valley Park
GSM abundance at reference site	100	20	20	10	2	18	72
Days since last rain	2	4	2	2	0	1	7
Volume last rain (mm)	0	0	0	5	1	3	3
Time - start	12:00	10:33	10:46	12:25	10:00	12:33	10:00
Time - end	15:03	14:13	15:27	13:55	15:00	12:58	13:00
Temp - start (°C)	24	20	27	25	15	21	30
Temp - middle (°C)	26	26	28	25	21	21	33
Temp - end (°C)	27	30	22	23	21	22	35
Wind direction - start	WSW	E	NNW	SSW	W	W	NNE
Wind direction - middle	W	SE	WNW	W	W	W	N
Wind direction - end	WSW	SE	SSW	SW	W	W	N
Wind speed - start (km/h)	28	9	26	13	35	37	25
Wind speed - middle (km/h)	20	13	22	15	35	35	25
Wind speed - end (km/h)	20	15	22	15	46	32	25
Cloud cover - start (%)	20	0	5	5	7	60	5
Cloud cover - middle (%)	20	0	8	20	7	70	5
Cloud cover - end (%)	20	0	8	10	6	80	5
Humidity - start (%)	25	48	12	29	59	40	16
Humidity - middle (%)	24	30	11	29	40	40	16
Humidity - end (%)	23	27	22	41	34	39	14
Soil condition - start	Dry	Dry	Dry	Dry	Dry	Dry	Dry

Parameter	18/11/2019	20/11/2019	25/11/2019	29/11/2019	3/12/2019	5/12/2019	9/12/2019
Soil condition - middle	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Soil condition - end	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Valid survey date	Y	Y	Y	Y	Y	Y	Y

Parameter	13/12/2019	14/12/2019	16/12/2019	17/12/2019	17/12/2019	18/12/2019	23/12/2019
GSM observed during survey	Y	N	N	N	N	Y	Y
GSM observed at reference site	Y	N	Y	Y	Y	Y	Y
Reference Site	Parcel CPS805151	-	Broad-meadows Valley Park	Broad-meadows Valley Park	Mt Ridley Grassland Extension	Parcels 1TP746632 & 2LP133657 Mt Ridley Grassland Extension	Parcel 6TP394032 Broadmeadows Valley Park
GSM abundance at reference site	1	6	15	20	39	27	37
Days since last rain	3	4	6	7	7	8	13
Volume last rain (mm)	0	0	0	0	0	0	0
Time - start	10:00	10:00	10:00	13:05	10:20	10:14	11:03
Time - end	15:00	15:00	12:30	13:49	14:00	14:20	12:05
Temp - start (°C)	14	16	20	28	33	29	20
Temp - middle (°C)	22	19	22	29	36	34	20
Temp - end (°C)	24	21	25	29	38	39	22
Wind direction - start	SSW	SW	SE	SE	NNE	ENE	SSE
Wind direction - middle	SSW	SW	SE	SE	NNW	NW	SSW
Wind direction - end	SSW	SW	ESE	SE	W	WNW	SW
Wind speed - start (km/h)	22	19	7	15	33	9	19
Wind speed - middle (km/h)	22	19	5	10	12	15	13
Wind speed - end (km/h)	24	19	2	9	4	15	15
Cloud cover - start (%)	7	8	2	30	5	0	5
Cloud cover - middle (%)	7	8		5	5	0	10
Cloud cover - end (%)	7	8	50	20	20	0	3
Humidity - start (%)	52	67	56	23	20	37	53

Parameter	13/12/2019	14/12/2019	16/12/2019	17/12/2019	17/12/2019	18/12/2019	23/12/2019
Humidity - middle (%)	40	50	50	23	21	22	53
Humidity - end (%)	34	47	34	23	15	13	34
Soil condition - start	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Soil condition - middle	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Soil condition - end	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Valid survey date	Y	N	Y	Y	Y	Y	Y

Parameter	27/11/2020	14/12/2020	09/01/2021	13/01/2021	21/01/21
GSM observed during survey	Y	Y	Y	N	N
GSM observed at reference site	Y	Y	Y	Y	Y
Reference site	Parcel 1PS733043, Broadmeadows, Long Forest,	Parcel 1PS714688, Craigieburn, Craigieburn Grassland Epping, Broadmeadows, Long Forest	Parcel 1PS71468, Broadmeadows	Parcel 1TP710356, Broadmeadows	Parcel 1TP710356
GSM abundance at reference site	43	145	10	5	6
Days since last rain	3	4	2	6	4
Volume last rain (mm)	3.4	0.6	3.2	3.2	5.2
Time - start	10:00	10:00	10:30	10:00	10:15
Time - end	14:00	13:00	14:00	11:30	13:00
Temp - start (°C)	24	25	25	20	21
Temp - middle (°C)	29	29	28	22	29
Temp - end (°C)	32	30	30	25	31
Wind direction - start	NNW	N	N	E	N
Wind direction - middle	NE	NNE	NNW	E	NE
Wind direction - end	N	NNE	N	SE	E
Wind speed - start (km/h)	10	38	24	9	7
Wind speed - middle (km/h)	24	46	11	7	20
Wind speed - end (km/h)	33	27.8	0	7	15
Cloud cover - start (%)	10	0	0	5	10
Cloud cover - middle (%)	30	0	0	20	5
Cloud cover - end (%)	80	0	10	30	5

Parameter	27/11/2020	14/12/2020	09/01/2021	13/01/2021	21/01/21
Humidity - start (%)	41	36	37	61	52
Humidity - middle (%)	34	28	35	55	28
Humidity - end (%)	24	24	34	46	19
Soil condition - start	Dry	Dry	Dry	Dry	Dry
Soil condition - middle	Dry	Dry	Dry	Dry	Dry
Soil condition - end	Dry	Dry	Dry	Dry	Dry
Valid survey date	Y	Y	Y	Y	Y

Appendix Q – Survey Results for Growling Grass Frog (Biosis 2020 and GHD 2020)

	Growling Grass Frog recorded
N/A	Dry - unsuitable for night survey
	Waterbody within or immediately adjacent Project Area

KP – Kilometre point

Parcel	KP start to finish	Habitat feature(s)	Location proximal to Project Area	Day survey	Potential habitat	Suitable condition for night survey	Night survey 1	Night survey 1
2PS343496	8.3 to 8.7	Tame Street Drain	Project Area crosses drain	10/12/2019	Y	Y	17/12/2019	22/01/2020
		1 x dam	Outside Project Area – 42 m	19/11/2020	Y	Y	*17/12/2019	*22/01/2020
1TP710576	9.1 to 9.2	1x dam	Outside Project Area – 14 m	10/12/2019 and 01/12/2020	Y	^Y	N/A	N/A
11LP92520	10.5 to 10.6	1x dam	Outside Project Area – 29 m	10/12/2019	Y	^unknown	*9/12/2020	*15/12/2020
12LP92520	10.6 to 10.8	1x dam	Dam outside Project Area 58 m, associated drainage line crossed by Project Area	10/12/2019 and 01/12/2020	Y	^Y	9/12/2020	15/12/2020
13LP92520	10.8 to 11.1	1x dam	Outside Project Area – 42 m	10/12/2019	Y	Y	17/12/2019	22/01/2020
2LP137651	11.2 to 11.3	1x dam	Within Project Area	10/12/2019 and 01/12/2020	Y	^Y	9/12/2020	15/12/2020
1LP137651	11.3 to 11.5	1x dam	Within Project Area	10/12/2019 and 01/12/2020	Y	^Y	9/12/2020	15/12/2020
D16PP2761	11.5 to 12.0	1x dam	Within Project Area	10/12/2019 and 19/11/2020	Y	^Y	*9/12/2020	*15/12/2020
1TP333383	12.9 to 13.7	1x dam	Outside Project Area – 30 m	10/12/2019 and 19/11/2020	Y	^Y	N/A	N/A
2029PP2761	13.7 to 13.7	Jacksons Creek	Within Project Area	Assume presence				
2010PP2258	13.7 to 13.8	Jacksons Creek	Within Project Area	Assume presence				
2002PP2258	16.7 to 16.7	Deep Creek	Within Project Area	Assume presence and recorded 28/01/2020				
2LP130112	17.6 to 17.9	1x dam	Outside Project Area – 30 m	19/11/2020	N	Y	*9/12/2020	*15/12/2020

Parcel	KP start to finish	Habitat feature(s)	Location proximal to Project Area	Day survey	Potential habitat	Suitable condition for night survey	Night survey 1	Night survey 1
1LP130112	17.9 to 18.3	1x dam	Outside Project Area – 23 m	10/12/2019 and 19/11/2020	Y	^Y	9/12/2020	15/12/2020
B7PP2258	18.3 to 19.0	2x dam	Outside Project Area – 6 and 16 m	10/12/2019 and 19/11/2020	Y	^Y	*9/12/2020	*15/12/2020
5LP88261	19.0 to 19.4	1x dam	Outside Project Area – 27 m	10/12/2019 and 01/12/2020	Y	^Y	N/A	N/A
10LP110642	19.4 to 20.2	1x dam	Within Project Area	10/12/2019	Y	Y	17/12/2019	22/01/2020
		1 x dam	Outside Project Area – 74 m	25/11/2020	Y	Y	N/A	N/A
2LP218160	20.2 to 21.4	1 x dam	Outside Project Area – 18 m	25/11/2020	Y	^Y	N/A	N/A
1PS733045	22.7 to 24.2	1x dam	Outside Project Area – 85 m	10/12/2019	Y	Y	17/12/2019	22/01/2020
32LP93445	27.0 to 27.4	1x dam	Outside Project Area – 0 m	10/12/2019 and 01/12/2020	Y	^Y	9/12/2020	15/12/2020
PPS816942	29.1-30.3	1x dam	Outside Project Area – 101 m	10/12/2019	Y	Y	17/12/2019	22/01/2020
1LP126752	31.1 to 31.3	1 x dam	Outside Project Area – 30 m	19/11/2020	Y	Y	9/12/2020	15/12/2020
1PS714688	31.5 to 31.7	1 x dam	Outside Project Area – 58 m	20/11/2020	N	Y	NA	NA
1TP201330	#33.4 to 34	1x dam	Outside Project Area – 28 m	10/12/2019	Y	N	N/A	N/A
29PP3100	#3.0 to 35.5	Kalkallo Creek and adjacent unnamed channel	Within Project Area	10/12/2019	Y	N	N/A	N/A
1LP136262	#35.5 to 35.7	1x dam	Outside Project Area – 25 m	10/12/2019	Y	N	N/A	N/A

Parcel	KP start to finish	Habitat feature(s)	Location proximal to Project Area	Day survey	Potential habitat	Suitable condition for night survey	Night survey 1	Night survey 1
9LP136262	#36.8 to 36.9	1x dam	Within Project Area	6/02/2020	Y	N	N/A	N/A
10LP5364	#39.0 to 39.8	1x dam	Outside Project Area – 94 m	6/02/2020	Y	Y	17/02/2020	-
1LP113763	#39.8 to 40.2	2x dam	1 x within Project Area and 1 x outside Project Area 25 m	6/02/2020	Y	N	N/A	N/A
2LP113763	#40.2 to 41.1	1x unnamed tributary of Merri Creek	Within Project Area	6/02/2020	Y	Y	No access	
1TP709372	#42.7 to 42.8	Merri Creek	Within Project Area	Assume presence				
2LP67181	#42.8 to 44.7	Merri Creek	Within Project Area	Assume presence				
1TP709759	#48.8 to 49.6	1x dam	Outside Project Area – 45 m	10/12/2019	Y	Y	17/12/2019	22/01/2020

*Acoustic and call play back survey only as no access to undertake visual inspection

^ Assessed as dry during 2019/20 surveys. Reassessed as holding water in 2020.

Within MSA

Appendix R – Aquatic species – likelihood of occurrence assessment

Common name	Scientific name	Conservation status			Source	Habitat preference	Likely of occurrence	Survey results (GHD 2020)
		EPBC	FFG	DELWP				
Australian Grayling	*Prototroctes maraena*	VU	L	v	2015 PMST	Adults inhabit cool, clear, freshwater streams.	Medium - Species is present throughout the Maribyrnong and Yarra River. However Deep Creek is the only waterway within the Project Area that contains suitable habitat.	Not detected
Dwarf Galaxias	*Galaxiella pusilla*	VU	L	e	PMST	Slow-flowing or still freshwater wetlands such as swamps, drains and backwaters of streams.	Low - Species range does not extend throughout the Project Area.	Not detected
Murray Cod	*Maccullochella peelii*	VU	L	v	2012 PMST	A diverse range of stream habitats in the Murray-Darling basin; principally main channels of rivers and major tributaries.	Low - Although a population exists in the Yarra River unlikely to occur in the upper reaches of Merri Creek due to a lack of suitable habitat. Historic records in Maribyrnong catchment represent failed translocations is considered unlikely to persist within Deep and Jacksons Creeks.	Not detected
Macquarie Perch	*Macquaria australasica*	EN	L	e	2015	Cool, clear freshwaters of rivers, lakes and reservoirs, preferring slow-flowing deep rocky pools.	Low - Last recorded in Yarra River near Dights Falls and represents translocated population.	Not detected
Australian Mudfish	*Neochanna cleaveri*		L	c	1991	Permanent and ephemeral stagnant freshwater swamps and drains, preferring areas with muddy or silty bottoms and thick instream and emergent vegetation.	Low - Last recorded in Yarra River near Dights Falls in 1991. No suitable habitat in Project Area and unlikely to migrate upstream.	Not detected
Silver Perch	*Bidyanus bidyanus*	CR	L	v	1981	Freshwater rivers, lakes and reservoirs, particularly in areas of high water flow.	Low - Last recorded in Maribyrnong River near Keilor in 1981 and Project Area outside of natural range of species.	Not detected
Murray River Turtle	*Emydura macquarii*			v	2019	Rivers and associated waterbodies such as backwaters, oxbows, anabranches and deep, permanent waterholes on the floodplains. Species appears to avoid shallow water.	Low - No suitable habitat in Project Area and only single record of occurrence within five kilometres.	Not detected

Appendix S – EPBC Act Significant Impact Assessments – Communities

Significant Impact Criteria	Natural Temperate Grassland of the Victorian Volcanic Plain (Critically Endangered)	Grassy Eucalypt Woodland of the Victorian Volcanic Plain (Critically Endangered)
An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will: (DoE 2013):		
Reduce the extent of an ecological community	NTGVVP ecological community is confined to open plains on Quaternary basalt soils. A total of 4.16 ha of NTGVVP is planned for removal during construction of the Project. The ecological community has a disjunct distribution from Melbourne to the South Australian border on the Victorian Volcanic Plain. In this landscape context, the proposed removal would not reduce the geographic extent of the community, as the proposed impacts are not at the edge of the range of the community. It should be noted that the TEC is estimated to have declined from pre-European settlement extent by at least 98%, with 5,240 ha remaining in 2004 (Threatened Species Scientific Committee, 2008). Sixteen years later, there is no current information on the extent or area of occupancy of the TEC; however, the extent of the community is likely to have further reduced, owing to ongoing clearing, weed invasion and poor management practices throughout the TEC's range. Based on the 2004 area of occupancy data, the removal of 4.16 ha of the community would constitute an impact of at least 0.13% of the listed community. There are no published thresholds for determining a significant impact based on extent of removal; therefore, it is difficult to determine the significance of impact under this criterion. That being said, the project is unlikely to reduce the *geographic extent* of the community. However, based on the removal of 4.16 ha of NTGVVP, it is likely to lead to a significant reduction in the *area of occupancy* of a critically endangered community. **Conclusion:** Unlikely to reduce the overall geographic extent of an ecological community but likely to significantly impact an ecological community through a reduction in the area of occupancy.	GEWVVP ecological community is endemic to western Victoria and is limited to the Victorian Volcanic Plain bioregion on Quaternary basalt soils. 2.26 ha of GEWVVP is planned for removal during construction of the Project. GEWVVP is recognised as a floristic component of grassy woodlands typically domeinated by River Red Gum that were formerly more widespread from southern Queensland through to South Australia. GEWVVP is restricted south of the Great Dividing Range in south-western Victoria but extends into Melbourne's peri-urban zone, including in the Project Area (Threatened Species Scientific Committee, 2009). Some patches occur as a treeless form owing to particular management regimes. The area of extent of the community is currently not known but was estimated between 18,000 and 60,500 ha by the Threatened Species Scientific Committee (2009). With ongoing clearing as a result of urbanisation and worsening in condition owing to weeds and lack of appropriate management of the TEC throughout much of its range, this area has almost undoubtedly and measurably declined. There are no published thresholds for determining a significant impact based on extent of removal. However, the distribution of GEWVVP is considered to be geographically restricted, based on the fragmentation of remnants into very small patch sizes that are subject to ongoing threats (Threatened Species Scientific Committee, 2009). In this context, the proposed removal of 2.26 ha of GEWVVP will not reduce the geographic area of extent of the community but will reduce its area of occupancy. **Conclusion:** Unlikely to reduce the overall geographic extent of GEWVVP but likely to significantly impact the TEC through a reduction in the area of occupancy.

Significant Impact Criteria	Natural Temperate Grassland of the Victorian Volcanic Plain (Critically Endangered)	Grassy Eucalypt Woodland of the Victorian Volcanic Plain (Critically Endangered)
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	The TEC was mapped as 30 discrete patches in the Project Area and is considered already highly fragmented. However, the removal of existing patches, or portions of patches, will cause further fragmentation in the broader study area. Fifteen patches within the construction corridor will be reduced to an area smaller than 0.05 ha and as a consequence, will no longer meet the patch size threshold for the TEC. Even though the patch size threshold for the NTGVVP community is small (0.05 ha), these areas of NTGVVP are considered worthy of protection (Threatened Species Scientific Committee, 2008). **Conclusion:** Likely to fragment or increase fragmentation of an ecological community leading to a significant impact.	In the Project area, GEWVVP is confined to a single patch outside the MSA that spans two properties separated by a bitumen road. The TEC was assessed as in good condition at one property and was of poorer quality and lacking native species diversity in the groundlayer at the other property. Both patches include a number of large River Red Gum trees. The entire patch is estimated from aerial imagery to be around 50 ha in extent. Four areas of the TEC within the construction corridor will be reduced to an area smaller than 0.05 ha and as a consequence, will no longer meet the patch size threshold for the TEC. Thus, construction of the Project will result in further fragmentation of the TEC. Impacts are expected to floristic and structural elements, in particular large trees that are keystone functional components of the vegetation and are hollow bearing. Additionally, the fragmented distribution of the community and its generally small patch size increase the vulnerability of the TEC to threatening processes (Threatened Species Scientific Committee, 2009). **Conclusion:** Likely to be a significant impact (rationale as per criterion above: reduce the extent of an ecological community)**.**

Significant Impact Criteria	Natural Temperate Grassland of the Victorian Volcanic Plain (Critically Endangered)	Grassy Eucalypt Woodland of the Victorian Volcanic Plain (Critically Endangered)
Adversely affect habitat critical to the survival of an ecological community	The *Approved Conservation Advice*, the *Listing Advice* (Threatened Species Scientific Committee, 2008) and the *Nationally Threatened Ecological Communities of the Victorian Volcanic Plain* Policy Statement (DSEWPaC 2011c) do not state where habitat critical to the survival of NTGVVP is located. Consequently, it is difficult to determine whether habitat critical to the survival of the ecological community would be significantly impacted by the Project. Despite this, the Policy Statement (DSEWPaC 2011c) does list a number of sites as key remnants of the listed community, including road and rail reserves, cemeteries and some reserves within the Greater Melbourne area. However, none of these remnants are proposed to be impacted. **Conclusion:** Unlikely to adversely affect habitat critical to the survival of an ecological community	There is no current list of sites critical for the survival of the ecological community and no critical habitat described for the TEC. Around 3% of GEWVVP was formally reserved in 2007 (Threatened Species Scientific Committee, 2009), otherwise the majority of the TEC occurs on private property. Clearing for urban development in the Hume, Melton and Whittlesea urban growth zones was identified by the Threatened Species Scientific Committee (2009) as a serious threat and likely to lead to further loss of the TEC. To date, establishment of a Grassy Woodland Reserve, planned under the MSA program, has not been implemented by DELWP. **Conclusion:** Likely to adversely affect habitat critical to the survival of an ecological community
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	The Project will not impact surface water drainage or groundwater associated with the areas of NTGVVP, since the depth to the water table is generally substantially deeper than the impact depth proposed. Construction of the Project involves removal of topsoil within a 30 m wide corridor and construction techniques will include open trenching (2 m deep x 1 m wide). **Conclusion:** Likely to modify or destroy abiotic (non-living) factors	The Project will not impact surface water drainage or groundwater associated with the areas of GEWVVP, since the depth to the water table is generally substantially deeper than the impact depth proposed. Construction of the Project involves removal of topsoil within a 30 m wide corridor and construction techniques will include open trenching (2 m deep x 1 m wide). **Conclusion:** Likely to modify or destroy abiotic (non-living) factors

Significant Impact Criteria	Natural Temperate Grassland of the Victorian Volcanic Plain (Critically Endangered)	Grassy Eucalypt Woodland of the Victorian Volcanic Plain (Critically Endangered)
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	NTGVVP species composition is generally lacking in diversity across the Project Area and is now restricted to the most resilient of species, e.g. Wallaby grasses and Spear grasses. In addition to the loss of the key indicator species, Kangaroo Grass, it appears that many small forbs that previously characterised the TEC, including native daisies and peas may also be long gone from the system, primarily owing to altered fire regimes, de-rocking, pasture improvement, cropping and weed invasion across the broader project area. Consequently, there is little opportunity for a further substantial change in the species composition of adjacent examples of the ecological community. **Conclusion:** Unlikely to cause a substantial change in the species composition of an occurrence of an ecological community adjacent to the project footprint.	Reduction in patch size through fragmentation of the TEC is likely to lead to a loss of floristic diversity and structural intactness, owing to an increased likelihood of weed invasion, given its position within an agricultural landscape. The area of the TEC within the construction corridor is in good condition, suggesting that its position within a larger area of GEWVVP and the current land use regime (livestock grazing) is beneficial. While the grazing regime is currently not known, this regime will be disrupted during construction. No burning is proposed or flora and fauna harvesting. EMMs to manage impacts to adjoining GEWVVP vegetation include including all vegetation clearing works being confined to the defined construction area, clearly demarcated no go areas, opportunities to reduce the construction area will be explored near identified environmentally sensitive locations prior to clearance, management of soil erosion, topsoil management, weed management and site rehabilitation. However, fragmentation of the community leading to increased vulnerability to threats and loss of large trees in particular, will result in the loss of functionally important species. **Conclusion:** Likely to cause a substantial change in the species composition of an occurrence of an ecological community

Significant Impact Criteria	Natural Temperate Grassland of the Victorian Volcanic Plain (Critically Endangered)	Grassy Eucalypt Woodland of the Victorian Volcanic Plain (Critically Endangered)
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – assisting invasive species, that are harmful to the listed ecological community, to become established, or – causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community	Declared noxious weeds and weeds of national significance are abundant throughout the Project Area and have the ability to rapidly establish on fertile basalt soils. Despite this, there is limited potential for introduction of new weeds and spread of established weeds during construction of the Project, since the construction corridor is already mostly dominated by non-native vegetation including extensive infestations of noxious weeds. Nevertheless, removal of vegetation within the construction easement is likely to render adjacent NTGVVP patches somewhat more vulnerable to weed invasion, through a reduction in patch size, increase in edge effects and susceptibility of fertile basalt soils to weed establishment. To this end, EMM B2 and B13 have been developed to manage weeds, contaminated soil and erosion, and measures will be incorporated into a CEMP to protect adjacent patches of NTGVVP where they occur. It should be noted that weed management during construction will be far more substantial than occurs at present. **Conclusion:** Unlikely to cause a substantial reduction in the quality or integrity of an occurrence of an adjacent ecological community	Declared noxious weeds and weeds of national significance that have the ability to rapidly establish on fertile basalt soils are abundant throughout the Project Area. However, there is little potential for introduction of new weeds and spread of established weeds during construction of the Project since the surrounding vegetation is already heavily invaded by weeds and the Project Area is mostly dominated by non-native vegetation. In spite of its position in an agricultural setting, the TEC was assessed as being in good condition and the majority of the TEC in the Project Area occurs within a larger patch that may potentially be vulnerable to weed establishment if disturbed. To address this, EMM B2 and EMM B13 include measures to manage potential weed invasion, contaminated soil and erosion and measures will be incorporated into a CEMP to protect surrounding areas of GEWVVP. Consequently, weed management during construction will be far more substantial than occurs at present. **Conclusion:** Unlikely to cause a substantial reduction in the quality or integrity of an occurrence of an ecological community

Significant Impact Criteria	Natural Temperate Grassland of the Victorian Volcanic Plain (Critically Endangered)	Grassy Eucalypt Woodland of the Victorian Volcanic Plain (Critically Endangered)
Interfere with the recovery of an ecological community	There is no recovery plan for the TEC. Within the project area, the NTGVVP is of poor quality and the removal of vegetation may be considered of limited consequence for the NTGVVP community across the broader landscape in regard to its potential for recovery. However, the loss will contribute to cumulative losses of NTGVVP both within the broader area, which is subject to ongoing urbanisation, and across the Victorian Volcanic Plain Bioregion. Delays in acquiring land for the Western Grassland Reserve and continuing threats of degradation are considered to pose significant risks to the TEC (VAGO, 2020). Therefore, removal of the community in the Project Area is likely to further exacerbate recovery efforts for the NTGVVP. **Conclusion:** Likely to interfere with the recovery of an ecological community	There is no recovery plan for the TEC. The GEWVVP in the Project Area is of good quality and would make a substantial contribution to recovery of the TEC in the broader landscape. The loss will also contribute to cumulative losses of GEWVVP across the Victorian Volcanic Plain Bioregion. Delays in acquiring land for the Grassy Eucalypt Woodland Reserve and continuing threats of degradation are considered to pose significant risks to the TEC (VAGO, 2020). Therefore, removal of the community in the Project Area is likely to further exacerbate recovery efforts for the GEWVVP. **Conclusion:** Likely to interfere with the recovery of an ecological community

Appendix T – EPBC Act Significant Impact Assessments – Flora

Table T1 Significant Impact criteria for Matted Flax-lily

Significant Impact Criteria	Matted Flax-lily (Endangered)
An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will (DoE 2013):	
Lead to a long-term decrease in the size of a population	Construction of the Project will not require removal of one Matted Flax-lily plant from one site. Based on this level of impact the Project would not result in a long-term decrease in the size of the population. **Unlikely** to lead to a long-term decrease in the size of a population.
Reduce the area of occupancy of the species	The Project will not result in the loss of the only plant and therefore will not reduce the area of occupancy of the species. **Unlikely** to reduce the area of occupancy of the species.
Fragment an existing population into two or more populations	The population would not be fragmented into two or more populations - only a single plant occurs at one location in the Project Area and will not be removed. **Unlikely** to fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of a species	The single Matted Flax-lily individual was identified within the fence line along an uncultivated area of roadside (around KP 23) adjacent to a paddock of Plains Grassy Woodland (KP 23 – KP 24). Currently there is no habitat identified as critical to the survival of Matted Falx-lily; however, the species would be expected to occur in grassland and grassy woodland communities of sufficient quality. No plants were recorded in these habitats in spite of detailed targeted surveys conducted during the flowering period and since only a single plant exists, dispersal to these areas is unlikely. **Unlikely** to adversely affect habitat critical to the survival of a species.
Disrupt the breeding cycle of a population	Native bees are the natural pollinator of Matted Flax-lily, suggesting that it is self-incompatible and little evidence exists to indicate whether pollinated flowers translate to successful seed germination and recruitment. Matted Flax-lily apparently does not readily regenerate from seed in situ, and spread is likely to be by vegetative means. A single plant is not considered a viable population and is unlikely lead to a viable population in the long-term. Therefore the project is unlikely to promote any further decline in the population. **Unlikely** to disrupt the breeding cycle of a population

Significant Impact Criteria	Matted Flax-lily (Endangered)
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Habitat for the single Matted Flax-lily is planned for removal in nearby grassy woodland vegetation during construction of the Project. Since only one plant occurs, it is highly unlikely that vegetation removal will be the sole cause of any species' decline. Some short-term impacts may occur (e.g. increased dust) and movement of heavy machinery; however, the plant will be clearly identified in a no go zone. **Unlikely to** modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Matted Flax-lily will be retained and no other critically endangered or endangered plant species are known from the construction corridor. Little if any change to current conditions is expected at the site where the plant occurs as a result of construction of the Project. **Unlikely** to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.
Introduce disease that may cause the species to decline	No diseases known to affect Matted Flax-lily would likely be activated or exacerbated by construction of the Project. **Unlikely** to introduce disease that may cause the species to decline.
Interfere with the recovery of the species	Construction of the project will not interfere with implementation of any known recovery effort in the broader area or the national recovery plan. **Unlikely** to interfere with the recovery of the species.

Appendix U – EPBC Act Significant Impact Assessments – Critically Endangered and Endangered Fauna (Golden Sun Moth, Grassland Earless Dragon and Australasian Bittern)

Table U1 Significant Impact Guidelines for Critically Endangered and Endangered fauna

Significant Impact Criteria	Golden Sun Moth (Critically Endangered)	Grassland Earless Dragon (Endangered)	Australasian Bittern (Endangered)
An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will (DoE 2013):			
Lead to a long-term decrease in the size of a population	Surveys were undertaken over the 2019/2020 and 2020/2021 survey season and 66 individuals were detected outside the MSA area. Four rounds of survey were completed at approximately 90% of parcels. Even though apparent population size (i.e., flying moths) is known to vary from year to year based on conditions, the numbers of individuals detected suggest that population sizes within the Project Area are small. Disturbance of habitat within the Project Area is expected to be temporary with habitats reinstated following works. However the ability for Golden Sun Moth to recolonise areas of ground disturbance is not well understood and the areas are considered lost. Impacts are expected to be restricted to a narrow Project Area where it bisects areas of Golden Sun Moth habitat, which will allow the species to still cross the Project Area during and following construction and maintain population flow. **Conclusion: Unlikely.** A long-term decrease in the size of the population is not expected as a result of the habitat disturbance.	The species has previously been recorded within the Project Area (near KP 42.6) in 1990. Extensive surveys for this species have been conducted at this location and the surrounding area to the north and west of Melbourne (Robertson and Evans 2009/2012) and the species has not been detected since (Biosis 2019). This species may now be extinct within northern Melbourne and potentially within Victoria (Melville et al 2019). Therefore, the likelihood of this species occurring within the Project Area is considered negligible. Disturbance of habitat within the Project Area is expected to be temporary with habitats reinstated following works. **Conclusion: Unlikely.** Project impacts are not expected to lead to a long-term decrease in the size of a population, due to the very low likelihood of the species occurring within the Project Area.	This species is now only known from <1000 mature individuals within Australia. The species has previously been recorded within the Study Area, however this record is over 30 years old. This species is known to prefer dense tall vegetation in permanent freshwater swamps and wetlands, particularly when dominated by sedges, rushes and reeds. Field habitat assessment identified that suitable wetland habitat for this species does not occur within the Project Area. Therefore, the likelihood of this species occurring within the Project Area is considered low. **Conclusion: Unlikely.** Project impacts are not expected to lead to a long-term decrease in the size of the population, due to the low likelihood of the species occurring within the Project Area.

Significant Impact Criteria	Golden Sun Moth (Critically Endangered)	Grassland Earless Dragon (Endangered)	Australasian Bittern (Endangered)
Reduce the area of occupancy of the species	The Project Area occurs in a landscape of nearly contiguous suitable habitat, where almost every parcel that the Project intercepted along the approximately 25 km outside the MSA area was considered suitable habitat. A total of 19.93 ha of habitat known to support this species (11.85 ha) or assumed to support this species (8.08 ha) is proposed to be impacted. Disturbance of habitat within the Project Area is expected to be temporary with habitats reinstated following works. However the ability for Golden Sun Moth to recolonise areas of ground disturbance is not well understood and the areas are considered lost. Impacts are expected to be restricted to the narrow Project Area where it bisects areas of Golden Sun Moth habitat, this will allow the population to maintain flow during and post construction. **Conclusion: Possible.** At a landscape scale, the area of occupancy for this species will not change. However, at a habitat-area scale, the residual area of occupancy for this species may be reduced. It is possible that over time the species may recolonise the Project Area but the species ability to do this is not well understood and habitat within the Project Area must be assumed to be lost.	This species may now be extinct within northern Melbourne and potentially within Victoria (Melville et al 2019). Known populations of this species are now confined to the ACT and NSW. Given the very low likelihood of the species occurring within the Project Area; Project impacts are not expected to reduce the area of occupancy of this species. Disturbance of habitat within the Project Area is expected to be temporary with habitats reinstated following works. **Conclusion: Unlikely.** The Project is not expected to reduce the area of occupancy given the very low likelihood of the species occurring within the Project Area.	The Australasian Bittern is found in south-east Australia, including south-east Queensland, New South Wales, Victoria, Tasmania, south-eastern South Australia and southern Western Australia. It is also occurs in New Zealand and New Caledonia. In Victoria, the species is widespread. Records are most numerous in coastal areas and the Murray River region of the central northern part of the state (Marchant and Higgins 2004). The VBA database (accessed 9/9/20) identifies three main hotspots for this species in Victoria: along the south coast between Port Fairy and Portland, around Port Phillip Bay between Geelong and Carrum Downs and along the Murray River between Swan Hill and Yarrawonga. Suitable habitat for this species is widely available across Victoria and field habitat assessment identified that suitable wetland habitat for this species does not occur within the Project Area. **Conclusion: Unlikely.** Given the extensive area of occupancy across Victoria, widespread availability of suitable habitat and the lack of suitable habitat within the Project Area; Project impacts are not expected to reduce the area of occupancy of this species.

Significant Impact Criteria	Golden Sun Moth (Critically Endangered)	Grassland Earless Dragon (Endangered)	Australasian Bittern (Endangered)
Fragment an existing population into two or more populations	The pipeline will occupy an easement of approximately 15 m width and be buried for its entire length. For construction, the Project Area is typically 30 metres wide and includes additional space in certain sections to accommodate machinery, vehicle turnarounds and material storage. Golden Sun Moth are capable of flying across such distances, so populations are unlikely to be fragmented during the construction period. With habitat reinstatement, any localised fragmentation would be temporary. **Conclusion: Unlikely.** This species is capable of crossing the area of disturbance during construction.	The likelihood of this species occurring within the Project Area is negligible and the impacts of the Project are not expected to result in the fragmentation of a population. **Conclusion: Unlikely.** Species not expected to occur in the Project Area.	This species is known to travel vast distances over disturbed land. Individuals are able to move between habitat areas in and around the Project Area if required. The Project is not expected to impact any habitat that this species frequently uses or relies on. Therefore, Project impacts are not expected to result in the fragmentation of a population. **Conclusion: Unlikely.** Species is highly mobile and has a low likelihood of presence.
Adversely affect habitat critical to the survival of a species	A total of 19.93 ha of habitat known to support this species (11.85 ha) or assumed to support this species (8.08 ha) is proposed to be impacted. The Project Area occurs in a landscape of nearly contiguous suitable habitat, where almost every parcel that the Project intercepted along the approximately 25 km outside the MSA area was considered suitable habitat. Impact to habitat or assumed habitat is minimal when considered at the scale at which habitat occurs in this area. Adverse impacts to habitat or assumed habitat for this species are not expected to be at the scale that would impact the survival of the species as a whole. **Conclusion: Unlikely.** Habitat within the Project Area is not expected to be critical to the survival of the species. Residual impacts are expected to be temporary with habitats reinstated following works and supporting the potential for recolonisation.	Potentially suitable habitat is present within sections of the Project Area, however, extensive surveys have failed to detect the species since 1990 and the species is likely to now be extinct within northern Melbourne and potentially within Victoria (Melville et al 2019). Given the species has not been recorded within the Project Area or surrounding area for 30 years, and targeted surveys have failed to detect the species, the likelihood of this species occurring in the Project Area is negligible. Any direct or indirect impacts of the Project are not expected to impact on habitat that is critical for the survival of this species. **Conclusion: Unlikely.** Species not expected to occur in the Project Area.	The habitat available within the Project Area is not considered suitable wetland habitat for the species. Far more suitable habitat is available in other areas within Victoria. The most recent record of the species within the Study Area was in 1989 (VBA). Given this, there is a low likelihood this species uses habitat within the Project Area. Any direct or indirect impacts of the Project are not expected to impact on habitat that is critical for the survival of this species. **Conclusion: Unlikely.** Habitat within the Project Area not considered suitable and low likelihood of species presence.

Significant Impact Criteria	Golden Sun Moth (Critically Endangered)	Grassland Earless Dragon (Endangered)	Australasian Bittern (Endangered)
Disrupt the breeding cycle of a population	Impacts to adults are expected to be minimal given the apparently small population sizes in the areas where they were detected (a total of 66 individuals were recorded from 7 parcels). Pupal and larval life stages within the Project Area are likely to be disturbed or killed during earth works. Larvae in adjacent habitat will not be impacted. Works are largely confined to a 30 m wide Project Area which is likely to be readily re-colonised following reinstatement. **Conclusion: Unlikely.** Any disruption to the breeding cycle of this species is expected to be temporary and highly localised, and not change the breeding dynamics of a population.	The likelihood of this species occurring in the Project Area is negligible. This species may now be extinct within northern Melbourne and potentially within Victoria (Melville et al 2019). Impacts to the breeding cycle of a population are not expected. **Conclusion: Unlikely.** Species not expected to occur in the Project Area.	Available data indicate that the Australasian Bittern breeds in relatively deep, densely vegetated freshwater swamps and pools. In rush land, it is expected to avoid breeding in the densest areas (Marchant & Higgins 1990). There is no suitable breeding habitat available within the Project Area. Impacts at a population level are not expected. **Conclusion: Unlikely.** No suitable breeding habitat within the Project Area.

Significant Impact Criteria	Golden Sun Moth (Critically Endangered)	Grassland Earless Dragon (Endangered)	Australasian Bittern (Endangered)
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Project Area occurs in a landscape of nearly contiguous suitable habitat, where almost every parcel that the Project intercepted along the approximately 25 km outside the MSA area was considered suitable habitat. A total of 19.93 ha of habitat known to support this species (11.85 ha) or assumed to support this species (8.08 ha) is proposed to be impacted. Disturbance of habitat within the Project Area will be reinstated following works. However the quality of the habitat following ground disturbance may be such that it is no longer considered habitat. The scale of such impacts are not expected to result in impacts to the level that would impact the species as a whole. **Conclusion: Unlikely.** Modifications, destruction and removal of habitat are expected to be highly localised and are not expected to result in impacts at a species level.	Suitable habitat is present within sections of the Project Area, however, extensive surveys have failed to detect the species since 1990 and the species may now be extinct within northern Melbourne and potentially within Victoria (Melville et al 2019). The proposed Project is not expected to directly or indirectly modify, destroy, remove, isolate or decrease the availability of habitat for this species, to the extent that the species is likely to decline. **Conclusion: Unlikely.** Species not expected to occur in the Project Area.	The habitat available within the Project Area is not considered suitable wetland habitat for the species. The Project Area lacks the required habitat features for this species (tall, dense aquatic vegetation) and is comprised predominantly of non-native grassland. The Project is not expected to directly or indirectly modify, destroy, remove, isolate or decrease the availability of habitat to the extent that the species is likely to decline. **Conclusion: Unlikely.** Species not expected to occur in the Project Area.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Invasive species that could be detrimental to this species are already present within the Project Area. These include fauna (cats, foxes, rats, mice) and flora (e.g., numerous non-native grassland species). Appropriate weed, disease and pathogen management will be implemented to prevent any further invasive flora or fauna being introduced to the Project as a result of works. **Conclusion: Unlikely.** Invasive species already present and the Project is not expected to introduce new species.	Invasive species that could be detrimental to this species are already present within the Project Area. These include fauna (cats, foxes, rats, mice) and flora (e.g., Chilean Needle Grass, Serrated Tussock, numerous other non-native grassland species). Appropriate weed, disease and pathogen management will be implemented to prevent any further invasive flora or fauna being introduced to the Project as a result of works. **Conclusion: Unlikely.** Invasive species already present and the Project is not expected to introduce new species.	Invasive species that could be detrimental to this species are already present within the Project Area. These include fauna (cats, foxes, rats) and flora (e.g., numerous non-native wetland species). Appropriate weed, disease and pathogen management will be implemented to prevent any further invasive flora or fauna being introduced to the Project as a result of works. **Conclusion: Unlikely.** Invasive species already present and the Project is not expected to introduce new species.

Significant Impact Criteria	Golden Sun Moth (Critically Endangered)	Grassland Earless Dragon (Endangered)	Australasian Bittern (Endangered)
Introduce disease that may cause the species to decline	The proposed Project is not expected to result in the introduction of disease that may cause the species to decline. Appropriate weed, disease and pathogen management will be implemented. **Conclusion: Unlikely.** The proposed Project is not expected to result in the introduction of disease that may cause the species to decline.	The proposed Project is not expected to result in the introduction of disease that may cause the species to decline. Appropriate weed, disease and pathogen management will be implemented. **Conclusion: Unlikely.** The proposed Project is not expected to result in the introduction of disease that may cause the species to decline.	The proposed Project is not expected to result in the introduction of disease that may cause the species to decline. Appropriate weed, disease and pathogen management will be implemented. **Conclusion: Unlikely.** The proposed Project is not expected to result in the introduction of disease that may cause the species to decline.
Interfere with the recovery of the species	Proposed impacts on habitat or assumed habitat within the Project Area are expected to be highly localised and subject to appropriate reinstatement. Proposed impacts occur in a narrow strip that in the long term will not create a barrier to movement and has the potential to be recolonised though the degree to which this is feasible is not well known. Proposed works are not expected to interfere with the recovery of the species with impacts being more likely to be detrimental to individuals rather than populations or the species as a whole. **Conclusion: Unlikely.** Impacts are expected to be highly localised and impact individuals rather than whole populations and are not expected to interfere in the recovery of the species.	There is a National Recovery Plan for the Grassland Earless Dragon (Robertson and Evans 2009/2012). A key priority action within the recovery plan for this species is to “Determine the current distribution and abundance of Grassland Earless Dragons by undertaking extensive targeted surveys in areas of potential habitat and map/document the distribution.” Extensive surveys for this species have been conducted north and west of Melbourne (Robertson and Evans 2009/2012) and the species has not been detected since 1990 (Biosis 2019). **Conclusion:** Given the species may now be extinct within northern Melbourne and potentially within Victoria, the Project is not expected to interfere with the recovery of the species.	The habitat available within the Project Area is not considered suitable wetland habitat for the species. Therefore, the likelihood of this species occurring within the Project Area is considered low. The proposed Project is not expected to interfere with the recovery of the species. **Conclusion: Unlikely.** Species not expected to occur in the Project Area.

Appendix V – EPBC Act Thresholds for Significant Impacts for the Critically Endangered Golden Sun Moth

Table V1 Thresholds for significant impacts for the Critically Endangered Golden Sun Moth

Ecological element affected	Impact threshold	Comment	Response for Golden Sun Moth (Critically Endangered)
Significant Impact Thresholds for the species: Golden Sun Moth			
Large or contiguous habitat area (>10 ha)	Habitat loss, degradation or fragmentation >0.5 ha	Habitat is considered to be a similar or connected area within which the golden sun moth is found during surveys or known from records. The function of the area may include, but is not limited to: feeding, breeding, dispersal.	The Project occurs in a landscape of contiguous habitat >10 ha. A total of 19.93 ha of habitat known to support this species (11.85 ha) or assumed to support this species (8.08 ha) is proposed to be impacted. The project meets this threshold for a significant impact.
Small or fragmented habitat area (<10 ha)	Any habitat loss, degradation or fragmentation	Small areas of habitat are more likely to suffer significant impacts from loss, degradation and fragmentation than larger areas. The limited dispersal ability of the golden sun moth means habitat areas separated by >200 m are effectively isolated and will be considered as separate habitat areas. Extremely small, isolated and degraded habitat patches (for example <0.25 ha) may support populations of golden sun moth but are unlikely to contribute to the overall ecological health of the species.	The study site comprises >10 ha of contiguous habitat. This criterion is not relevant.

Ecological element affected	Impact threshold	Comment	Response for Golden Sun Moth (Critically Endangered)
Habitat connectivity	Fragmentation of a population through the introduction of a barrier to dispersal	Barriers to dispersal could include: breaks in habitat of >200 m; structures that prohibit movement (for example buildings, solid fences).	The majority of the infrastructure associated with the Project will be installed underground and therefore will not result in the introduction of a barrier to dispersal. Outside the MSA area there are two mainline valves (Oaklands Road and Holden Road) that will have above ground infrastructure associated, though these are small discrete areas. The Project would not impact on habitat connectivity as proposed impacts do not comprise structures that prohibit movement (e.g., buildings, solid fences).

Appendix W – EPBC Act Significant Impact Assessments – Vulnerable Fauna (Striped Legless Lizard, Growling Grass Frog and Pink-tailed Worm-lizard)

Table W1 Significant Impact Guidelines for Vulnerable fauna (Striped Legless Lizard, Growling Grass Frog and Pink-tailed Worm-lizard)

Significant Impact Criteria	Striped Legless Lizard (Vulnerable)	Growling Grass Frog (Vulnerable)	Pink-tailed Worm-lizard (Vulnerable)
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will (DoE 2013):			
Lead to a long-term decrease in the size of an important population of a species	The population within the Project Area may be considered an important population (Biosis 2020), however; works are not expected to lead to a long-term decrease in the size of this population. As a vast area of similarly suitable habitat surrounds the Project Area, there is sufficient habitat available for individuals to reside during construction. The habitat within the Project Area will be made unsuitable prior to construction to encourage individuals away from the Project Area itself, but it will then be reinstated post-construction to encourage individuals back. Six individuals were identified from two grids, which suggests that populations are not large. Whilst not all areas of habitat were surveyed the majority of unsurveyed habitat is marginal and considered to have a lower likelihood of supporting the species. Measures will be undertaken to prevent mortality of individuals in all areas considered habitat including: Slashing areas of suitable habitat to make them less suitable (i.e., less shelter for the animals), prior to tyning; Tyning areas of suitable habitat immediately prior to trenching to salvage any individuals and relocate them to immediately adjacent suitable habitat;	All 'viable' populations of the Growling Grass Frog are considered important populations, however; works are not expected to lead to a long-term decrease in the size of a population of the species. Small amounts of habitat removal and degradation may occur within the Project Area at two locations (outside of the MSA): Deep Creek – though the waterway crossing here is expected to be HDD and impacts to instream habitat will be avoided and any adjacent terrestrial habitat minimised. Jacksons Creek – crossing of this waterway is expected to be via an open trench method. The Project Area width has been reduced within the waterway to 20 m wide. Works within Jacksons Creek will be outside the species' peak active period (November to March) to minimise impacts to individuals and connectivity. Whilst individuals (IF present) are expected to incur a small loss in available habitat impacts to individuals let alone populations is considered low, where the areas of impact will be temporary they will be reinstated following works. **Conclusion: Unlikely.** Residual impacts of the works are not expected to result in a long-term population change.	In Victoria, this species is only known from a single population around Bendigo. There is a single record of this species approximately 30 km west of the Project Area near Ballan though this is a known database location error and is actually located at One Tree Hill reserve, Bendigo. Project impacts are not expected to lead to a long-term decrease in the size of a population, due to the very low likelihood of the species occurring within the Project Area. **Conclusion: Unlikely.** Project impacts are not expected to lead to a long-term decrease in the size of the population, due to the low likelihood of the species occurring within the Project Area.

Significant Impact Criteria	Striped Legless Lizard (Vulnerable)	Growling Grass Frog (Vulnerable)	Pink-tailed Worm-lizard (Vulnerable)
	Installing trench management to prevent trench mortality. These mitigation measures will help to reduce the chances of a long-term population size decrease. **Conclusion: Unlikely.** Residual impacts of the works are not expected to result in a long-term population change.		
Reduce the area of occupancy of an important population	The population within the Project Area may be considered an important population, and work may be considered to lead to a reduction in its area of occupancy. Proposed impacts are expected to be limited to 0.67 ha of known habitat, however a total of 39.34 ha of known and assumed habitat will be impacted. The ability for this species to recolonise areas following ground disturbance is not well understand and it must therefore be assumed that the area of occupancy may be reduced as a result of works within the Project Area. **Conclusion: Possible.** The residual area of occupancy for this species may be reduced. It is possible that over time the species may recolonise the Project Area but the species' ability to do this is not well understood and habitat within the Project Area must be assumed to be lost.	A small reduction in available habitat at Jacksons Creek (0.03 ha) is expected. Foraging, breeding and sheltering habitat may occur at this location though habitat quality is low and works are expected to result in temporary removal of habitat where areas of impact will be reinstated following works. **Conclusion: Unlikely.** The area of occupancy for this species is not expected to change.	Given there are no records of this species within 5 km of the Project Area, the Project is not expected to reduce the area of occupancy of an important population of this species. **Conclusion: Unlikely.** The area of occupancy for this species is not expected to change.
Fragment an existing important population into two or more populations	The pipeline will occupy an easement of approximately 15 m width and be buried for its entire length. For construction, the Project Area is typically 30 metres wide and includes additional space in certain sections to accommodate machinery, vehicle turnarounds and material storage.	Works in and near Growling Grass Frog habitat predominantly comprises installation of underground infrastructure. Following works these areas will be reinstated and there will be no permanent barrier to movement. Temporary impacts to aquatic and terrestrial habitats will be reinstated following works.	The likelihood of this species occurring in the Project Area is low and the impacts of the Project are not expected to result in the fragmentation of a population. **Conclusion: Unlikely.** Species not expected to occur in the Project Area.

Significant Impact Criteria	Striped Legless Lizard (Vulnerable)	Growling Grass Frog (Vulnerable)	Pink-tailed Worm-lizard (Vulnerable)
	This species may be capable of crossing the Project Area following rehabilitation, though its ability to do this is not well understood. If the species is present and unable to cross the Project Area following rehabilitation, this could result in the fragmentation of a population. In many places along the Project Area, the route follows the edge of parcel boundaries where land use might change or already disturbed areas such as driveways and roads which already present barriers to the species. The only confirmed habitat within the Project Area is bordered by a waterway which does not constitute habitat for the species. In this location the important population present is not expected to be fragmented. Given the sedentary nature of the species if they are unable to cross the Project Area following rehabilitation this could result in the fragmentation of a population if present within areas of assumed habitat. **Conclusion: Possible.** If the species is not able to cross areas of ground disturbance then fragmentation may occur if any important populations exist within areas of assumed habitat.	Works within Jacksons Creek will be outside the species' peak active period (November to March) to minimise impacts to individuals and population connectivity. **Conclusion: Unlikely.** The Project is not expected to result in fragmentation of a population.	

Significant Impact Criteria	Striped Legless Lizard (Vulnerable)	Growling Grass Frog (Vulnerable)	Pink-tailed Worm-lizard (Vulnerable)
Adversely affect habitat critical to the survival of a species	All habitat is likely to provide 'critical habitat' in that it is necessary for foraging, breeding or dispersal, though a vast area of similarly suitable habitat surrounds the Project Area and there is sufficient habitat available for individuals to reside during construction. The habitat within the Project Area will be made unsuitable prior to construction to encourage individuals away from the Project Area itself, but it will then be reinstated post-construction to encourage individuals back. **Conclusion: Unlikely**. Habitat of similar quality is prevalent across parcels that have been considered habitat. Suitable habitat is present across the extent of the parcel known to support the species within which it can reside during construction.	Small amounts of temporary degradation to potential habitat may occur within the Project Area at two locations: Deep Creek – though the waterway crossing here is expected to be HDD and impacts to instream habitat will be avoided and any adjacent terrestrial habitat minimised. Jacksons Creek – crossing of this waterway is expected to be via an open trench method. The Project Area width has been reduced within the waterway to 20 m wide. Foraging, breeding and shelter may occur at either of these locations though habitat quality is considered low and works are expected to result in temporary disturbance to habitat and areas of impact will be reinstated following works. Habitat degradation is not expected to result in impacts to habitat critical to the species such as those which support recruitment, survival, or dispersal. **Conclusion:** Adverse impacts to habitat for this species are expected to be temporary and residual impacts to critical habitat are not expected; subject to appropriate reinstatement.	In Victoria, this species is only known from a single population around Bendigo. There is a single record of this species approximately 30 km west of the Project Area near Ballan though this is a known database location error and is actually located at One Tree Hill reserve, Bendigo. **Conclusion: Unlikely.** The Project is not expected to impact any critical habitat for this species.
Disrupt the breeding cycle of an important population	Works within the Project Area are expected to be temporary and localised to the linear Project Area. The breeding cycle if disrupted is expected to be limited to a small number of individuals within the Project Area rather than the population or species as a whole. Measures will be undertaken to prevent mortality of individuals of the population including:	Works within the Project Area are expected to be temporary and localised to the linear Project Area. The breeding cycle if disrupted is expected to be limited to a small number of individuals within the Project Area rather than the population or species as a whole. Measures will be undertaken to prevent mortality of individuals of the population including:	The likelihood of this species occurring or breeding in the Project Area is low. Impacts to the breeding cycle of a population are not expected. **Conclusion: Unlikely.** Species not expected to occur in the Project Area.

Significant Impact Criteria	Striped Legless Lizard (Vulnerable)	Growling Grass Frog (Vulnerable)	Pink-tailed Worm-lizard (Vulnerable)
	Slashing areas of suitable habitat to make them less suitable, prior to tyning; Tyning areas of suitable habitat immediately prior to trenching to salvage any individuals and relocating them to immediately adjacent suitable habitat; and Installing trench management to prevent trench mortality. These mitigation measures will help to reduce the chances of local disruption to the breeding cycle. **Conclusion: Unlikely.** Any disruption to the breeding cycle of this species is expected to be temporary and highly localised, and not change the breeding dynamics of the broader population.	Limiting timing of construction within Jacksons Creek to outside the species peak active period (November to March); Making habitat unsuitable for the species prior to construction, to discourage the species from using the Project Area; Undertaking checks for the individuals immediately prior to construction to remove individuals to adjacent suitable habitat; Installation of fauna proof fencing following any removal of individuals; Implementation of handling and hygiene protocols; Preparation of a salvage and relocation plan outlining these measures and others as required. **Conclusion: Unlikely.** Works will be scheduled outside of the peak breeding season at locations were presence is known or assumed and that is holding water during this period.	

Significant Impact Criteria	Striped Legless Lizard (Vulnerable)	Growling Grass Frog (Vulnerable)	Pink-tailed Worm-lizard (Vulnerable)
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	As a vast area of similarly suitable habitat surrounds the Project Area, there is sufficient habitat available for individuals to reside during construction. Proposed impacts are expected to be limited to 0.67 ha of known habitat. Though it is acknowledged that a total of 39.34 ha of habitat is considered suitable though largely marginal for this species within the Project Area. Disturbance of grassland is expected to decrease the availability of habitat for Striped Legless Lizards. However, this is expected to be temporary and is not expected to result in species' decline. **Conclusion: Unlikely.** Habitat is not expected to be modified, destroyed, removed, isolated or decreased to the extent that would constitute an impact on the species as a whole.	Proposed impacts are limited to small areas at two discrete locations (Deep and Jacksons Creeks). Deep Creek –the waterway crossing here is expected to be HDD and impacts to instream habitat will be avoided and any adjacent terrestrial habitat minimised. Jacksons Creek – crossing of this waterway is expected to be via an open trench method. The Project Area width has been reduced within the waterway to 20 m wide. At both of these locations there is sufficient habitat available immediately adjacent to the Project Area for individuals to reside during construction. Works are expected to result in small amounts of temporary habitat removal or degradation, however, this is not expected to result in species' decline. **Conclusion: Unlikely.** Habitat is not expected to be modified, destroyed, removed, isolated or decreased to the extent that would constitute an impact on the species as a whole.	In Victoria, this species is only known from a single population around Bendigo. There is a single record of this species approximately 30 km west of the Project Area near Ballan though this is a known database location error and is actually located at One Tree Hill reserve, Bendigo. There are no known populations of this species around Melbourne. The Project is not expected to directly or indirectly modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. **Conclusion: Unlikely.** Species not expected to occur in the Project Area.

Significant Impact Criteria	Striped Legless Lizard (Vulnerable)	Growling Grass Frog (Vulnerable)	Pink-tailed Worm-lizard (Vulnerable)
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Invasive species that could be detrimental to this species are already present within the Project Area. These include fauna (cats, foxes, rats, mice) and flora (e.g., Chilean Needle Grass, Serrated Tussock, numerous other non-native grassland species). Appropriate weed, disease and pathogen management will be implemented to prevent any further invasive flora or fauna being introduced to the Project as a result of works. **Conclusion: Unlikely.** Invasive species already present and the Project is not expected to introduce new species.	Invasive species that could be detrimental to this species are already present within the Project Area. These include fauna (cats, foxes, rats, Carp, Gambusia) and flora (e.g., numerous non-native wetland species). Appropriate weed, disease and pathogen management will be implemented to prevent any further invasive flora or fauna being introduced to the Project as a result of works. **Conclusion: Unlikely.** Invasive species already present and the Project is not expected to introduce new species.	In Victoria, this species is only known from a single population around Bendigo. There is a single record of this species approximately 30 km west of the Project Area near Ballan though this is a known database location error and is actually located at One Tree Hill reserve, Bendigo. There are no known populations of this species around Melbourne. The Project will not result in the introduction or spread of invasive species that could be detrimental to this species. **Conclusion: Unlikely.** Invasive species already present and the Project is not expected to introduce new species.
Introduce disease that may cause the species to decline	The proposed Project is not expected to result in the introduction of disease that may cause the species to decline. Appropriate weed, disease and pathogen management will be implemented. **Conclusion: Unlikely.** The proposed Project is not expected to result in the introduction of disease that may cause the species to decline.	Indirect impacts from the proposed works may include the introduction or spread of Amphibian Chytrid Fungus. This fungus is likely to be present across the Project Area already, given the widespread presence of the Common Froglet, *Crinia signifera*, which is likely to be a host and transmission vector (Brannelly et al. 2018). Transmission of the disease from vehicles is unlikely with the correct implementation of hygiene protocols for Chytrid Fungus. These will be included in site specific CEMPs. Additionally, if the handling of frogs is required during the proposed works (i.e. during salvage), a suitably qualified and experienced ecologist will be engaged, and will employ hygiene protocols as identified in Murray et al (2011). **Conclusion: Unlikely.** Chytrid is likely already present in the Project Area.	The proposed Project is not expected to result in the introduction of disease that may cause the species to decline. Appropriate weed, disease and pathogen management will be implemented. **Conclusion: Unlikely.** The proposed Project is not expected to result in the introduction of disease that may cause the species to decline.

Significant Impact Criteria	Striped Legless Lizard (Vulnerable)	Growling Grass Frog (Vulnerable)	Pink-tailed Worm-lizard (Vulnerable)
		Mitigation will manage the risk of introduction or further spreading of chytrid.	
Interfere substantially with the recovery of the species	The proposed Project proposes to impact only a small amount of known habitat (0.67 ha) when considering the context of the grassland habitats available within the immediate area. Though it is acknowledged that a total of 39.34 ha of known and assumed habitat is considered suitable though largely marginal for this species within the Project Area. Disturbance of grassland is expected to decrease the availability of habitat for Striped Legless Lizard locally and possibly temporarily. This is not expected to interfere in any way with the recovery of the species as a whole. **Conclusion: Unlikely.** Impacts are not expected to interfere in any way with the recovery of the species as a whole.	Proposed impacts are limited to small areas at two discrete locations where suitable refuge habitat for any displaced individuals is available immediately adjacent to the Project Area. Impacts here are expected to be temporary with works installed underground and no long term barrier to connectivity or movement is expected. Impacts to individuals will be minimised through measures outlined with a salvage and relocation plan and timing of works limited to outside of the peak movement period. Impacts to individuals or habitat within the Project Area are not expected to interfere in any way with the recovery of the species as a whole. **Conclusion: Unlikely.** Impacts are expected to be largely temporary or not impacting critical habitat and are not expected to result in the recovery of the species.	The species is not known from the Study Area. The nearest record is in excess of 100 km to the north near Bendigo. The Project will not interfere with the recovery of this species as this species and its breeding and foraging habitats will not be impacted by the proposed works, directly or indirectly. **Conclusion: Unlikely.** Species not expected to occur in the Project Area.

Appendix X – EPBC Act Significant Impact Assessments – Vulnerable Fauna (Painted Honeyeater, Grey-headed Flying-fox and Australian Grayling)

Table X1 Significant Impact Guidelines for Vulnerable fauna (Painted Honeyeater, Grey-headed Flying-fox and Australian Grayling)

Significant Impact Criteria	Painted Honeyeater (Vulnerable)	Grey-headed Flying-fox (Vulnerable)	Australian Grayling (Vulnerable)
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will (DoE 2013):			
Lead to a long-term decrease in the size of an important population of a species	This species is a nomadic or migratory; uncommon species. The species is rarely recorded in the Melbourne area and is more typically found in northern Victoria. There are no records of this species within 5 km of the Project Area and the likelihood of this species occurring within the Project Area is considered negligible. **Conclusion: Unlikely.** Project impacts are not expected to lead to a long-term decrease in the size of a population, due to the very low likelihood of the species occurring within the Project Area.	Roosts (camps) in the Melbourne area are well-documented and it is unlikely that any occur within or near the Project Area. The vegetation within the Project Area is not likely to constitute important or limiting habitat for the species. **Conclusion: Unlikely.** Project impacts are not expected to lead to a long-term decrease in the size of a population.	This species is migratory with adults moving downstream from upper freshwater reaches to estuaries from around April to July. There are no records of this species within 5 km of the Project Area. However, connectivity of Merri Creek to the Yarra River and Jacksons Creek and Deep Creek to Maribyrnong River (where the species is known to occur) suggests there is potential for them to migrate into the Project Area. Habitat assessments and targeted surveys determined the likelihood of the species being present in Jacksons and Merri Creek is low. In Deep Creek the likelihood is medium. Project impacts are not expected to lead to a long-term decrease in the size of a population as HDD is the construction technique to be used for Deep Creek. Measures will be undertaken to prevent mortality of individuals in the population including: Controls for erosion, sedimentation and other contaminants; Limiting the removal of riparian and other vegetation; Rehabilitation of the sites following construction. These measures will help to reduce the chances of a long-term population decrease. **Conclusion: Unlikely.** Project impacts are not expected to lead to a long-term decrease in the size of a population.

Significant Impact Criteria	Painted Honeyeater (Vulnerable)	Grey-headed Flying-fox (Vulnerable)	Australian Grayling (Vulnerable)
Reduce the area of occupancy of an important population	Given there are no records of this species within 5 km of the Project Area, the Project is not expected to reduce the area of occupancy of an important population of this species. **Conclusion: Conclusion: Unlikely.** The area of occupancy for this species is not expected to change.	Despite no records of this species within 5 km of the Project Area, this species is likely to use flowering indigenous and planted trees within and adjacent to the Project Area for foraging. However, This habitat is common across the landscape and readily available to this species. Project impacts are not expected to reduce the area of occupancy of an important population of this species. **Conclusion: Unlikely.** The area of occupancy for this species is not expected to change.	During non-migratory periods, the species typically occupies a restricted home range (i.e. tens to hundreds of metres). There have been no records of the species within 5 km of the Project Area. Furthermore, the targeted surveys did not detect the species within the Project Area or further upstream and downstream (using eDNA sampling). Based on the above, it is not considered the species regularly inhabits the Deep Creek Project Area and the Project is not expected to reduce the area of occupancy of an important population of this species. **Conclusion: Unlikely.** The area of occupancy for this species is not expected to change.
Fragment an existing important population into two or more populations	The likelihood of this species occurring in the Project Area is negligible and the impacts of the Project are not expected to result in the fragmentation of a population. **Conclusion: Unlikely.** Species highly mobile and fragmentation of a population of this species is not expected.	This species routinely crosses wide open spaces. The impacts of the Project are not expected to result in the fragmentation of a population. **Conclusion: Unlikely.** Species highly mobile and fragmentation of a population of this species is not expected.	The species is not considered to regularly inhabit Deep Creek in the Project Area. While it may migrate through the Project Area, HDD is the construction technique for Deep Creek. Therefore, the Project is not expected to result in the fragmentation of a population. **Conclusion: Unlikely.** HDD reduces the chance of a barrier and fragmentation of a population of this species is not expected.
Adversely affect habitat critical to the survival of a species	This species mostly occurs in dry open woodlands and forests. It is typically more abundant in locations where there are a large number of trees present and a high percentage of canopy cover. **Conclusion: Unlikely.** Suitable habitat for the species within the Project Area is very limited in extent and value and is not critical to the survival of this species.	The Grey-headed Flying-fox uses a wide range of habitats in Victoria, from lowland rainforest and coastal Stringybark forests to agricultural land and suburban gardens. This species is likely to use flowering indigenous and planted trees within and adjacent to the Project Area for foraging. However, this type of habitat is common and widespread across the region, and no habitat within the Project Area is likely to	The species is not considered to regularly inhabit the Deep Creek Project Area. While it may migrate through the Project Area, HDD is the construction technique for Deep Creek. Measures will be undertaken to prevent adverse effects to habitat including: Controls for erosion, sedimentation and other contaminants; Limiting the removal of riparian and other vegetation;

Significant Impact Criteria	Painted Honeyeater (Vulnerable)	Grey-headed Flying-fox (Vulnerable)	Australian Grayling (Vulnerable)
		be considered habitat critical to the survival of the species. **Conclusion: Unlikely.** Habitat within the Project Area not considered critical to the species survival.	Rehabilitation of the sites following construction. Furthermore, while the above will prevent adverse effects to habitat, the Project Area does not represent habitat critical to the survival of the species. **Conclusion: Unlikely.** Habitat within the Project Area not considered critical to the species survival.
Disrupt the breeding cycle of an important population	The likelihood of this species occurring or breeding in the Project Area is negligible. **Conclusion: Unlikely.** Impacts to the breeding cycle of a population are not expected.	It is unlikely that any roosts (camps) occur within or near the Project Area. Therefore, direct impacts (e.g. feeding tree removal) and indirect impacts (e.g. noise) are not expected on an important population of this species, and the breeding cycle will not be disrupted. **Conclusion: Unlikely.** Impacts to the breeding cycle of a population are not expected.	The species is not considered to regularly inhabit the Deep Creek Project Area. The important point to consider is that it may migrate through the Project Area during its breeding cycle. Adults move downstream from upper freshwater reaches to estuaries from around April to July. Given that HDD is the construction technique for Deep Creek, no disruptions to the breeding cycle, through the creation of barriers, are expected. **Conclusion: Unlikely.** Impacts to the breeding cycle of a population are not expected as barriers to migration are not anticipated.

Significant Impact Criteria	Painted Honeyeater (Vulnerable)	Grey-headed Flying-fox (Vulnerable)	Australian Grayling (Vulnerable)
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Suitable habitat for this species within the Project Area is very limited and of low value. **Conclusion: Unlikely.** The Project is not expected to directly or indirectly modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	This species is likely to use flowering indigenous and planted trees within and adjacent to the Project Area for foraging. However, this habitat does not constitute important habitat for the species, or habitat that the species relies on. **Conclusion: Unlikely.** The Project is not expected to directly or indirectly modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The species is not considered to regularly inhabit the Deep Creek Project Area. While it may migrate through the Project Area, HDD is the construction technique for Deep Creek. Measures will be undertaken to prevent adverse effects to habitat including: Controls for erosion, sedimentation and other contaminants; Limiting the removal of riparian and other vegetation; Rehabilitation of the sites following construction. The Project is not expected to directly or indirectly modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. **Conclusion: Unlikely.** The Project is not expected to directly or indirectly modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Invasive species that could be detrimental to this species are already present within the Project Area. These include fauna (cats, foxes) and flora (e.g., numerous non-native species). Appropriate weed, disease and pathogen management will be implemented to prevent any further invasive flora or fauna being introduced to the Project as a result of works. **Conclusion: Unlikely.** Invasive species already present and the Project is not expected to introduce new species.	Invasive species that could be detrimental to this species are already present within the Project Area. These include fauna (cats, foxes, rats) and flora (e.g., numerous non-native species). Appropriate weed, disease and pathogen management will be implemented to prevent any further invasive flora or fauna being introduced to the Project as a result of works. **Conclusion: Unlikely.** Invasive species already present and the Project is not expected to introduce new species.	Invasive species can pose a threat to this species and their habitats through predation, competition, disease transmission and other effects such as physical habitat degradation. The invasive species that pose a threat include Common Carp (*Cyprinus carpio*), Goldfish (*Carrasius auratus*), Redfin (*Perca fluviatilis*), Eastern Gambusia (*Gambusia holbrooki*) and Oriental Weatherloach (*Misgurnis anguillicaudatus*). These species are already present in the Project Area. No additional invasive aquatic

Significant Impact Criteria	Painted Honeyeater (Vulnerable)	Grey-headed Flying-fox (Vulnerable)	Australian Grayling (Vulnerable)
			species are expected to be introduced due to the Project. Appropriate weed, disease and pathogen management will be implemented to prevent any further invasive flora or fauna being introduced to the Project as a result of works. **Conclusion: Unlikely.** Invasive aquatic species already present and the Project is not expected to introduce new species.
Introduce disease that may cause the species to decline	The proposed Project is not expected to result in the introduction of disease that may cause the species to decline. Appropriate weed, disease and pathogen management will be implemented. **Conclusion: Unlikely.** The proposed Project is not expected to result in the introduction of disease that may cause the species to decline.	The proposed Project is not expected to result in the introduction of disease that may cause the species to decline. Appropriate weed, disease and pathogen management will be implemented. **Conclusion: Unlikely.** The proposed Project is not expected to result in the introduction of disease that may cause the species to decline.	The proposed Project is not expected to result in the introduction of disease that may cause the species to decline. Appropriate weed, disease and pathogen management will be implemented. **Conclusion: Unlikely.** The proposed Project is not expected to result in the introduction of disease that may cause the species to decline.

Significant Impact Criteria	Painted Honeyeater (Vulnerable)	Grey-headed Flying-fox (Vulnerable)	Australian Grayling (Vulnerable)
Interfere substantially with the recovery of the species	The Project will not interfere with the recovery of this species as this species and its breeding and foraging habitats will not be impacted by the proposed works, directly or indirectly. **Conclusion: Unlikely.** The Project is not expected to interfere with species recovery.	This species is likely to use flowering indigenous and planted trees within and adjacent to the Project Area for foraging occasionally. However, it is unlikely that this habitat is relied on by this species. It is unlikely that any roosts (camps) occur within or near the Project Area. **Conclusion: Unlikely.** The Project is not expected to interfere with species recovery.	The Recovery Plan for this species lists the following threatening processes: barriers to movement, river regulation, poor water quality, siltation, introduced species, climate change, disease and fishing. It is unlikely the Project will interfere with the majority of these processes (as discussed above for other criteria) although management measures will need to be employed for siltation and water quality including: Controls for erosion, sedimentation and other contaminants; Limiting the removal of riparian and other vegetation; Rehabilitation of the sites following construction **Conclusion: Unlikely.** The Project is not expected to interfere with species recovery.

Appendix Y – EPBC Act Thresholds for Significant Impacts for the Vulnerable Growling Grass Frog

Table Y1 Thresholds for significant impacts for the Vulnerable Growling Grass Frog

Ecological element affected	Impact threshold	Comment	Response for Growling Grass Frog (Vulnerable)
Significant Impact Thresholds for the species: Growling Grass Frog			
Habitat degradation in an area supporting an important population	Permanent removal or degradation of terrestrial habitat (for example between ponds, drainage lines or other temporary/permanent habitat) within 200 metres of a water body in temperate regions, or 350 metres of a water body in semi-arid regions, that results in the loss of dispersal or overwintering opportunities for an important population.	• Habitat is a connected area that supports one or more key ecological functions for this species. These functions may include, but are not limited to: foraging, breeding, dispersal, shelter. • Any action that results in the degradation of habitat such that the recruitment, survival or dispersal rates of an important population are lowered may have a significant impact on the species. • Habitat quality increases with: increasing wetland area, water permanence, and aquatic vegetation cover. • Habitat quality decreases with: the degree of development in the terrestrial zone (that is, Roads, buildings etc.), and the presence of predatory fish.	Small amounts of degradation to potential habitat may occur within the Project Area at two locations: Deep Creek – though the waterway crossing here is expected to be HDD and impacts to instream habitat will be avoided and any adjacent terrestrial habitat minimised. Jacksons Creek – crossing of this waterway is expected to be via an open trench method. The Project Area width has been reduced within the waterway to 20 m wide.Foraging, breeding and shelter may occur at either of these locations though works are expected to result in temporary removal of habitat and areas of impact will be reinstated following works. Habitat at the Jacksons Creek location is already degraded on the northern bank which is predominately pasture grasses which are cattle grazed and pugged all the way to the waters edge. The southern bank is fenced to exclude cattle; however, it is very steep to the point that it is expected to be a hinderance to frogs. Very little habitat in the form of either emergent or bank aquatic vegetation is presented. Whist Growling Grass Frog are known from this waterway the chance of them using the actual Project Area within this Creek is considered low. Habitat degradation is not expected to result in impacts to recruitment, survival, or dispersal.

Ecological element affected	Impact threshold	Comment	Response for Growling Grass Frog (Vulnerable)
	Alteration of aquatic vegetation diversity or structure that leads to a decrease in habitat quality.		Small amounts of degradation to potential habitat may occur within the Project Area at two locations: Deep Creek – though the waterway crossing here is expected to be HDD and impacts to instream habitat will be avoided and any adjacent terrestrial habitat minimised. Jacksons Creek – crossing of this waterway is expected to be via an open trench method. The Project Area width has been reduced within the waterway to 20 m wide. Habitat at the Jacksons Creek location is already degraded on the northern bank which is predominately pasture grasses which are cattle grazed and pugged all the way to the waters edge. The southern bank is fenced to exclude cattle; however, it is very steep to the point that it is expected to be a hinderance to frogs. Very little habitat in the form of either emergent or bank aquatic vegetation is presented. Whist Growling Grass Frog are known from this waterway the chance of them using the actual Project Area within this Creek is considered low. Whilst individuals (IF present) are expected to incur a small loss in available habitat the areas of impact (0.03 ha at Jacksons Creek) will be temporary and will be reinstated following works.

Ecological element affected	Impact threshold	Comment	Response for Growling Grass Frog (Vulnerable)
	Alteration to wetland hydrology, diversity and structure (for example any changes to timing, duration or frequency of flood events) that leads to a decrease in habitat quality.		Wetland hydrology, diversity or structure is not expected to be altered to the point that it impacts habitat quality. Works involve the installation of underground infrastructure so there will be no long-term hindrance to hydrology, diversity or structure. Impacts at Jacksons Creek are expected to involve open trenching technique for a section 20 m wide which will then be reinstated.
	Introduction of predatory fish and/or disease agents.		The project is not expected to result in the introduction of predatory fish or disease agents. Predatory fish are already expected within Deep and Jacksons Creek.

Ecological element affected	Impact threshold	Comment	Response for Growling Grass Frog (Vulnerable)
Isolation and fragmentation of populations	Net reduction in the number and/or diversity of water bodies available to an important population.	• Habitat connectivity could be provided by a linear water body (for example creekline) or by suitable terrestrial habitat between waterbodies. Individuals may use a range of terrestrial and aquatic habitats as movement corridors between water bodies, including floodways or grassy fields. • Any isolation of water bodies, through destruction of habitat, or creation of a barrier such that movement or migration between waterbodies is less likely to have a significant impact on the species.	A small reduction in available habitat at Jacksons Creek is expected (0.03 ha). Removal of three dams is also proposed. Targeted surveys at these three dams were undertaken in December 2020 and the species was not found to occur. These dams are unlikely to be considered critical habitat; as ephemeral waterbodies they are also less likely to be key habitat over the critical spring/summer period. Works will be restricted to a two-four week period within the waterway will be outside the Growling Grass Frog peak active period (November to March) to minimise impacts to individuals and connectivity. Habitat removal at this locations is not expected to isolate or fragment populations.
	Removal or alteration of available terrestrial or aquatic habitat corridors (including alteration of connectivity during flood events).		Alteration of habitat within the Project Area that may impact a habitat corridor is limited to works at Jacksons Creek where works are proposed as open trench through the waterway. Works involve installation of underground infrastructure, as such impacts are temporary and a permanent barrier will not prevent connectivity. Impacts to aquatic and terrestrial habitats will be reinstated following works. Works within Jacksons Creek will be outside the species peak active period (November to March) to minimise impacts to individuals and connectivity.

Ecological element affected	Impact threshold	Comment	Response for Growling Grass Frog (Vulnerable)
	Construction of physical barriers to movement between water bodies, such as roads or buildings.		Works in and near Growling Grass Frog habitat is limited to the installation of underground infrastructure. Following works these areas will be reinstated and there will be no permanent barrier to movement.

Appendix Z – EPBC Act Significant Impact Assessments – Migratory

Significant Impact Criteria	Migratory species
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will: (DoE 2013):	
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	A total of 20 migratory species have been recorded or are predicted to occur within the Study Area. The majority of these species are unlikely to make significant use of the Project Area, with the possible exception of Latham's Snipe (Biosis 2019). White-throated Needletail and Fork-tailed Swift may visit the airspace above the Project Area occasionally. Latham's Snipe uses a wide variety of permanent and ephemeral wetlands, generally freshwater wetlands with cover and has also been recorded along creeks, rivers and floodplains. It forages in soft mud at edge of wetlands and roosts in a variety of vegetation around wetlands including tussock grasslands, reeds and rushes, tea-tree scrub, woodlands and forests. This species could potentially use seasonal wetlands that support tussock-grasses and rushes as well as vegetated farm dams within the Project Area. Important habitat for this species is described as areas that have previously been identified as internationally important for the species, or areas that support at least 18 individuals. The Project Area does not include any areas of habitat that are currently recognised as internationally important, or areas that are considered likely to support at least 18 individuals, and therefore, does not contain important habitat for this species. The White-throated Needletail has a high likelihood of occurring in the airspace above the Project Area, having been recorded in the Project Area as recently as 2014. This species is highly mobile and occurs over most habitats but particularly wooded areas and may use the aerial space over the Project Area to forage. The Fork-tailed Swift, is also predominantly an aerial species and it is not limited to particular land habitats. The species has not been observed within the Study Area since 2007. Given these species are almost exclusively aerial, they are highly unlikely to be impacted by the Project and the Project Area is not expected to constitute important habitat for the species. Other migratory species such as terns, curlews and sandpipers that were identified by the assessment usually occur in coastal habitats and surrounding wetlands and mudflats that are not present within the Project Area. It is highly unlikely that the Project Area supports habitat that will be considered important for migratory species foraging or breeding activity or support an ecologically significant proportion of a population of 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	It is considered highly unlikely that the proposed works will result in the introduction of invasive species into the Project Area that might be harmful to migratory species. A CEMP will be developed for the Project that will include measures such as vehicle hygiene protocols to mitigate the potential spread of weeds.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	Given that the Project Area does not provide important habitat for listed migratory species, the planned works are highly unlikely to disrupt the lifecycle of an ecologically significant proportion of a population of a migratory species.

Appendix AA – Potentially threatening processes – likelihood of occurrence

Likelihood of occurrence of key threatening processes (EPBC Act) potentially threatening processes (FFG Act)

Key /potentially threatening processes	Source	Likelihood of occurrence within study area	Project likely to exacerbate key threatening processes?
Dieback caused by the root-rot fungus *Phytophthora cinnamomi*	EPBC Act	Low No signs of dieback were observed in the Project Area Little documented evidence of Cinnamon Fungus in fragmented, urban landscapes. Higher risk genera such as *Banksia* and *Xanthorrhoea* were not recorded	Given the amount of soil movement that will occur during construction, there is the potential, if inappropriately managed. However, if the CEMP has a specific section addressing *Phytophthora*, then the risk can be managed such that the Project is unlikely to exacerbate the threatening process.
Land clearance	EPBC Act	Present Land will be cleared to facilitate the WORM	Yes Clearing of up to 15.32 ha of native vegetation and 34 trees, including TECs NTGVVP and GEWVVP are planned to be removed. Removal of these TECs meets the criteria for a significant impact and will exacerbate to this key threatening process
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	EPBC Act	Moderate Project mostly located in urban and disturbed areas already invaded with garden species	No Native vegetation and animal habitat within the Project Area is already invaded by 'garden plant' species, environmental weeds and noxious weeds and the Project is therefore unlikely to exacerbate this threatening process.
Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases	EPBC Act/FFG Act	Unlikely Project Area occurs within urban and agricultural areas, with large existing transport corridors (Hume Freeway and Calder Freeway).	No
Infection of amphibians with chytrid fungus resulting in chytridiomycosis	EPBC Act/FFG Act	Moderate – High. The Amphibian Chytrid Fungus is likely to be widespread throughout frog populations and habitats within the Project Area already, and additional local movements of chytrid fungus (e.g. through transport of soil, wet or muddy equipment) are unlikely to cause ecologically significant impacts on frog populations in the area.	No, through site-specific hygiene measures that will limit the movements of soil and water between sites. The Project would not involve activities that would be likely to introduce or increase the spread of chytrid fungus.
Novel biota and their impact on biodiversity	EPBC Act	Unlikely The Project Area occurs within an already disturbed and urbanised landscape where indigenous and non-indigenous biota already occur.	No

Key /potentially threatening processes	Source	Likelihood of occurrence within study area	Project likely to exacerbate key threatening processes?
Alteration to the natural flow regimes of rivers and streams.	FFG Act	Moderate Existing flow regimes of waterways in the Project Area are currently impacted by river regulation and increased stormwater connectivity.	No. Flume pipes used where open trench construction and coffer dams occurs across water to maintain downstream flow. Minimal impacts to groundwater levels and baseflow expected and will be mitigated to avoid impacts on GDEs and other groundwater users through the use of trench breakers installed adjacent to watercourses, wetlands and steep slopes.
Alteration to the natural temperature regimes of rivers and streams.	FFG Act	Low Existing streams (e.g. Merri creek, Deep Creek, Jacksons Creek) are currently in poor to moderate condition within the Project Area due to agricultural and urban land use pressure.	No Thermal impacts to existing streams would be minimal given the existing level of degradation.
Degradation of native riparian vegetation along Victorian rivers and streams.	FFG Act	High All riparian vegetation within the Project Area has already been degraded historically to some degree through urbanisation and agriculture. The Project would further degrade riparian vegetation at some locations.	Yes. The Project would impact on native riparian vegetation where the Project crosses Merri, Deep and Jacksons Creeks. Additional impacts are not expected to alter the ecological effectiveness of the waterways, given the extent of existing degradation.
Habitat fragmentation as a threatening process for fauna in Victoria	FFG Act	High The Project Area is located in an already fragmented urban landscape.	No. Any additional fragmentation is not expected to be extensive enough to alter the ecological effectiveness of existing habitat for wildlife corridors, or to create new barriers to fauna movement.
Increase in sediment input into Victorian rivers and streams due to human activities.	FFG Act	High The Project is located in already disturbed and urbanised areas where sediment input into rivers and streams is already occurring from human and agricultural activities. The Project Area occurs within close proximity of waterways (e.g. Deep Creek, Merri Creek, and Jacksons Creek).	No. A CEMP would be developed for the Project's construction works detailing best-practice measures to prevent sediment runoff and discharges during construction. Discharge and spillways will also be designed to prevent movement of sediment into local rivers and waterways from built infrastructure.

Key /potentially threatening processes	Source	Likelihood of occurrence within study area	Project likely to exacerbate key threatening processes?
Input of toxic substances into Victorian rivers and streams.	FFG Act	High The Project is located in already disturbed and urbanised areas where input of toxic substances into rivers and streams already occurs occasionally from human activities. The Project Area occurs within close proximity of waterways (e.g. Deep Creek, Merri Creek, and Jacksons Creek).	No. A CEMP would be developed for the Project's construction works detailing best-practice measures to prevent discharges of toxic substances into waterways during construction. Discharge and spillways will also be designed to prevent discharges of toxic substances into local rivers and waterways from built infrastructure.
Invasion of native vegetation by Blackberry *Rubus fruticosus* spp. agg.	FFG Act	Low Blackberry not recorded within the Project Area	Possible. Clearance of native vegetation may create opportunities for Blackberry to invade the Project Area. Ongoing monitoring and mitigation will be required to reduce the likelihood of this threatening process being exacerbated by this Project. The Project will be managed by a CEMP which details measures for weed and soil management.
Invasion of native vegetation by 'environmental weeds'.	FFG Act	High. Declared weed species recorded within Project Area.	No. Native vegetation within the Project Area is already heavily invaded by 'environmental weeds' and the Project is therefore unlikely to exacerbate this threatening process.
Invasion of native vegetation communities by Tall Wheat-grass *Lophopyrum ponticum*.	FFG Act	Unlikely. Species not recorded within the Project Area.	No.
Loss of biodiversity as a result of the spread of Coast Wattle (*Acacia longifolia* subsp. *sophorae*) and Sallow Wattle (*Acacia longifolia* subsp. *longifolia*) into areas outside its natural range.	FFG Act	Low. No signs of Sallow Wattle were observed in the Project Area.	No. Clearance of native vegetation is unlikely to create opportunities for Sallow Wattle to invade the Project Area on basalt soils. Ongoing monitoring and mitigation will be required to reduce the likelihood of this threatening process being exacerbated by this Project. The Project will be managed by a CEMP which details measures for weed and soil management.
Loss of coarse woody debris from Victorian native forests and woodlands	FFG Act	High Coarse woody debris has been lost from many of the patches of native vegetation across the Project Area.	No. Direct impacts on native forests and woodlands would comprise removal of vegetation and habitat rather than removal of coarse woody debris alone.

Key /potentially threatening processes	Source	Likelihood of occurrence within study area	Project likely to exacerbate key threatening processes?
Removal of wood debris from Victorian streams	FFG Act	Moderate Wood debris has been lost from areas of streams across the Project Area due to agriculture and urbanisation.	No. Direct impacts on streams would comprise removal of riparian vegetation and habitat rather than removal of coarse woody debris alone.
Loss of hollow-bearing trees from Victorian native forests	FFG Act	Moderate. All occurrence of loss of moderate and large trees from across the study area is likely to involve loss of hollows (even if small) that may be used by fauna. Hollows were observed within the Project Area where areas of woodland and scattered trees were present, however these remnant woodland areas were sparse.	No. Most vegetation loss associated with the Project is from areas where trees are relatively young and unlikely to have hollows. Some areas of remnant woodland may support larger trees that may have small hollows. Extent of hollow loss is not expected to be extensive enough to exacerbate the threatening process.
Spread of *Pittosporum undulatum* in areas outside its natural distribution.	FFG Act	Low No signs of Sweet Pittosporum were observed in the Project Area.	No. Clearance of native vegetation will not create opportunities for Sweet Pittosporum to invade into the Project Area, since no suitable habitat exists. Ongoing monitoring and mitigation would be required to reduce the likelihood of this threatening process being exacerbated by the Project.
The spread of *Phytophthora cinnamomi* from infected sites into parks and reserves, including roadsides, under the control of a state or local government authority.	FFG Act	Low No signs of dieback were observed in the Project Area. Little documented evidence of Cinnamon Fungus in fragmented, urban landscapes.	No. Cinnamon Fungus is unlikely to occur in the construction corridor and would be managed in accordance with EMM B2, which includes machinery hygiene measures to be incorporated into a project-specific CEMP.
Use of Phytophthora-infected gravel in construction of roads, bridges and reservoirs.	FFG Act	Low No signs of dieback were observed in the Project Area. Little documented evidence of Cinnamon Fungus in fragmented, urban landscapes.	No. Accidental introduction of Cinnamon Fungus would be managed in accordance with EMM B2, which includes machinery hygiene measures to be incorporated into a project-specific CEMP.
Wetland loss and degradation as a result of change in water regime, dredging, draining, filling and grazing	FFG Act	High Most of the wetlands and waterways in the study area are highly modified and degraded due to agriculture and urbanisation.	Possible. Groundwater or hydrological changes as a result of project construction may cause further loss or degradation of wetlands and waterways.

Appendix BB – NVR reports for Project Area – Inside and Outside the MSA

Native vegetation removal report

This report provides information to support an application to remove, destroy or lop native vegetation in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation*. The report **is not an assessment by DELWP** of the proposed native vegetation removal. Native vegetation information and offset requirements have been determined using spatial data provided by the applicant or their consultant.

Date of issue: **10/03/2021**
Time of issue: **2:04 pm**

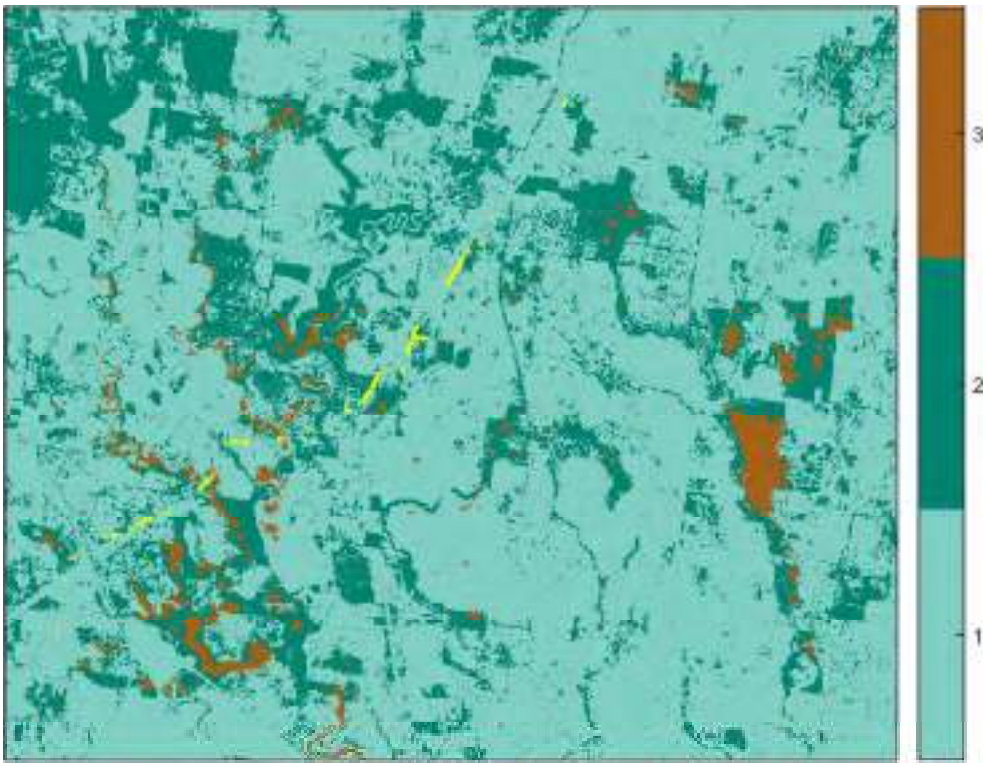
Report ID: GHD_2021_011

Project ID	12529997_DELWP_NVR_OutsideMSA_20210305

Assessment pathway

Assessment pathway	**Detailed Assessment Pathway**
Extent including past and proposed	14.789 ha
Extent of past removal	0.013 ha
Extent of proposed removal	14.775 ha
No. Large trees proposed to be removed	19
Location category of proposed removal	Location 3 The native vegetation is in an area where the removal of less than 0.5 hectares could have a significant impact on habitat for one or more rare or threatened species.The native vegetation is also in an area mapped as an endangered Ecological Vegetation Class (as per the statewide EVC map).

1. Location map



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Offset requirements if a permit is granted

Any approval granted will include a condition to obtain an offset that meets the following requirements:

General offset amount[1]	5.521 general habitat units
Vicinity	Port Phillip and Westernport Catchment Management Authority (CMA) or Hume City, Melton City Council
Minimum strategic biodiversity value score[2]	0.522
Large trees	19 large trees

NB: values within tables in this document may not add to the totals shown above due to rounding

Appendix 1 includes information about the native vegetation to be removed

Appendix 2 includes information about the rare or threatened species mapped at the site.

Appendix 3 includes maps showing native vegetation to be removed and extracts of relevant species habitat importance maps

1 The general offset amount required is the sum of all general habitat units in Appendix 1.

2 Minimum strategic biodiversity score is 80 per cent of the weighted average score across habitat zones where a general offset is required

Next steps

Any proposal to remove native vegetation must meet the application requirements of the Detailed Assessment Pathway and it will be assessed under the Detailed Assessment Pathway.

If you wish to remove the mapped native vegetation you are required to apply for a permit from your local council. Council will refer your application to DELWP for assessment, as required. **This report is not a referral assessment by DELWP.**

This *Native vegetation removal report* must be submitted with your application for a permit to remove, destroy or lop native vegetation.

Refer to the *Guidelines for the removal, destruction or lopping of native* vegetation (the Guidelines) for a full list of application requirements This report provides information that meets the following application requirements:

- The assessment pathway and reason for the assessment pathway
- A description of the native vegetation to be removed (partly met)
- Maps showing the native vegetation and property (partly met)
- Information about the impacts on rare or threatened species.
- The offset requirements determined in accordance with section 5 of the Guidelines that apply if approval is granted to remove native vegetation.

Additional application requirements must be met including:

- Topographical and land information
- Recent dated photographs
- Details of past native vegetation removal
- An avoid and minimise statement
- A copy of any Property Vegetation Plan that applies
- A defendable space statement as applicable
- A statement about the Native Vegetation Precinct Plan as applicable
- A site assessment report including a habitat hectare assessment of any patches of native vegetation and details of trees
- An offset statement that explains that an offset has been identified and how it will be secured.

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Obtaining this publication does not guarantee that an application will meet the requirements of Clauses 52.16 or 52.17 of the Victoria Planning Provisions and Victorian planning schemes or that a permit to remove native vegetation will be granted.

Notwithstanding anything else contained in this publication, you must ensure that you comply with all relevant laws, legislation, awards or orders and that you obtain and comply with all permits, approvals and the like that affect, are applicable or are necessary to undertake any action to remove, lop or destroy or otherwise deal with any native vegetation or that apply to matters within the scope of Clauses 52.16 or 52.17 of the Victoria Planning Provisions and Victorian planning schemes.

Appendix 1: Description of native vegetation to be removed

The species-general offset test was applied to your proposal. This test determines if the proposed removal of native vegetation has a proportional impact on any rare or threatened species habitats above the species offset threshold. The threshold is set at 0.005 per cent of the mapped habitat value for a species. When the proportional impact is above the species offset threshold a species offset is required. This test is done for all species mapped at the site. Multiple species offsets will be required if the species offset threshold is exceeded for multiple species.

Where a zone requires species offset(s), the species habitat units for each species in that zone is calculated by the following equation in accordance with the Guidelines:

Species habitat units = extent x condition x species landscape factor x 2, where the species landscape factor = 0.5 + (habitat importance score/2)

The species offset amount(s) required is the sum of all species habitat units per zone

Where a zone does not require a species offset, the general habitat units in that zone is calculated by the following equation in accordance with the Guidelines:

General habitat units = extent x condition x general landscape factor x 1.5, where the general landscape factor = 0.5 + (strategic biodiversity value score/2)

The general offset amount required is the sum of all general habitat units per zone.

Native vegetation to be removed

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
1-A	Scattered Tree	vvp_0132	Endangered	1	no	0.200	0.070	0.070	0.430		0.015	General
2-A	Scattered Tree	vvp_0132	Endangered	1	no	0.200	0.070	0.070	0.820		0.019	General
3-A	Scattered Tree	vvp_0055	Endangered	1	no	0.200	0.070	0.070	0.900		0.020	General
4-A	Scattered Tree	vvp_0055	Endangered	0	no	0.200	0.031	0.031	0.930		0.009	General
5-A	Scattered Tree	vvp_0055	Endangered	1	no	0.200	0.070	0.070	0.930		0.020	General
6-A	Scattered Tree	cvu_0055	Endangered	1	no	0.200	0.070	0.061	0.960		0.018	General
7-A	Scattered Tree	cvu_0055	Endangered	1	no	0.200	0.070	0.062	0.960		0.018	General
8-A	Scattered Tree	cvu_0055	Endangered	1	no	0.200	0.070	0.070	0.960		0.021	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
9-A	Scattered Tree	vvp_0132	Endangered	0	no	0.200	0.031	0.020	0.838		0.005	General
10-A	Scattered Tree	vvp_0132	Endangered	0	no	0.200	0.031	0.020	0.847		0.006	General
11-A	Scattered Tree	vvp_0132	Endangered	0	no	0.200	0.031	0.026	0.810		0.007	General
12-A	Scattered Tree	vvp_0132	Endangered	0	no	0.200	0.031	0.020	0.860		0.006	General
13-A	Scattered Tree	vvp_0132	Endangered	0	no	0.200	0.031	0.020	0.860		0.006	General
14-A	Scattered Tree	vvp_0132	Endangered	0	no	0.200	0.031	0.031	0.810		0.008	General
15-A	Scattered Tree	vvp_0132	Endangered	0	no	0.200	0.031	0.031	0.810		0.008	General
16-A	Scattered Tree	vvp_0132	Endangered	0	no	0.200	0.031	0.029	0.810		0.008	General
17-A	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.065	0.710		0.017	General
18-A	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.065	0.710		0.017	General
19-A	Scattered Tree	cvu_0055	Endangered	1	no	0.200	0.070	0.070	0.960		0.021	General
13-B	Scattered Tree	vvp_0132	Endangered	0	no	0.200	0.031	0.031	0.400		0.007	General
20-A	Patch	cvu_0132	Endangered	0	no	0.270	0.005	0.005	0.440		0.001	General
21-A	Patch	cvu_0132	Endangered	0	no	0.290	0.079	0.079	0.710		0.030	General
22-A	Patch	cvu_0132	Endangered	0	no	0.290	0.043	0.043	0.758		0.017	General
23-A	Patch	cvu_0132	Endangered	0	no	0.320	0.121	0.121	0.568		0.046	General
24-A	Patch	cvu_0641	Endangered	0	no	0.530	0.095	0.095	0.960		0.074	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
25-A	Patch	vvp_0055_61	Endangered	0	no	0.160	0.570	0.570	0.433		0.098	General
26-A	Patch	vvp_0055_61	Endangered	0	no	0.160	0.493	0.493	0.429		0.085	General
27-A	Patch	vvp_0055_61	Endangered	0	no	0.160	0.222	0.222	0.630		0.043	General
28-A	Patch	vvp_0055_61	Endangered	0	no	0.170	0.397	0.397	0.748		0.089	General
29-A	Patch	vvp_0055_61	Endangered	0	no	0.190	0.001	0.001	0.620		0.000	General
30-A	Patch	vvp_0055_61	Endangered	0	no	0.190	0.031	0.031	0.620		0.007	General
31-A	Patch	vvp_0055_61	Endangered	0	no	0.200	0.258	0.258	0.912		0.074	General
32-A	Patch	vvp_0055_61	Endangered	0	no	0.200	0.055	0.055	0.911		0.016	General
33-A	Patch	vvp_0055_61	Endangered	0	no	0.210	0.018	0.018	0.618		0.005	General
37-A	Patch	vvp_0055_61	Endangered	0	no	0.310	0.000	0.000	0.620		0.000	General
38-A	Patch	vvp_0055_61	Endangered	0	no	0.330	0.025	0.025	0.660		0.010	General
39-A	Patch	vvp_0055_61	Endangered	0	no	0.330	0.027	0.027	0.710		0.011	General
42-A	Patch	vvp_0055_61	Endangered	0	no	0.560	0.006	0.006	0.660		0.004	General
43-A	Patch	vvp_0055_61	Endangered	1	no	0.560	0.054	0.054	0.660		0.038	General
44-A	Patch	vvp_0055_61	Endangered	0	no	0.560	0.260	0.260	0.683		0.184	General
45-A	Patch	vvp_0132	Endangered	0	no	0.120	0.013	0.013	0.810		0.002	General
46-A	Patch	vvp_0132	Endangered	0	no	0.120	0.032	0.032	0.810		0.005	General
47-A	Patch	vvp_0132	Endangered	0	no	0.120	0.040	0.040	0.810		0.006	General
48-A	Patch	vvp_0132	Endangered	0	no	0.180	0.074	0.074	0.460		0.015	General
49-A	Patch	vvp_0132	Endangered	0	no	0.190	0.037	0.037	0.920		0.010	General
21-B	Patch	vvp_0132	Endangered	0	no	0.210	0.630	0.630	0.510		0.150	General
50-A	Patch	vvp_0132	Endangered	0	no	0.220	0.055	0.055	0.250		0.011	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
51-A	Patch	vvp_0132	Endangered	0	no	0.230	0.018	0.018	0.929		0.006	General
52-A	Patch	vvp_0132	Endangered	0	no	0.230	0.019	0.019	0.920		0.006	General
53-A	Patch	vvp_0132	Endangered	0	no	0.230	0.089	0.089	0.450		0.022	General
54-A	Patch	vvp_0132	Endangered	0	no	0.230	0.208	0.208	0.705		0.061	General
55-A	Patch	vvp_0132	Endangered	0	no	0.240	0.090	0.090	0.270		0.021	General
56-A	Patch	vvp_0132	Endangered	0	no	0.250	0.007	0.007	0.190		0.002	General
57-A	Patch	vvp_0132	Endangered	0	no	0.250	0.000	0.000	0.190		0.000	General
58-A	Patch	vvp_0132	Endangered	0	no	0.260	0.006	0.006	0.880		0.002	General
59-A	Patch	vvp_0132	Endangered	0	no	0.260	0.001	0.001	0.880		0.001	General
60-A	Patch	vvp_0132	Endangered	0	no	0.260	0.214	0.214	0.867		0.078	General
61-A	Patch	vvp_0132	Endangered	0	no	0.260	0.054	0.054	0.740		0.018	General
62-A	Patch	vvp_0132	Endangered	0	no	0.260	1.239	1.239	0.365		0.330	General
63-A	Patch	vvp_0132	Endangered	0	no	0.260	0.521	0.521	0.762		0.179	General
64-A	Patch	vvp_0132	Endangered	0	no	0.270	0.443	0.443	0.869		0.168	General
65-A	Patch	vvp_0132	Endangered	0	no	0.280	0.042	0.042	0.250		0.011	General
66-A	Patch	vvp_0132	Endangered	0	no	0.280	0.062	0.062	0.434		0.019	General
67-A	Patch	vvp_0132	Endangered	0	no	0.280	0.574	0.574	0.924		0.232	General
68-A	Patch	vvp_0132	Endangered	0	no	0.280	0.415	0.415	0.880		0.164	General
69-A	Patch	vvp_0132	Endangered	0	no	0.290	0.063	0.063	0.647		0.022	General
70-A	Patch	vvp_0132	Endangered	0	no	0.290	0.053	0.053	0.440		0.016	General
71-A	Patch	vvp_0132	Endangered	0	no	0.290	0.007	0.007	0.920		0.003	General
72-A	Patch	vvp_0132	Endangered	0	no	0.290	0.042	0.042	0.920		0.018	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
73-A	Patch	vvp_0132	Endangered	0	no	0.310	0.002	0.002	0.727		0.001	General
74-A	Patch	vvp_0132	Endangered	0	no	0.320	0.123	0.123	0.641		0.049	General
75-A	Patch	vvp_0132	Endangered	0	no	0.360	0.268	0.268	0.900		0.137	General
76-A	Patch	vvp_0132	Endangered	0	no	0.360	0.031	0.031	0.410		0.012	General
77-A	Patch	vvp_0132	Endangered	0	no	0.360	0.086	0.086	0.800		0.042	General
78-A	Patch	vvp_0132	Endangered	0	no	0.360	0.137	0.137	0.799		0.067	General
79-A	Patch	vvp_0132	Endangered	0	no	0.360	0.214	0.214	0.794		0.104	General
80-A	Patch	vvp_0132	Endangered	0	no	0.360	0.105	0.105	0.830		0.052	General
81-A	Patch	vvp_0132	Endangered	0	no	0.360	0.065	0.065	0.830		0.032	General
82-A	Patch	vvp_0132	Endangered	0	no	0.360	0.160	0.160	0.830		0.079	General
83-A	Patch	vvp_0132	Endangered	0	no	0.360	0.157	0.157	0.930		0.082	General
84-A	Patch	vvp_0132	Endangered	0	no	0.360	0.262	0.262	0.853		0.131	General
85-A	Patch	vvp_0132	Endangered	0	no	0.370	0.768	0.768	0.536		0.327	General
86-A	Patch	vvp_0132	Endangered	0	no	0.410	0.447	0.447	0.547		0.213	General
87-A	Patch	vvp_0132	Endangered	0	no	0.480	0.458	0.458	0.447		0.238	General
88-A	Patch	vvp_0132_61	Endangered	0	no	0.280	0.317	0.317	0.814		0.121	General
89-A	Patch	vvp_0132_61	Endangered	0	no	0.360	0.011	0.011	0.800		0.005	General
90-A	Patch	vvp_0132_61	Endangered	0	no	0.360	0.022	0.022	0.800		0.011	General
91-A	Patch	vvp_0132_61	Endangered	0	no	0.360	0.023	0.023	0.786		0.011	General
92-A	Patch	vvp_0132_61	Endangered	0	no	0.360	0.009	0.009	0.830		0.005	General
93-A	Patch	vvp_0641	Endangered	2	no	0.430	0.080	0.080	0.880		0.048	General
94-A	Patch	vvp_0653	Endangered	0	no	0.320	0.062	0.062	0.430		0.021	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
41-A	Patch	vvp_0055_61	Endangered	6	no	0.560	0.005	0.005	0.662		0.003	General
40-A	Patch	vvp_0055_61	Endangered	0	no	0.480	1.350	1.350	0.513		0.735	General
34-A	Patch	vvp_0055_61	Endangered	0	no	0.290	0.064	0.064	0.716		0.024	General
36-A	Patch	vvp_0055_61	Endangered	0	no	0.290	0.556	0.556	0.730		0.209	General
35-A	Patch	vvp_0055_61	Endangered	0	no	0.290	0.140	0.140	0.706		0.052	General
95-A	Patch	vvp_0132	Endangered	0	no	0.310	0.000	0.000	0.910		0.000	General
96-A	Patch	vvp_0132	Endangered	0	no	0.310	0.102	0.102	0.796		0.043	General
97-A	Patch	vvp_0125	Endangered	0	no	0.460	0.007	0.007	0.467		0.003	General

Appendix 2: Information about impacts to rare or threatened species' habitats on site

This table lists all rare or threatened species' habitats mapped at the site.

Species common name	Species scientific name	Species number	Conservation status	Group	Habitat impacted	% habitat value affected
Bacchus Marsh Wattle	*Acacia rostriformis*	505136	Vulnerable	Dispersed	Habitat importance map	0.0040
Werribee Blue-box	*Eucalyptus baueriana subsp. thalassina*	507580	Endangered	Dispersed	Habitat importance map	0.0027
Heath Spear-grass	*Austrostipa exilis*	503984	Rare	Dispersed	Habitat importance map	0.0027
Small Golden Moths	*Diuris basaltica*	501473	Endangered	Dispersed	Habitat importance map	0.0019
Fragrant Saltbush	*Rhagodia parabolica*	502929	Rare	Dispersed	Habitat importance map	0.0019
Melbourne Yellow-gum	*Eucalyptus leucoxylon subsp. connata*	504484	Vulnerable	Dispersed	Habitat importance map	0.0014
Large-headed Fireweed	*Senecio macrocarpus*	503116	Endangered	Dispersed	Habitat importance map	0.0013
Large-flower Crane's-bill	*Geranium sp. 1*	505342	Endangered	Dispersed	Habitat importance map	0.0013
Plump Swamp Wallaby-grass	*Amphibromus pithogastrus*	503624	Endangered	Dispersed	Habitat importance map	0.0012
Werribee Blue-box	*Eucalyptus baueriana subsp. thalassina*	507580	Endangered	Dispersed	Top ranking map	0.0012
Brackish Plains Buttercup	*Ranunculus diminutus*	504314	Rare	Dispersed	Habitat importance map	0.0011
Grassland Earless Dragon	*Tympanocryptis pinguicolla*	12922	Critically endangered	Dispersed	Habitat importance map	0.0009
Matted Flax-lily	*Dianella amoena*	505084	Endangered	Dispersed	Habitat importance map	0.0007
Pale-flower Crane's-bill	*Geranium sp. 3*	505344	Rare	Dispersed	Habitat importance map	0.0007
Tough Scurf-pea	*Cullen tenax*	502776	Endangered	Dispersed	Habitat importance map	0.0006
Rye Beetle-grass	*Tripogon loliiformis*	503455	Rare	Dispersed	Habitat importance map	0.0006
Brittle Greenhood	*Pterostylis truncata*	502821	Endangered	Dispersed	Habitat importance map	0.0006

Spiny Rice-flower	*Pimelea spinescens subsp. spinescens*	504823	Endangered	Dispersed	Habitat importance map	0.0006
Arching Flax-lily	*Dianella sp. aff. longifolia (Benambra)*	505560	Vulnerable	Dispersed	Habitat importance map	0.0005
Austral Tobacco	*Nicotiana suaveolens*	502275	Rare	Dispersed	Habitat importance map	0.0005
Velvet Daisy-bush	*Olearia pannosa subsp. cardiophylla*	502317	Vulnerable	Dispersed	Habitat importance map	0.0005
Pale Swamp Everlasting	*Coronidium gunnianum*	504655	Vulnerable	Dispersed	Habitat importance map	0.0005
Small Scurf-pea	*Cullen parvum*	502773	Endangered	Dispersed	Habitat importance map	0.0005
Rosemary Grevillea	*Grevillea rosmarinifolia subsp. rosmarinifolia*	504066	Rare	Dispersed	Habitat importance map	0.0005
Cane Spear-grass	*Austrostipa breviglumis*	503268	Rare	Dispersed	Habitat importance map	0.0004
Snowy Mint-bush	*Prostanthera nivea var. nivea*	502746	Rare	Dispersed	Habitat importance map	0.0004
Button Wrinklewort	*Rutidosis leptorhynchoides*	502982	Endangered	Dispersed	Habitat importance map	0.0004
Fragrant Saltbush	*Rhagodia parabolica*	502929	Rare	Dispersed	Top ranking map	0.0004
Basalt Podolepis	*Podolepis linearifolia*	504658	Endangered	Dispersed	Habitat importance map	0.0004
Small Golden Moths	*Diuris basaltica*	501473	Endangered	Dispersed	Top ranking map	0.0004
Heath Spear-grass	*Austrostipa exilis*	503984	Rare	Dispersed	Top ranking map	0.0003
Plains Yam-daisy	*Microseris scapigera s.s.*	504657	Vulnerable	Dispersed	Habitat importance map	0.0003
Golden Sun Moth	*Synemon plana*	15021	Critically endangered	Dispersed	Habitat importance map ; special site	0.0003
Button Wrinklewort	*Rutidosis leptorhynchoides*	502982	Endangered	Dispersed	Top ranking map	0.0003
Shiny Leionema	*Leionema lamprophyllum subsp. obovatum*	505478	Rare	Dispersed	Habitat importance map	0.0003
Western Golden-tip	*Goodia medicaginea*	501518	Rare	Dispersed	Habitat importance map	0.0003
Dark Wire-grass	*Aristida calycina var. calycina*	503630	Rare	Dispersed	Habitat importance map	0.0003
Purple Blown-grass	*Lachnagrostis punicea subsp. punicea*	504206	Rare	Dispersed	Habitat importance map	0.0003
Swamp Fireweed	*Senecio psilocarpus*	504659	Vulnerable	Dispersed	Habitat importance map	0.0003

Basalt Podolepis	*Podolepis linearifolia*	504658	Endangered	Dispersed	Top ranking map	0.0003
Small Milkwort	*Comesperma polygaloides*	500798	Vulnerable	Dispersed	Habitat importance map	0.0003
Austral Crane's-bill	*Geranium solanderi var. solanderi s.s.*	505337	Vulnerable	Dispersed	Habitat importance map	0.0002
Large-headed Fireweed	*Senecio macrocarpus*	503116	Endangered	Dispersed	Top ranking map	0.0002
Clover Glycine	*Glycine latrobeana*	501456	Vulnerable	Dispersed	Habitat importance map	0.0002
Late-flower Flax-lily	*Dianella tarda*	505085	Vulnerable	Dispersed	Habitat importance map	0.0002
Melbourne Yellow-gum	*Eucalyptus leucoxylon subsp. connata*	504484	Vulnerable	Dispersed	Top ranking map	0.0002
Curly Sedge	*Carex tasmanica*	500650	Vulnerable	Dispersed	Habitat importance map	0.0002
Purple Diuris	*Diuris punctata*	501084	Vulnerable	Dispersed	Habitat importance map	0.0002
Yellow Burr-daisy	*Calotis lappulacea*	500598	Rare	Dispersed	Habitat importance map	0.0001
Clumping Golden Moths	*Diuris gregaria*	504887	Endangered	Dispersed	Habitat importance map	0.0001
Branching Groundsel	*Senecio cunninghamii var. cunninghamii*	503104	Rare	Dispersed	Habitat importance map	0.0001
Swamp Everlasting	*Xerochrysum palustre*	503763	Vulnerable	Dispersed	Habitat importance map	0.0001
Bearded Dragon	*Pogona barbata*	12177	Vulnerable	Dispersed	Habitat importance map	0.0001
Waterbush	*Myoporum montanum*	502240	Rare	Dispersed	Habitat importance map	0.0001
Hairy Tails	*Ptilotus erubescens*	502825	Vulnerable	Dispersed	Habitat importance map	0.0001
Growling Grass Frog	*Litoria raniformis*	13207	Endangered	Dispersed	Habitat importance map	0.0001
Black Falcon	*Falco subniger*	10238	Vulnerable	Dispersed	Habitat importance map ; special site	0.0001
Striped Legless Lizard	*Delma impar*	12159	Endangered	Dispersed	Habitat importance map	0.0001
Golden Cowslips	*Diuris behrii*	501061	Vulnerable	Dispersed	Habitat importance map	0.0001
Dwarf Brooklime	*Gratiola pumilo*	503753	Rare	Dispersed	Habitat importance map	0.0001
Buloke	*Allocasuarina luehmannii*	500678	Endangered	Dispersed	Habitat importance map	0.0001
Port Lincoln Snake	*Parasuta spectabilis*	12813	Vulnerable	Dispersed	Habitat importance map	0.0000

Lewin's Rail	*Lewinia pectoralis pectoralis*	10045	Vulnerable	Dispersed	Habitat importance map	0.0000
Silky Kidney-weed	*Dichondra sp. 1*	505786	Rare	Dispersed	Habitat importance map	0.0000
Australian Painted Snipe	*Rostratula australis*	10170	Critically endangered	Dispersed	Habitat importance map	0.0000
Floodplain Fireweed	*Senecio campylocarpus*	507136	Rare	Dispersed	Habitat importance map	0.0000
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	10226	Vulnerable	Dispersed	Habitat importance map	0.0000
Australian Little Bittern	*Ixobrychus dubius*	10195	Endangered	Dispersed	Habitat importance map	0.0000
Musk Duck	*Biziura lobata*	10217	Vulnerable	Dispersed	Habitat importance map	0.0000
Blue-billed Duck	*Oxyura australis*	10216	Endangered	Dispersed	Habitat importance map	0.0000
Little Egret	*Egretta garzetta nigripes*	10185	Endangered	Dispersed	Habitat importance map	0.0000
Baillon's Crake	*Porzana pusilla palustris*	10050	Vulnerable	Dispersed	Habitat importance map	0.0000
Brown Toadlet	*Pseudophryne bibronii*	13117	Endangered	Dispersed	Habitat importance map	0.0000
Australasian Bittern	*Botaurus poiciloptilus*	10197	Endangered	Dispersed	Habitat importance map	0.0000
Hardhead	*Aythya australis*	10215	Vulnerable	Dispersed	Habitat importance map	0.0000
Speckled Warbler	*Chthonicola sagittatus*	10504	Vulnerable	Dispersed	Habitat importance map	0.0000
Freckled Duck	*Stictonetta naevosa*	10214	Endangered	Dispersed	Habitat importance map	0.0000
Brolga	*Grus rubicunda*	10177	Vulnerable	Dispersed	Habitat importance map	0.0000
Australasian Shoveler	*Anas rhynchotis*	10212	Vulnerable	Dispersed	Habitat importance map	0.0000
Painted Honeyeater	*Grantiella picta*	10598	Vulnerable	Dispersed	Habitat importance map	0.0000
Eastern Great Egret	*Ardea modesta*	10187	Vulnerable	Dispersed	Habitat importance map	0.0000
Swift Parrot	*Lathamus discolor*	10309	Endangered	Dispersed	Habitat importance map	0.0000
Intermediate Egret	*Ardea intermedia*	10186	Endangered	Dispersed	Habitat importance map	0.0000
Slender Mint-bush	*Prostanthera saxicola var. bracteolata*	502750	Rare	Dispersed	Habitat importance map	0.0000
Barking Owl	*Ninox connivens connivens*	10246	Endangered	Dispersed	Habitat importance map	0.0000

Grey Goshawk	*Accipiter novaehollandiae novaehollandiae*	10220	Vulnerable	Dispersed	Habitat importance map	0.0000
Elegant Parrot	*Neophema elegans*	10307	Vulnerable	Dispersed	Habitat importance map	0.0000
White-throated Needletail	*Hirundapus caudacutus*	10334	Vulnerable	Dispersed	Habitat importance map	0.0000
Buloke Mistletoe	*Amyema linophylla subsp. orientalis*	500217	Vulnerable	Dispersed	Habitat importance map	0.0000

Habitat group

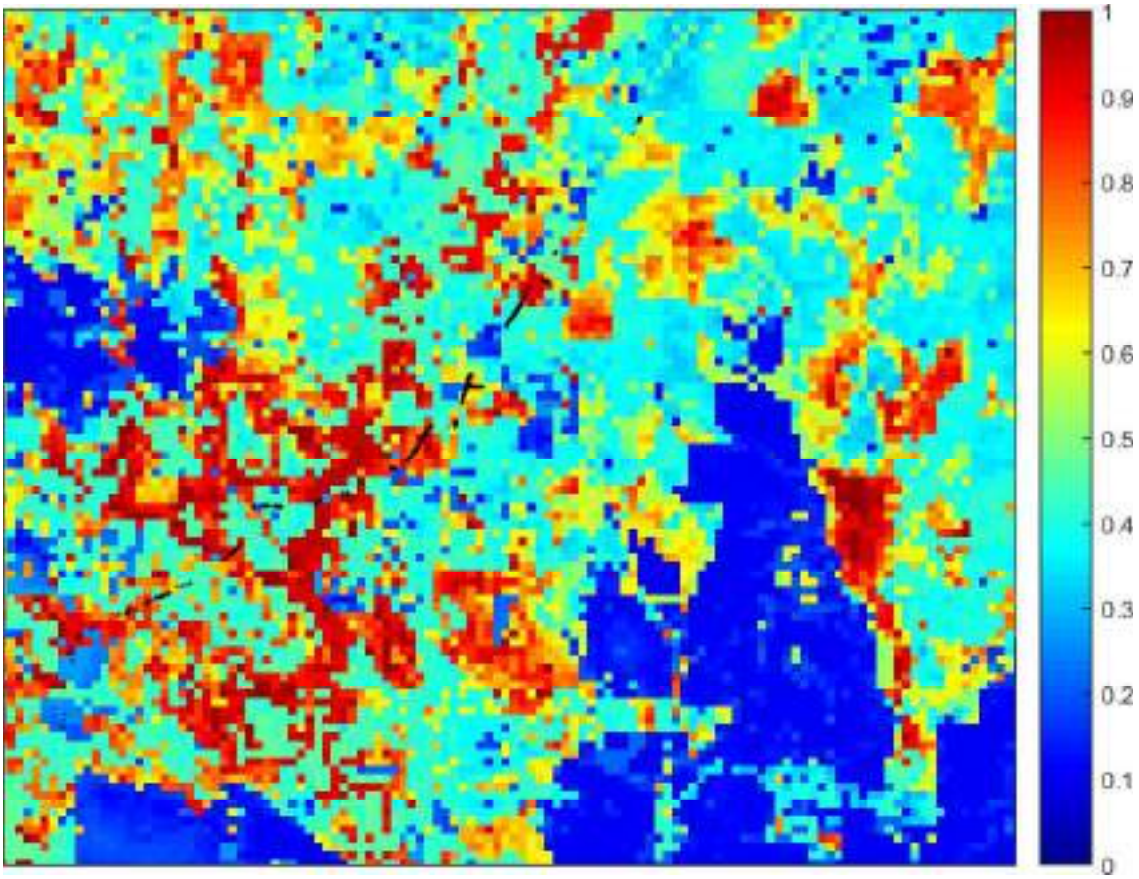
- Highly localised habitat means there is 2000 hectares or less mapped habitat for the species
- Dispersed habitat means there is more than 2000 hectares of mapped habitat for the species

Habitat impacted

- Habitat importance maps are the maps defined in the Guidelines that include all the mapped habitat for a rare or threatened species
- Top ranking maps are the maps defined in the Guidelines that depict the important areas of a dispersed species habitat, developed from the highest habitat importance scores in dispersed species habitat maps and selected VBA records
- Selected VBA record is an area in Victoria that represents a large population, roosting or breeding site etc.

Appendix 3 – Images of mapped native vegetation

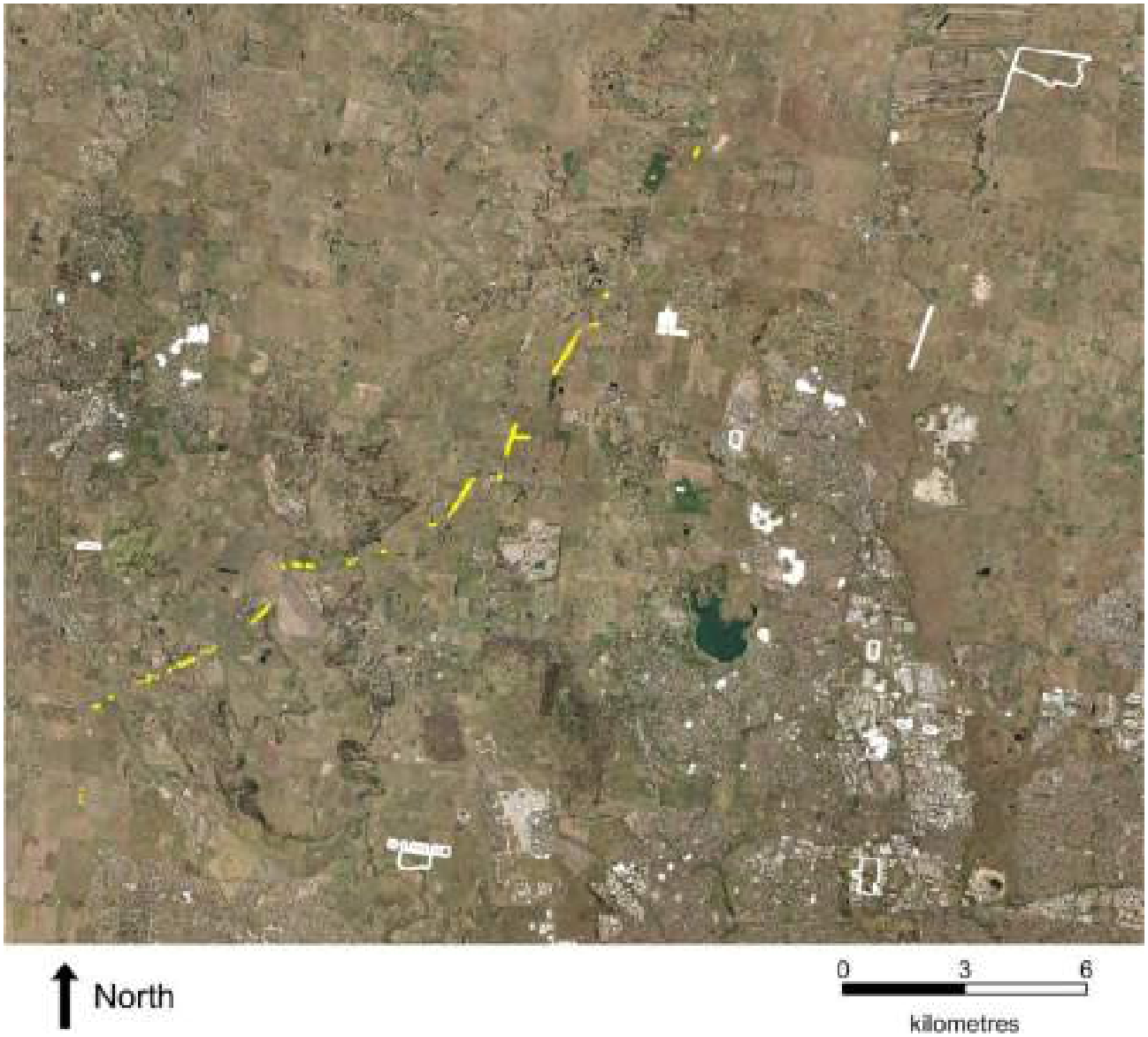
2. Strategic biodiversity values map



3. Aerial photograph showing mapped native vegetation



4. Map of the property in context



Yellow boundaries denote areas of proposed native vegetation removal.

Red boundaries denote areas of past removal.

Native vegetation removal report

This report provides information to support an application to remove, destroy or lop native vegetation in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation*. The report **is not an assessment by DELWP** of the proposed native vegetation removal. Native vegetation information and offset requirements have been determined using spatial data provided by the applicant or their consultant.

Date of issue: **05/02/2021**
Time of issue: **12:46 pm**

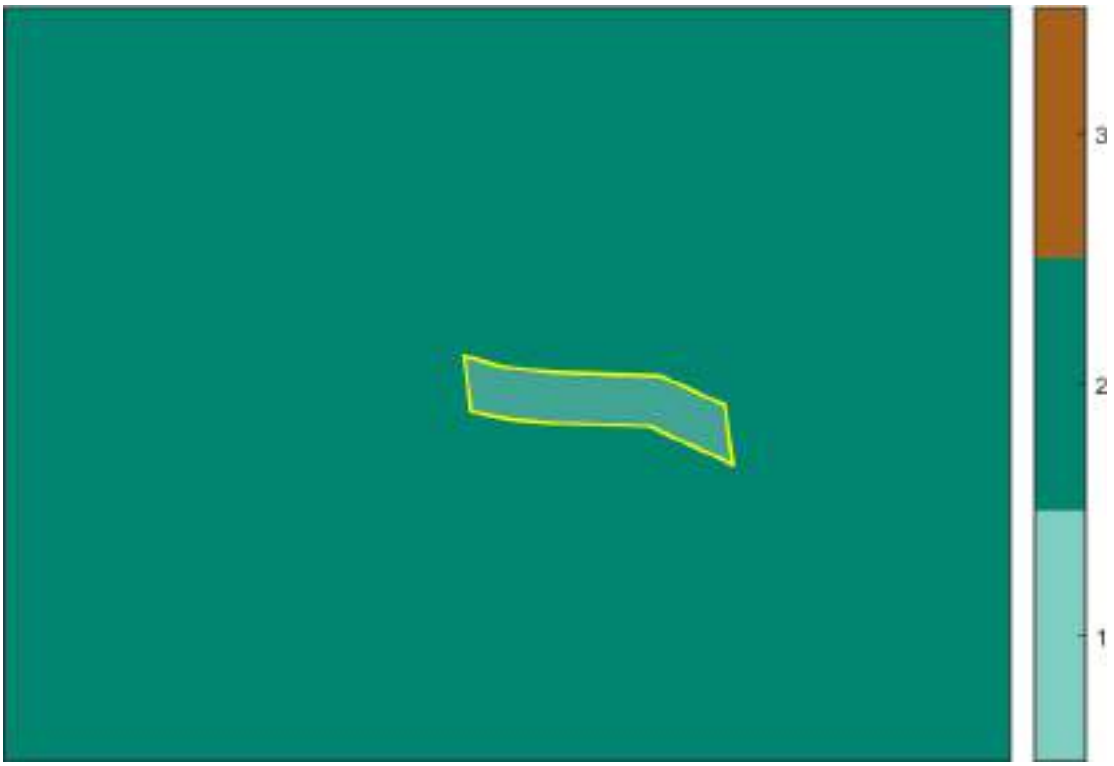
Report ID: GHD_2021_005

Project ID	12529997_DELWP_NVR_Crown_20210201

Assessment pathway

Assessment pathway	**Intermediate Assessment Pathway**
Extent including past and proposed	0.013 ha
Extent of past removal	0.000 ha
Extent of proposed removal	0.013 ha
No. Large trees proposed to be removed	0
Location category of proposed removal	Location 2 The native vegetation is in an area mapped as an endangered Ecological Vegetation Class (as per the statewide EVC map). Removal of less than 0.5 hectares of native vegetation in this location will not have a significant impact on any habitat for a rare or threatened species.

1. Location map



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Offset requirements if a permit is granted

Any approval granted will include a condition to obtain an offset that meets the following requirements:

General offset amount[1]	0.006 general habitat units
Vicinity	Port Phillip and Westernport Catchment Management Authority (CMA) or Mitchell Shire, Whittlesea City Council
Minimum strategic biodiversity value score[2]	0.304
Large trees	0 large trees

NB: values within tables in this document may not add to the totals shown above due to rounding

Appendix 1 includes information about the native vegetation to be removed

Appendix 2 includes information about the rare or threatened species mapped at the site.

Appendix 3 includes maps showing native vegetation to be removed and extracts of relevant species habitat importance maps

1 The general offset amount required is the sum of all general habitat units in Appendix 1.

2 Minimum strategic biodiversity score is 80 per cent of the weighted average score across habitat zones where a general offset is required

Next steps

Any proposal to remove native vegetation must meet the application requirements of the Intermediate Assessment Pathway and it will be assessed under the Intermediate Assessment Pathway.

If you wish to remove the mapped native vegetation you are required to apply for a permit from your local council. Council will refer your application to DELWP for assessment, as required. **This report is not a referral assessment by DELWP.**

This *Native vegetation removal report* must be submitted with your application for a permit to remove, destroy or lop native vegetation.

Refer to the *Guidelines for the removal, destruction or lopping of native* vegetation (the Guidelines) for a full list of application requirements This report provides information that meets the following application requirements:

- The assessment pathway and reason for the assessment pathway
- A description of the native vegetation to be removed (met unless you wish to include a site assessment)
- Maps showing the native vegetation and property
- The offset requirements determined in accordance with section 5 of the Guidelines that apply if approval is granted to remove native vegetation.

Additional application requirements must be met including:

- Topographical and land information
- Recent dated photographs
- Details of past native vegetation removal
- An avoid and minimise statement
- A copy of any Property Vegetation Plan that applies
- A defendable space statement as applicable
- A statement about the Native Vegetation Precinct Plan as applicable
- An offset statement that explains that an offset has been identified and how it will be secured.

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Appendix 1: Description of native vegetation to be removed

All zones require a general offset, the general habitat units each zone is calculated by the following equation in accordance with the Guidelines:

General habitat units = extent x condition x general landscape factor x 1.5, where the general landscape factor = 0.5 + (strategic biodiversity value score/2)

The general offset amount required is the sum of all general habitat units per zone.

Native vegetation to be removed

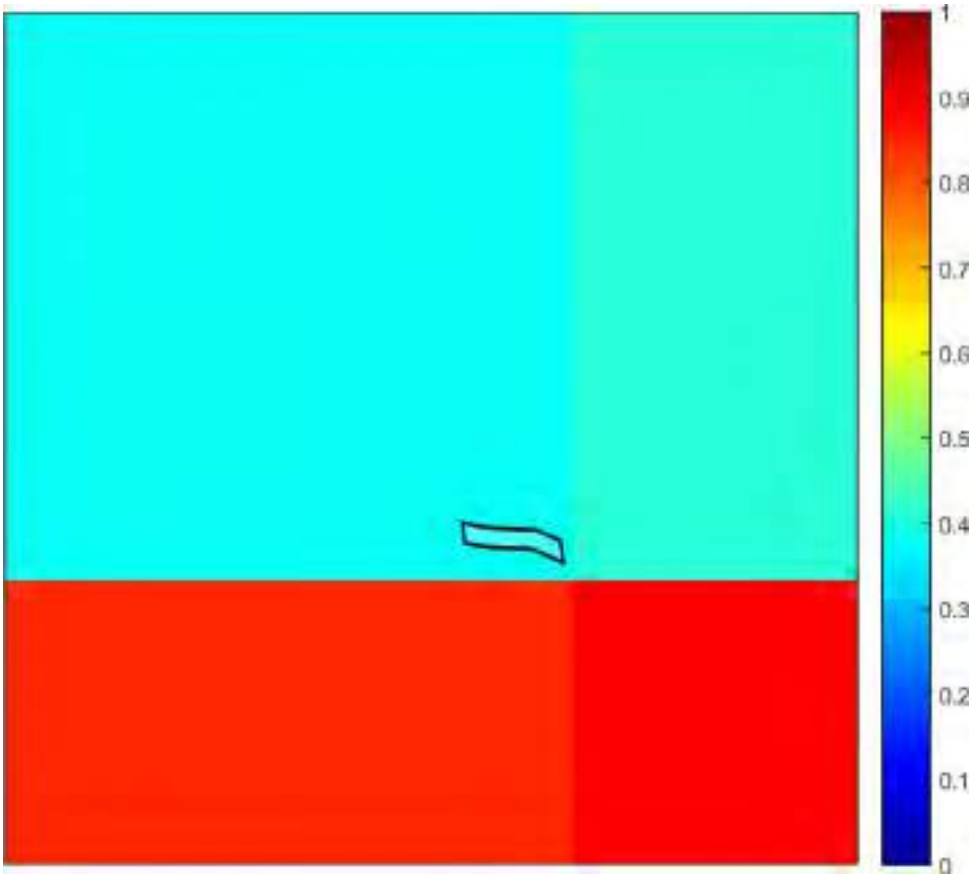
Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
26-B	Patch	vvp_0641	Endangered	0	no	0.420	0.013	0.013	0.380		0.006	General

Appendix 2: Information about impacts to rare or threatened species' habitats on site

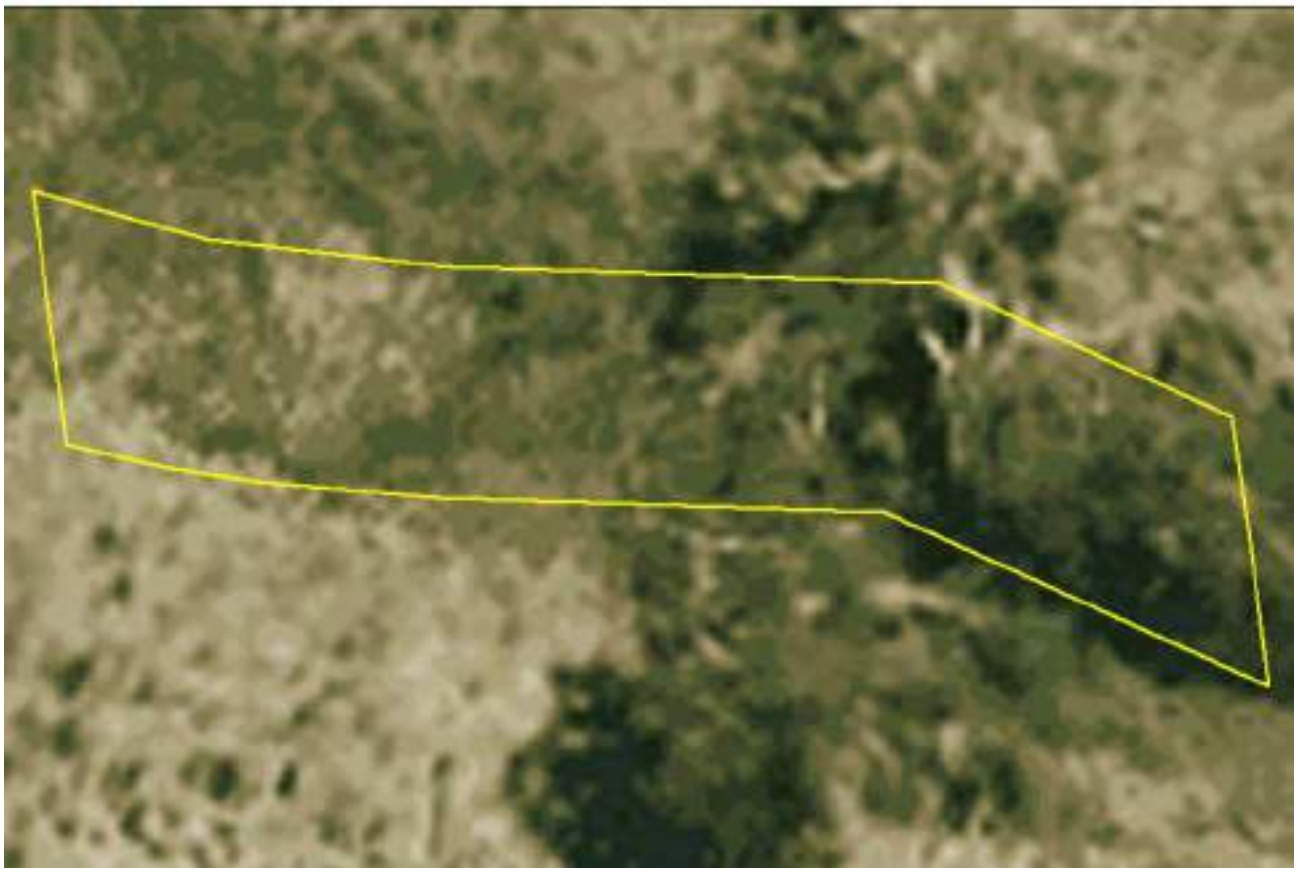
This is not applicable in the Intermediate Assessment Pathway.

Appendix 3 – Images of mapped native vegetation

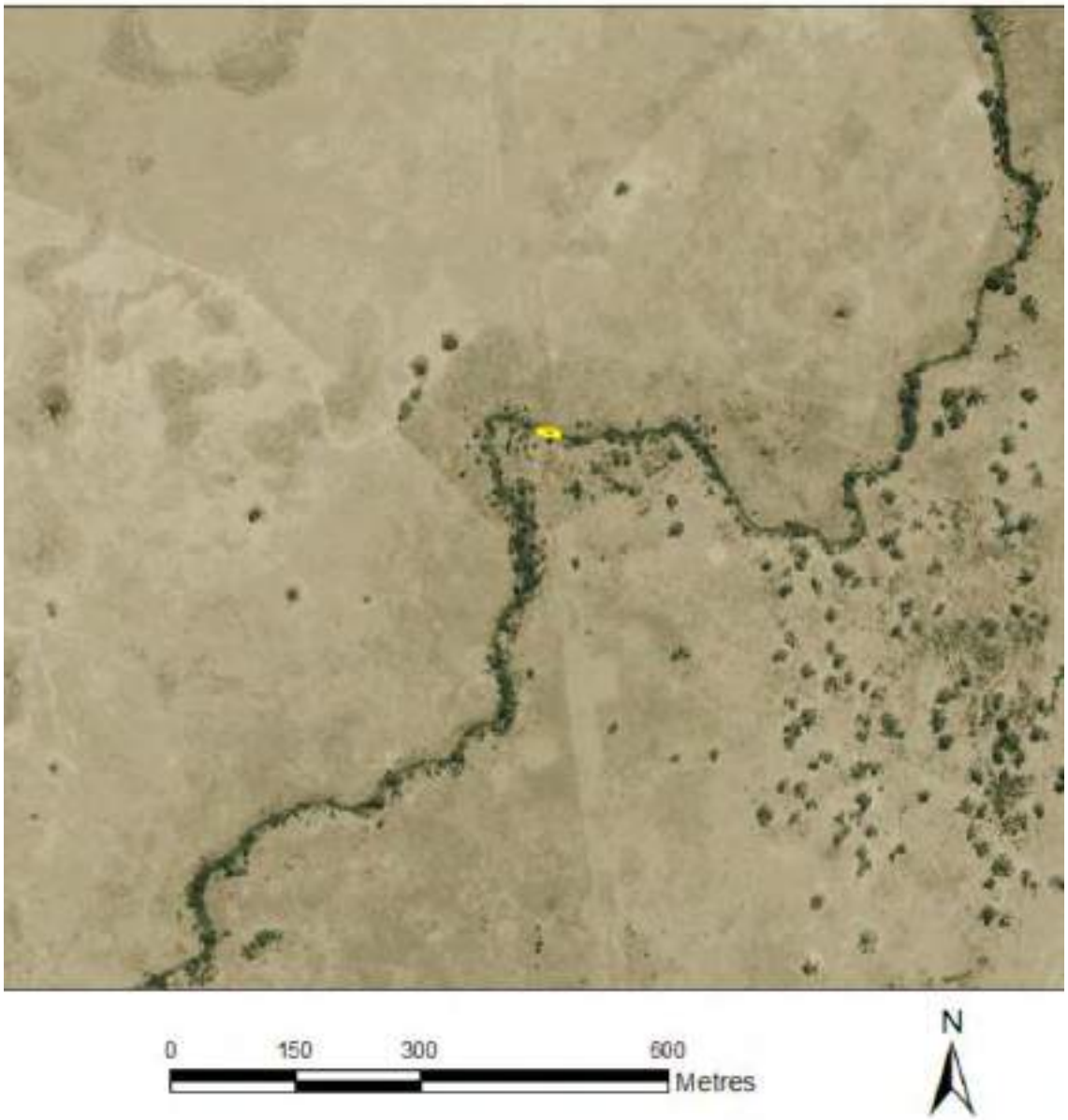
2. Strategic biodiversity values map



3. Aerial photograph showing mapped native vegetation



4. Map of the property in context



Yellow boundaries denote areas of proposed native vegetation removal.

Appendix CC – Biosis 2020 Report

Western Outer Ring Main (WORM): Biodiversity assessment

FINAL REPORT

Prepared for APA

4 June 2020

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- Daniel Gilmore & Clare McCutcheon (fauna inputs)
- Sera Cutler & Matthew Gibson (flora inputs)
- Julian Turner (mapping)
- Ian Smales & Matt Looby (quality assurance)

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Summary

Biosis Pty Ltd was commissioned by APA to undertake ecological surveys for the proposed Western Outer Ring Main (WORM). The WORM project (the Project) is planned to provide a new high pressure link between existing sources of gas supply in the north and east of the State with those in western Victoria.

The Project is a proposed 500 millimetre diameter buried high pressure gas transmission pipeline between APA's existing Plumpton Regulating Station (approx. 38 kilometres west of Melbourne's CBD) and Wollert (approx. 26 kilometres north-east of Melbourne's CBD).

This assessment builds on the results of the *Western Outer Ring Main (WORM): Desktop biodiversity assessment* (the desktop assessment) (Biosis 2019). The scope of the field surveys was determined by the listed flora, fauna and ecological communities identified in the desktop assessment as most likely to occur within the construction footprint (Biosis 2019).

The scope of this report is to document the methods and results of the ecological field surveys carried out between July 2019 and February 2020, inclusive. The report incorporates information from the previous desktop assessment conducted by Biosis (2019). This assessment also provides advice on the implications of the survey results with regard to Commonwealth and State biodiversity legislation and policy along with a refined estimate of biodiversity offset obligations.

Methods

Targeted flora surveys were conducted for 26 listed flora species (details in Section 2) from July 2019 to February 2020. Targeted surveys for *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) listed fauna Striped Legless Lizard *Delma impar*, Growling Grass Frog *Litoria raniformis* and Golden Sun Moth *Synemon plana* were carried out over the summer 2019/20 survey season. Native vegetation and threatened ecological communities were also mapped throughout the construction footprint. All surveys were conducted in accordance with relevant State and Commonwealth survey guidelines.

Results

Flora surveys identified three listed flora species. One Matted Flax-lily *Dianella amoena* (Endangered under the EPBC Act) was recorded within public land, outside the approved Melbourne Strategic Assessment (MSA) areas near KP 23. A total of 48 Tough Scurf-pea *Cullen tenax* (*Flora and Fauna Guarantee Act 1988* [FFG Act] listed) were recorded within private land in an area within the approved MSA areas near KP 51. One Flax-lily *Dianella longifolia* var. *grandis* (Victorian Advisory List) was recorded within private land, outside the approved MSA areas near KP 9.

Targeted fauna surveys detected all three of the target EPBC Act listed fauna species. Growling Grass Frog were recorded within Deep Creek and also within an offline waterbody within the approved MSA area near KP 40. Growling Grass Frog have been previously recorded from the three major streams (Jacksons, Deep and Merri Creeks) crossed by the construction footprint. Golden Sun Moth were recorded in areas within and outside of the approved MSA areas from approximately KP 22 through to KP 51. Striped Legless Lizard were recorded in two tile survey grids within one parcel at approximately KP 11, outside of the approved MSA areas.

The vegetation field assessment mapped patches of native vegetation both within and outside of the approved MSA areas. A summary of native vegetation mapped within the construction footprint through on-ground assessment along with the Department of Environment, Land, Water and Planning (DELWP)

timestamped native vegetation data for areas within the approved MSA areas is presented below. A total of 16.3 hectares of native vegetation was mapped within the construction footprint. Most of this native vegetation (12.7 hectares) occurs outside of the approved MSA areas. Native vegetation mapping was not completed on six parcels due to land access. To account for this uncertainty, a scenario was run assuming native vegetation is present in the vegetated areas of these six parcels which are also covered by the construction footprint. Under this scenario, a maximum of 23.30 hectares of native vegetation could be present within the construction footprint,18.79 hectares of the 23.30 hectares would be outside the approved MSA areas.

Native Vegetation	MSA Timestamped Data (ha)	Biosis Desktop & Field Assessment Data (ha)*
Inside the approved MSA areas (approved under Part 10 of the EPBC Act)		
Sub-total	9.98	3.60 (4.51)
Outside the approved MSA areas		
Sub-total	-	12.69 (18.79)
Total	-	16.29 (23.30)

* values in parentheses include assumed native vegetation in the six unsurveyed parcels

Three parcels were identified to contain patches of native vegetation with significantly higher biodiversity values than other native vegetation patches mapped within the construction footprint. These patches should be prioritised in future design changes that avoid / minimise impacts to native vegetation.

Parcel identifier	Habitat zone	VQA score
12LP92520	191119-2	48
13LP92520	191119-3	32
2LP119116	191118-5	23

Two EPBC listed threatened ecological communities (Grassy Eucalypt Woodland of the Victorian Volcanic Plain and Natural Temperate Grassland of the Victorian Volcanic Plain) were confirmed to occur within the construction footprint. The areas of these communities are summarised below and generally correspond with occurrences of Plains Grassland and Plains Grassy Woodland EVCs.

Nationally significant ecological community	Inside approved MSA areas (ha)	Outside approved MSA areas (ha)	Total (ha)
Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVVP)	0.10	2.39	**2.49**
Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP)	1.15	6.76	**7.91**

All patches of Plains Grassland EVC (10.47 ha total) within the construction footprint were considered to also be occurrences of the FFG Act listed Western (Basalt) Plains Grasslands Community. Similarly, all patches of

Plains Grassy Woodland EVC (2.97 ha total) were considered to also be occurrences of the FFG Act listed Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland.

Biodiversity legislation and offsets

Under the *Guidelines for the removal, destruction or lopping of native vegetation* an application to remove native vegetation will be assessed under the detailed assessment pathway. Offset requirements for the removal of native vegetation in areas outside the MSA are presented below. Both general and species offsets are required. The offset requirements consider the two pipeline alignment options provided at KP 18 separately (see Figure 3 for alignment details). Proposed native vegetation removal extents are slightly larger than the extent of native vegetation mapped on ground due to the inclusion of DELWP mapped wetlands, which are automatically considered native vegetation regardless of condition.

Attribute	Pipeline alignment options	
	Northern option at KP 18	Southern option at KP 18
Proposed native vegetation removal extent	19.340 ha	19.199 ha
General offsets		
Offset amount: general habitat units	4.430 units	4.385 units
General offset minimum Strategic Biodiversity Value Score	0.449	0.450
Large trees*	5 large trees	5 large trees
Species offsets		
Offset amount: general habitat units	8.486 units for Small Golden Moths 8.616 units for Heath Spear-grass 6.662 units for Bacchus Marsh Wattle	8.527 units for Small Golden Moths 8.655 units for Heath Spear-grass 6.701 units for Bacchus Marsh Wattle
Large trees*	15 large trees	15 large trees

* 20 large trees to be protected in either the general, species or combination across all habitat units protected

The Project was referred under both the EPBC Act and the *Environment Effects Act 1978* (EE Act). Under the EPBC Act the proposed action is a controlled action and an Environment Effects Statement (EES) is required under the EE Act. The results from this field assessment campaign will be critical in informing further assessment of impacts to biodiversity from the Project for the State and Commonwealth approvals processes.

APA has been advised by the Department of Agriculture, Water and the Environment (DAWE) that it can rely on the approval decision made under Part 10 of the EPBC Act for those parts of the WORM project within the approved MSA areas between KP 0 to approximately KP 3.2, and KP 28.8 to KP 51.2. Consequently, impacts to biodiversity as a result of the Project can be offset through the payment of Habitat Compensation Obligations (HCOs).

It is noted the *Melbourne Strategic Assessment (Environment Mitigation Levy) Act 2020* (Levy Act) will commence on 1 July 2020. The Levy Act will introduce an environment mitigation levy scheme (Levy) to replace the HCOs that exist under the EPBC Act approval conditions. It is unlikely HCOs will be paid prior to 1 July 2020,

therefore the Levy Act will apply. The Levy unit fees will be indexed and updated over time (at the beginning of each financial year) to return the MSA offset obligations to full cost recovery by 2024–25.

Regardless of HCOs or the Levy applying, the obligations will remain the same and preliminary estimates are indicated below.

Offset type	Obligation
Inside approved MSA areas (HCOs or Levy)	
Native vegetation	4.498 ha
Spiny Rice-flower	1.065 ha
Matted Flax-lily	3.432 ha
Golden Sun Moth	32.418 ha
Growling Grass Frog	9.887 ha
Outside approved MSA areas (preliminary estimates of offset areas required)	
Striped Legless Lizard	2.5 – 3.3 ha
Golden Sun Moth	86.4 – 144.0 ha
NTGVVP	33 ha
GEWVVP	9 ha

Flora and Fauna Guarantee Act 1988 Protected flora species, threatened species and threatened communities are present on public land within the construction footprint, and a protected flora permit from DELWP will be required for works on public land (e.g. roadsides).

Recommendations summary

This assessment has identified significant biodiversity values within the construction footprint. Further surveys will be required for parcels not assessed to date or where surveys were incomplete due to land access constraints. The results of any additional surveys should be incorporated with the findings of this report to determine the full impact of the Project.

It is recommended that options for avoidance and minimisation of impacts to significant biodiversity values be implemented with the following considerations:

- Revisions to the construction footprint to minimise impacts on biodiversity wherever feasible.
- Alterations to construction methods to minimise biodiversity impacts should be investigated, particularly in areas of high native vegetation value, where threatened ecological communities occur and where threatened species have been recorded.
- Minimising construction corridors in areas of high ecological value.

Where direct impact to habitat for threatened species is unavoidable, translocation of threatened flora and relocation of threated fauna (for threatened vertebrate species) is advised.

Where direct impact to native vegetation and habitat cannot be avoided, and where construction impacts may affect adjacent vegetation or habitat, consider feasible options to reinstate native vegetation and habitat values through appropriate site remediation and rehabilitation to maintain condition and connectivity.

An offset strategy should be developed for any residual impacts to biodiversity values which cannot be avoided or mitigated.

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1. Introduction

1.1 Project background

Biosis Pty Ltd was commissioned by APA to undertake ecological surveys for the proposed Western Outer Ring Main (WORM). The WORM project (the Project) is planned to provide a new high pressure link between existing sources of gas supply in the north and east of the State with those in western Victoria (Figure 1).

The Project is a proposed 500 millimetre diameter buried high pressure gas transmission pipeline between APA's existing Plumpton Regulating Station (approx. 38 kilometres west of Melbourne's CBD) and Wollert (approx. 26 kilometres north-east of Melbourne's CBD), which will provide an additional connection between the eastern and western pipeline networks of the Victorian Transmission System. The location of the Project is presented in Figure 2. The Project traverses land both inside and outside the Melbourne Urban Growth Boundary (UGB) and land that was subject to the Melbourne Strategic Assessment (MSA), including:

- KP 0 – 3.2 and KP 28.8 – 51.2 located within the MSA.
- KP 3.2 – 28.8 is located outside the MSA.

The pipeline will occupy an easement of nominally 15 metres width and be buried for its entire length to a minimum depth of cover of 900 millimetres. An additional compressor and a regulating station are also proposed as part of the Project at APA's existing gas compressor station located at 365 Summerhill Road, Wollert. The Project was assessed based on the Revision 5 construction footprint (the construction footprint) provided by APA (Figure 3). The construction footprint is typically 30 metres wide and includes additional space in certain sections to accommodate machinery, vehicle turnarounds and material storage..

The pipeline and all the associated facilities will be designed, constructed, commissioned and operated in accordance with Australian Standard AS 2885 Pipelines – Gas and Liquid Petroleum (AS2885) and a Pipeline Licence, which would be required pursuant to the *Pipelines Act 2005* (Vic) (Pipelines Act).

This report follows on from the *Western Outer Ring Main (WORM): Desktop biodiversity assessment* (Biosis 2019) (the desktop report). The desktop report assessed a 100 metre wide corridor (desktop study area), which was indicative of where the Project could conceivably occur (either during construction or operational phases). The desktop study area is wider than the construction footprint, however it provided flexibility in the micro-siting process.

1.2 Scope of assessment

The scope of this report is to document the methods and results of the ecological field surveys carried out between July 2019 and February 2020, inclusive. The report incorporates information from the previous desktop assessment conducted by Biosis (2019). This assessment also provides advice on the implications of the survey results with regard to Commonwealth and State biodiversity legislation and policy along with a refined estimate of biodiversity offset obligations.

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1.3 Assessment objectives

The objectives of this assessment are as follows:

- Summarise the desktop assessment methods and findings.
- Document survey methodologies with regard to relevant Commonwealth and State guidelines.
- Document the results of all ecological field surveys (July 2019 to February 2020).
- Identify gaps in the ecological surveys conducted to date.
- Revise likely impacts to biodiversity beyond our previous advice in the desktop assessment (Biosis 2019).
- Provide a revised estimate of offset obligations from the desktop assessment (Biosis 2019).
- Provide recommendations for further field surveys.
- Provide recommendations regarding impact avoidance and minimisation.

1.4 Regional context

The construction footprint encompasses private and public land within the:

- Central Victorian Uplands (CVU) and Victorian Volcanic Plain (VVP) Bioregions.
- Port Phillip and Western Port Catchment Region managed by Melbourne Water for the Port Philip and Western Port Catchment Management Authority (PPWCMA).
- Cities of Melton, Hume and Whittlesea and Mitchell Shire.

The construction footprint is within the Werribee River, Maribyrnong River and Yarra River Catchments and crosses the following creeks and waterways:

- Jacksons Creek, Deep Creek and the Tame Street Drain within the Maribyrnong River Catchment.
- Kalkallo Creek and Merri Creek within the Yarra River Catchment.

A number of minor streams, watercourses and farm dams are also traversed. The Alluvium (2019) desktop assessment of Surface Water and Groundwater within the desktop study area provides further details on these features.

The construction footprint traverses land both inside and outside the Melbourne UGB and land that was subject to the MSA. The construction footprint traverses parts of the Plumpton, Lindum Vale, Merrifield West, Merrifield North Employment, Lockerbie, Donnybrook-Woodstock, Shenstone Park and Northern Quarries Precinct Structure Plans (PSPs) within the Northern and Western Growth Corridors.

1.5 Existing assessments and approvals

Land within the construction footprint has been subject to a number of assessment and approval processes under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) and the *Planning and Environment Act 1987* (PE Act). Specifically, the following processes have been completed:

- An assessment was conducted under Part 10 of the EPBC Act for all land within the MSA area in 2009. This assessment involved targeted surveys and detailed assessments of the potential impacts of urban development and associated infrastructure on matters of national environmental significance (MNES). While the MSA assessment was initiated under the EPBC Act an integrated assessment process was conducted, whereby matters of State ecological significance were assessed concurrently, including State significant species and native vegetation (as defined under State based assessment methods). Surveys were undertaken in accordance with the Department of Environment, Land, Water and Planning (DELWP) Biodiversity Precinct Structure Planning Kit (DSE 2010) and EPBC Act guidelines and listing advice for MNES. Significant species recorded during the MSA surveys were submitted to State biodiversity databases.
- The MSA surveys and assessments resulted in development of the Native Vegetation Time Stamping Dataset (the timestamped dataset), a definitive view of native vegetation extent and condition across Melbourne's VC68 urban growth areas and incomplete Precinct planning areas within the Melbourne UGB, timestamped as at 13 December 2012. The timestamped dataset is based on an assessment of native vegetation using the Victorian habitat hectares method (Version 1.3), the current DELWP method for assessing native vegetation extent and condition for regulatory purposes. The dataset was based on a combination of extensive on-ground site surveys and estimated data using the best available information (desktop assessments, modelling, expert opinion, and over the fence assessment) for those properties where access was not obtained.
- The area covered by the timestamped dataset aligns with the extent of the Biodiversity Conservation Strategy (BCS) for Melbourne's Growth Corridors (DSE 2013a). The BCS sets out the detailed conservation measures required for Victoria to satisfy the commitments made to the Commonwealth Government under the MSA and meet State requirements for biodiversity under the Victorian planning scheme.
- A Part 10 EPBC Act approval was granted on 5 September 2013 allowing Actions resulting from urban development and infrastructure in parts of the MSA area. The areas covered under this approval are referred to as the 'approved MSA areas' and include the sections between approximately KP 0 to KP 3.2 and KP 28.8 to KP 51.2.
- The BCS and timestamped dataset have been used as the basis for assessing decisions under the PE Act within the approved MSA areas. Where Precinct Structure Plans (PSPs) have been approved in the MSA area there has been an amendment to clause 52.17 (Native vegetation) of relevant planning schemes so that proponents can rely on approval conditions under the Part 10 EPBC approval.
- The timestamped dataset has been combined with significant species habitat data collected as part of the MSA program to produce the Environment Mitigation Dataset, used to determine habitat compensation obligations (HCOs) for projects assessed under the MSA approvals. The Time Stamping Dataset and Environment Mitigation Dataset are currently used to determine impacts and mitigation requirements for projects within the approved MSA area under the EPBC Act and PE Act. The Victorian Northern Interconnect (VNI) pipeline project constructed in the eastern part of the construction footprint is one such project that was within the definition of Actions resulting from urban development and infrastructure under the Part 10 approval and which relied on that approval.

- APA has been advised by the Department of Agriculture, Water and Environment (DAWE) that it can rely on the approval decision made under Part 10 of the EPBC Act for those parts of the WORM project within the approved MSA areas between KP 0 to approximately KP 3.2 and KP 28.8 to KP 51.2.

The sections requiring referral under Part 9 of the EPBC Act (i.e. not covered by the Part 10 EPBC Act approval for the MSA) are hereafter referred to as 'areas outside the MSA approvals'. This includes the section from approximately KP 3.2 to KP 28.8.

Approved MSA areas and areas outside the MSA approvals are shown in Figure 3.

2. Methods

2.1 Desktop assessment methodology

The sub-sections below provide a summary of the methods used for the desktop assessment, which included:

- Database reviews.
- Aerial photo interpretation.
- Rapid field assessments.
- Potential native vegetation mapping.

The desktop assessment was conducted based on Revision 4 of the pipeline construction footprint. Refer to Section 2 of the *Western Outer Ring Main (WORM): Desktop biodiversity assessment* (Biosis 2019) for more details.

2.1.1 Database review

In order to provide context for the Project, information about flora and fauna from within 5 kilometres of the construction footprint (the 'local area') was obtained from relevant biodiversity databases, many of which are maintained by the DELWP or DAWE (Biosis 2019).

Aquatic fauna records were searched for the Maribyrnong catchment (Deep Creek and Jacksons Creek) and Yarra Catchment (Merri Creek).

2.1.2 Definitions of significance

The significance of a species or ecological community is determined by its listing status under Commonwealth or State legislation / policy (Table 1).

Table 1 Criteria for determining significance of species & ecological communities

Significance	
National	Threatened species listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable or conservation dependent under the EPBC Act. Threatened ecological communities listed as critically endangered, endangered or vulnerable under the EPBC Act.
State	Threatened species listed as critically endangered, endangered or vulnerable in Victoria on a DELWP Advisory List (DSE 2009; DSE 2013; DEPI 2014a). Species or ecological communities listed as threatened under the FFG Act.

Migratory species are also considered as part of the significant impact assessment under the EPBC Act.

Flora protected under the *Flora and Fauna Guarantee Act 1988* (FFG Act) but not listed as threatened are also considered under the FFG Act.

Noxious weeds and Pest animals listed under the *Catchment and Land Protection Act 1994* (CaLP Act) are of significance for their potential to cause environmental or economic harm or have the potential to cause such harm.

2.1.3 Determining likelihood of occurrence of significant species and ecological communities

Likelihood of occurrence indicates the potential for a species or ecological community to occur within the construction footprint. It is based on expert opinion, information in relevant biodiversity databases and reports, and an assessment of the habitat within the construction footprint. Only those species previously recorded from within 5 kilometres of the construction footprint, or which have been predicted to occur within the area based on the DAWE Protected Matters Search Tool (PMST) were considered. Likelihood of occurrence was ranked as negligible, low, medium, high, or recorded.

2.1.4 Aerial photo interpretation

A review of aerial photos was conducted for all areas outside the MSA approvals within the construction footprint (between approximately KP 3.2 to 28.8). The review identified additional areas of potential native vegetation beyond areas identified in existing datasets and reports. An Ecological Vegetation Class (EVC) was assigned to all areas of potential native vegetation based on the aerial imagery interpretation and pre-1750 EVC modelling or a previously reported EVC. Ecological Vegetation Classes were assigned to broad habitat types (grassland, woodland, wetland). Dams and waterbodies were also mapped as potential habitat. Rapid field assessments helped to ground-truth aerial photo interpretation by mapping of areas of potential native vegetation and/or habitat for significant species. Any areas of potential native vegetation and habitat were mapped and a 'Cultivated', 'Previously Cultivated' or 'Uncultivated' status assigned.

2.1.5 Potential native vegetation and habitat mapping

A potential native vegetation (PNV) map for the construction footprint was created using a combination of DELWP's Native Vegetation Time Stamping Dataset - Melbourne Growth Areas (VC68), rapid field assessment mapping and aerial photo interpretation described above.

For those species with a medium or higher likelihood of occurrence within the construction footprint, potential habitat was defined on the basis of vegetation type using the potential native vegetation mapping to broadly categorise habitat types (grassland, woodland, wetland), and using the 'Previously Cultivated' and 'Uncultivated' categories where relevant. In addition, dams, waterbodies and waterways were used to define potential habitat for species reliant on these landscape features.

2.2 Field survey methods

Field surveys were conducted across the length of the Revision 5 construction footprint (where access to parcels was available). In addition to the need for on-ground native vegetation mapping and habitat assessment, the scope of the field surveys was determined by the listed flora, fauna and ecological communities identified in the desktop assessment as most likely to occur within the construction footprint (Biosis 2019).

The sub-sections below document the survey methods employed for each field assessment with regard to relevant Commonwealth and State guidelines. Further information on field survey timing and conditions is available in Appendix 5.

In the interests of preserving landholder anonymity all parcels in this report are referred to by their unique parcel identifier.

All field survey phases included suitable areas that occurred within the approved MSA areas as a risk mitigation measure in the event that APA were advised by DAWE that it could not rely on the approval decision made under Part 10 of the EPBC Act for those parts of the Project within the approved MSA areas.

2.2.1 Flora

Targeted surveys were conducted for the 29 EPBC Act, FFG Act and / or DELWP Advisory listed species identified in Table 4 of the desktop assessment as most likely to occur in the construction footprint (Biosis 2019). Due to the broad range of flowering times of the target species, the threatened flora surveys were broken into three phases: winter (June – August) for Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens*, spring (September – October), late spring / summer (November - February). Listed species that could be detected in any season due to their perennial life history or obvious field traits were also surveyed for.

2.2.1.1 Spiny Rice-flower targeted surveys

Surveys for Spiny Rice-flower (SRF) were conducted west of Deep Creek in areas of uncultivated grassland. The species has not been recorded east of Jacksons Creek however much of the area between Jacksons Creek and Deep Creek has not been extensively surveyed, therefore a precautionary approach was proposed in setting the eastern limit. The construction footprint from KP 0 to KP18 (Deep Creek) encompasses 44 parcels, all of which were determined to require survey for SRF (Figure 4).

Survey guidelines for SRF state that transect surveys should be undertaken from April to August, when the plant is in flower, in any location containing suitable habitat for the species (DEWHA 2009a). In the absence of recommended transect spacing in the DEWHA (2009) survey guidelines for SRF, the default transect spacing for the surveys was 5 metres. This is the minimum spacing recommended in the *Survey guidelines for Australia's threatened orchids* (DoEE 2013) and was adjusted as required based on vegetation density and survey timing.

The timing and survey results for the SRF surveys are provided in Table A5.2 in Appendix 5. Targeted surveys of 18 parcels were undertaken on 24 July 2019, during the flowering period of the species. The surveys involved trained botanists walking transects spaced approximately 5 metres apart.

Access to 24 parcels was not available during April to August 2019. Where surveys were unable to be conducted during the flowering season, an adjusted survey effort of 2.5 metre spaced transects was used to compensate for the decreased likelihood of detecting the species outside of the flowering period. This adjusted method was adopted for SRF surveys from 9 September 2019 through to 14 February 2020.

Two parcels (1TP829278 & 1LP200366) remain unsurveyed due to access restrictions.

2.2.1.2 Spring targeted flora surveys

The spring targeted flora surveys focussed on the following four species:

- Large-headed Fireweed *Senecio macrocarpus*
- Small Golden Moths *Diuris basaltica*
- Swamp Diuris *Diuris palustris*
- Purple Diuris *Diuris punctata*

Surveys were carried out in accordance with *Survey guidelines for Australia's threatened orchids* (DoEE 2013). Surveys were conducted throughout the first three weeks of October 2019 to coincide with the flowering times of the four target species (Backhouse & Lester 2010, Jeanes 2015, Jeanes & Stajsic 2018, Sinclair 2010). A local reference site known to contain Small Golden Moths was checked on 23 September 2019 and 6 October 2019 to confirm that the species was flowering (the species was flowering during both reference site visits).

Surveys were undertaken in all areas of suitable habitat across the construction footprint involving three trained botanists walking parallel transects spaced at the minimum recommended separation distance (5

metres apart) (DoEE 2013). This allowed the majority of the construction footprint (30 metres wide) to be covered in two passes.

The timing and survey results of the spring targeted flora surveys are provided in Table A5.3 in Appendix 5. In total 65 of 71 parcels identified as containing suitable habitat for the target species in the desktop report were surveyed between 30 September 2019 and 22 October 2019. The remaining 54 parcels within the construction footprint were ruled out for survey based on the absence of sufficiently high quality grassland / woodland / wetland (Figure 5). The parcels, which contained suitable habitat, but were not surveyed due to access restrictions are:

- 1TP829278
- 11LP215406
- 11LP92520
- 1LP200366
- 1TP212870
- 1LP221466.

2.2.1.3 Late spring / summer targeted flora surveys

The late spring / summer phase of the targeted flora surveys encompassed the following 21 species:

- Plump Swamp Wallaby-grass *Amphibromus pithogastrus*
- Small Milkwort *Comesperma polygaloides*
- Small Scurf-pea *Cullen parvum*
- Tough Scurf-pea *Cullen tenax*
- Matted Flax-lily *Dianella amoena*
- Narrow Goodenia *Goodenia macbarronii*
- Adamson's Blown-grass *Lachnagrostis adamsonii*
- Button Wrinklewort *Ruitdosis leptorhynchoides*
- Clover Glycine *Glycine latrobeana*
- Curly Sedge *Carex tasmanica*
- River Swamp Wallaby-grass *Amphibromus fluitans*
- Basalt Peppercress *Lepidium hyssopifolium*
- Large-flower Crane's-bill *Geranium* sp. 1
- Cut-leaf Burr-daisy *Calotis anthemoides*
- Plump Windmill Grass *Chloris ventricosa*
- Flax-lily *Dianella longifolia* var. *grandis*
- Flat Spike-sedge *Eleocharis plana*
- Pale Swamp Everlasting *Coronidium gunnianum*
- Austral Crane's bill *Geranium solanderi* var. *solanderi* s.s.
- Plains Yam-daisy *Microseris scapigera* s.s.

- Basalt Podolepis *Podolepis linearifolia*

Surveys were carried out in accordance with DoEE (2013) *Survey guidelines for Australia's threatened orchids*. These guidelines are considered best practice for threatened flora surveys in the absence of species-specific survey guidelines. All 21 target species are known to flower during November and December (DoEE 2019a, DoEE 2019b, DoEE 2019c, Murphy 2010, Foreman & Walsh 1993, Walsh & Entwisle 1994, Walsh & Entwisle 1996, Walsh & Entwisle 1999).

Surveys were undertaken in all areas of suitable habitat (Figure 6). Surveys involved three trained botanists walking parallel transects spaced at the minimum recommended separation distance (5 metres apart) (DoEE 2013). This allowed the majority of the construction footprint (30 metres wide) to be covered in two passes.

The timing and survey results for the late spring / summer targeted flora surveys are provided in Table A5.4 in Appendix 5. In total 100 of 124 parcels identified as containing suitable habitat were surveyed between 18 November 2019 and 19 December 2019. A further 17 parcels were surveyed from 9 January 2020 to 14 February 2020. An adjusted survey effort of 2.5 metre spaced transects was used to compensate for the decreased likelihood of detecting the species outside of their flowering period. The seven parcels with suitable habitat that remain unsurveyed are:

- 1TP829278
- 11LP215406
- 11LP92520
- 1LP200366
- 1TP212870
- 6LP136262
- 9LP136262.

One parcel (6LP92520), a vehicle wrecking yard, was determined during Spiny Rice-flower surveys not to have suitable habitat for any of the late spring / summer target species.

2.2.1.4 Year-round species (non-seasonal dependent species)

The following species are trees and readily detected/identified at any time of the year:

- Melbourne Yellow-gum *Eucalyptus leucoxylon* subsp*. connata*
- Studley Park Gum *Eucalyptus* X *studleyensis*
- Buloke *Allocasuarina luehmannii.*

While no targeted surveys were required for these species, they were included in all field flora assessments within the construction footprint, primarily the vegetation assessment surveys.

2.2.1.5 Vegetation quality assessment

On-ground assessments were conducted from 18 September 2019 to 14 February 2020 to map native vegetation extent and habitat values, including the extent and condition of threatened grassland, woodland and wetland ecological communities (see Table A5.1). Native vegetation condition was assessed using Victoria's Vegetation Quality Assessment (VQA) method by an accredited VQA assessor in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (the Guidelines) (DELWP 2017a).

Patches of native vegetation were compared against diagnostics for State (FFG Act) and Commonwealth (EPBC Act) listed threatened ecological communities. The vegetation assessment was also the basis for determining the presence of FFG Act protected flora within the construction footprint.

Of the 125 parcels within the construction footprint, 119 were surveyed under the vegetation assessment (Figure 7). The six parcels that remain unsurveyed are:

- 1TP829278
- 11LP215406
- 1LP200366
- 1TP212870
- 6LP136262
- 9LP136262.

Where field surveys were not undertaken for a parcel as detailed in Section 2.2 below, native vegetation extent within the construction footprint was assumed to be present in vegetated areas of these parcels within the construction footprint. For any PNV the DELWP Native Vegetation Regulation Condition (2017) – 75 metre resolution dataset has been used to assign a default condition score.

A potential occurrence of the EPBC Act listed ecological community Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (SHWTLP) identified during the VQA assessment was re-surveyed by a Biosis ecologist on 26 March 2020. The targeted survey encompassed the locally low-lying area around KP 18 across the following three parcels:

- 1TP107502
- 2LP130112
- 1LP130112

2.2.2 Fauna

Targeted surveys focussed on determining the presence of cryptic, resident species typically with relatively small and discrete home ranges in areas of suitable habitat within the construction footprint. Species that are only seasonally present, wide-ranging and highly mobile are generally unlikely to be significantly impacted by the Project, and targeted surveys for such species were considered unlikely to add any value as the absence of records does not necessarily mean that these species will not visit habitat within the construction footprint.

Target species surveyed for were:

- Striped Legless Lizard *Delma impar*
- Golden Sun Moth *Synemon plana*
- Growling Grass Frog *Litoria raniformis*.

Threatened species where no targeted survey was required however may be detected during field assessment campaign / vegetation assessment sufficient to assess habitat included:

- Swift Parrot *Lathamus discolor*
- Grey-headed Flying-fox *Pteropus poliocephalus*
- Eastern Great Egret *Ardea alba modesta*
- Little Egret *Egretta garzetta*

- Freckled Duck *Stictonetta naevosa*
- Blue-billed Duck *Oxyura australis*
- Latham's Snipe *Gallinago hardwickii*
- Brown Toadlet *Pseudophryne bibronii*
- Intermediate Egret *Ardea intermedia*
- Red-chested Button-quail *Turnix pyrrhothorax*
- Lewin's Rail *Lewinia pectoralis*
- Baillon's Crake *Porzana pusilla*
- Black Falcon *Falco subniger*
- Common Bent-wing Bat (eastern ssp.) *Miniopterus schreibersii oceanensis*
- Australasian Shoveler *Spatula rhynchotis*
- Hardhead *Aythya australis*
- Musk Duck *Biziura lobate*
- White-throated Needletail *Hirundapus caudacutus*
- Tussock Skink *Pseudemoia pagenstecheri*.

The Project is considered unlikely to pose a significant risk to protected aquatic biota provided appropriate sediment management and site remediation measures are implemented. These species are:

- Murray Cod *Maccullochella peelii*
- Australian Grayling *Prototroctes maraena*.

With the exception of Latham's Snipe, Migratory species listed under the EPBC Act are unlikely to make significant use of or have significant habitat within the construction footprint. Latham's Snipe may occur in seasonal wetlands supporting tussock-grasses and rushes as well as vegetated farm dams. Important habitat for Latham's Snipe is described as areas that have previously been identified as internationally important for the species, or areas that support at least 18 individuals of the species. No internationally important areas of habitat occur within the construction footprint and the likelihood of 18 individuals being recorded from seasonal wetlands or farm dams within the construction footprint is considered low due to the limited size of these habitat types within the construction footprint (Biosis 2019).

Further details on the basis for targeted surveys are provided in the *Western Outer Ring Main (WORM): Desktop biodiversity assessment* (Biosis 2019).

2.2.2.1 Striped Legless Lizard

The Striped Legless Lizard (SLL) is listed as Vulnerable under the EPBC Act. Based on current research and known records, this species inhabits native and exotic grassland dominated by tussock grasses with high biomass, surface rocks or invertebrate burrows (Commonwealth of Australia 2011, TSSC 2016).

The Striped Legless Lizard survey employed the artificial shelter (tile surveys) technique, as this is widely recognised as the most effective technique to survey for the species, and is therefore generally expected by DELWP and DAWE (Commonwealth of Australia 2011).

Twenty tile arrays were deployed in early August, which allowed the tiles to 'bed down' for a month and for animals to become accustomed to using them for shelter. The parcels containing SLL grids are itemised in Table A5.5 (Appendix 5) and mapped in Figure 8.

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The linear nature of the Project spanning multiple land parcels precluded the strict application of the SLL survey guidelines recommended by the Commonwealth of Australia (2011). The guidelines' definition of a 'site' refers to a discrete area of land that has been subject to the same land-use history. The guidelines for SLL is therefore difficult to apply to large linear infrastructure projects because they invariably cross numerous landholdings, each supporting habitat of varying quality and extent.

The guidelines require 10 tile arrays for 'sites' greater than 30 hectares in size, however if the entire construction footprint was treated as a 'site', ten tile arrays would be an inadequate survey effort for the approximately 170 hectare impact area. Conversely, if each land parcel supporting potential habitat was treated as a 'site' in accordance with the survey guidelines, an unmanageable (and unjustifiable) number of tile grids would need to be deployed.

The construction footprint traverses some areas of vegetation (habitat) considered to have a high likelihood of supporting SLL populations through to areas with a low likelihood of supporting the species. The sampling approach used was designed to maximise the probability of detection of the species by preferentially targeting higher quality habitat while ensuring sampling sites spanned the longitudinal extent of the construction footprint. As such, sampling (using tile grids) focused on areas of native grassland and to a lesser extent exotic grassland that contained appropriate habitat structure (tussock grasses, embedded and surface rock). Habitat considered unlikely to support the species included land subject to historic and/or ongoing significant ground disturbance such as cropping and ploughing. No sampling was undertaken in these areas.

In addition to evaluation of habitat suitability, geographic proximity to other populations of SLL is a useful indicator of the likely occurrence of the species. Hence, consideration of previous records of the species formed an important component of the assessment. The spatial distribution of SLL in the Melbourne region is clustered, with records concentrated in Melbourne's west but few records from Melbourne's north. Based on current knowledge of the distribution of SLL in Melbourne's west and north, the construction footprint was divided into three sampling sections. A habitat assessment was undertaken to determine the location and number of tile arrays to be deployed in each of these sections.

We consider that the survey effort and approach were appropriately tailored to the linear nature of the Project based on logic, pre-existing information and ecological survey principles.

The resulting rationale and survey effort in each of these sections was as follows:

- The western section (west of Calder Freeway; KP0 to KP9) is the section of the construction footprint considered most likely to support SLL, as it is closest to the majority of recent SLL records. This section of the construction footprint was subject to the highest level of survey effort. The majority of apparently suitable habitat patches were sampled within this section. Five tile arrays were placed within this section.
- The north-western section (east of Calder Freeway and west of Hume Freeway; KP9 to KP37) is the section of construction footprint which held the greatest uncertainty in regards to the potential for SLL to be present. There were no SLL records through this section, however, only a limited number of surveys have been undertaken in this area. A moderate level of survey effort was undertaken in this section to account for uncertainty, and survey effort was stratified to represent the variety of suitable habitat present (i.e. a range of vegetation patch sizes and grassland types was sampled). Ten tile arrays were placed within this section.
- The northern section (east of Hume Freeway; KP37 to KP51) is the section of construction footprint considered least likely to support SLL, as a recent review by DELWP concluded that SLL are unlikely to occur in this area, based on previous survey results. Survey effort was therefore reduced through this section, which focused on the better quality areas of potential habitat based on grassland structure,

land use history, proximity to historical SLL records, patch size and level of fragmentation. Five tile arrays were placed within this section.

The highest quality habitat patches in which to place the tiles were identified from aerial photo interpretation and verified by on-ground survey by a senior zoologist with extensive experience in SLL survey. Subsequent detailed flora investigations confirmed that the tile arrays were located within or adjacent to the highest quality SLL habitat patches occurring within the construction footprint.

Each tile grid consisted of 50 roof tiles spaced approximately 5 metres apart. Tiles were typically arranged in a rectangular grid of ten tiles by five, however it was also appropriate to adjust this to suit the impact area (e.g. one transect of 50 tiles, or two transects of 25 tiles for linear impact areas). Tile arrays were positioned on a northerly aspect where possible (Commonwealth of Australia 2011).

All tile grids (except grids 16, 17 and 18 on B7PP2258) were checked once per week between September and November (5/6 September 2019 to 27/29 November 2019), and fortnightly in December (5/6 and 19 December 2019) culminating in a total of 15 checks per grid.

Grids 16, 17 & 18 were checked ten times due to land access issues.

Further details on the survey dates for each tile grid check are provided in Table A5.5 (Appendix 5). In accordance with survey guidelines shelter sites were not checked once ambient temperatures exceeded 28 degrees Celsius (Commonwealth of Australia 2011).

Striped legless lizards were recorded in two of the 20 grids deployed across the construction footprint. The two grids were Grids 6 and 7 on 12LP92520 (Table A5.5).

The number of SLL individuals recorded from the survey effort was determined using photo analysis of head-scale pattern, which is unique to each individual lizard. Interpretation of head scales identified six unique individuals across Grids 6 and 7.

2.2.2.2 Golden Sun Moth

The Golden Sun Moth (GSM) is listed as Critically Endangered under the EPBC Act. Based on current research and known records, this species inhabits native grasslands or grassy woodlands containing native wallaby grasses *Rytidosperma* spp., spear grasses *Austrostipa* spp., and Red-leg Grass *Bothriochloa macra*, as well as exotic grasslands dominated by introduced tussock-forming species such as Chilean Needle-grass *Nassella nessiana* (DEWHA 2009b).

Surveys for GSM must be completed during the flight season for this species, and must comply with minimum survey guidelines outlined in the *Significant impact guidelines for the critically endangered Golden Sun Moth (*Synemon plana*) Nationally threatened species and ecological communities EPBC Act policy statement 3.12* (DEWHA 2009b).

To meet Commonwealth current requirements for indicating presence or absence of GSM within affected land parcels and to quantify 'stocking rates' for EPBC offset calculations, four targeted surveys were undertaken in accordance with the national survey guidelines (DEWHA 2009b).

Biosis undertook Golden Sun Moth surveys in accordance with the minimum survey guidelines, as outlined below:

- Surveys were undertaken from 18 November 2019 to 23 December 2019, which was within the typical GSM flight season of November to early January. Surveys did not commence until GSM were confirmed to be flying in the Melbourne area (18 November 2019).

- Each land parcel that had been identified as supporting potential habitat was surveyed up to four times, and each survey conducted at approximately weekly intervals during the flight season. Access restrictions limited the number of surveys on some sites that contain suitable habitat.
- Each survey was undertaken by an ecologist walking in a straight line transect through the 30 metre construction footprint. Where the construction footprint extended beyond 50 metres in width parallel transects spaced 50 metres apart were walked.
- Valid survey days met criteria for suitable weather conditions to detect the species. The survey guidelines define suitable conditions as days where temperatures exceed 20 degrees Celsius by 10 am; low wind speed and cloud cover; at least two days since rain; and surveys were undertaken during the warmest part of the day (i.e. 10 am to 3 pm). Sightings of GSM within the construction footprint, from nearby GSM surveys and / or reference site checks were used to confirm that the species was flying and therefore readily detectable (Table A5.7).
    - One GSM survey day (14 December 2019) was considered invalid due to no sightings of GSM within the construction footprint or at a local reference site and unsuitable weather conditions.
- The location of any GSM observed were recorded using hand-held GPS-enabled tablets and tracks were recorded via a hand-held GPS unit.

The timing and conditions for all GSM surveys are provided in Table A5.6 and Table A5.7 respectively (Appendix 5). Surveys were conducted across 105 parcels identified as containing suitable habitat for GSM. Four targeted surveys were completed in accordance with the minimum survey guidelines in 69 of these 105 parcels. 28 parcels received between one and three surveys with eight parcels completely unsurveyed primarily due to access restrictions and weather constraints.

20 parcels were considered to have unsuitable habitat as a result of being recently cropped or lacking native and / or exotic tussock-forming grasses.

2.2.2.3 Growling Grass Frog

The construction footprint contains suitable wetland habitat for Growling Grass Frog (GGF) in the form of creeks, farm dams and other off-stream waterbodies within and adjacent to the proposed alignment (Pyke & White 1996). The species is also likely to utilise terrestrial habitat adjacent to occupied wetlands for foraging, dispersal and over-wintering (DEWHA 2009c). The species has been previously recorded from the three major streams (Jacksons, Deep and Merri Creeks) bisected by the construction footprint. Previous studies of GGF in the region have found the probability of occupancy of waterbodies to be positively associated with wetland hydroperiod, aquatic vegetation cover and proximity (connectivity) to other GGF populations (Heard & Scroggie 2009). This means that permanent waterbodies supporting a high cover of aquatic vegetation close to existing populations of GGF are more likely to occupied by the species, while isolated, ephemeral or intermittent waterbodies with little or no aquatic vegetation are much less likely to be occupied (Heard, Scroggie, & Clemann 2010).

Potential GGF waterbodies within 100 metres of the boundaries of the construction footprint were identified through aerial photo interpretation and ground truthing. Waterbodies both within and outside the approved MSA area were assessed. Waterbodies greater than 100 metres from the alignment were considered unlikely to be directly affected by the Project and were not inspected. A daytime habitat assessment was made of each waterbody to determine whether, at the time of inspection, the waterbody displayed habitat attributes favoured by the species.

Targeted survey was flagged for waterbodies that contained water at the time of the diurnal inspection and supported at least some emergent, submergent or floating aquatic vegetation. Farm dams that were heavily pugged and fouled through unrestricted stock access generally had no aquatic vegetation and were considered to represent poor quality habitat for the species. Waterbodies with potential to support the species were surveyed after dark in accordance with the methods described in Heard, Robertson & Scroggie (2006) and the DEWHA (2009c), as outlined below:

- Surveys were carried out between 17 December 2019 and 17 February 2020, which is within the recommended survey period of November to March.
- Each waterbody and stream crossing was subject to two (2) surveys. The exception being 10LP5364 where GGF were detected during the first survey.
- Surveys were undertaken at night under conditions thought to be suitable for GGF Activity; night time temperatures above 12 degrees Celsius with little or no wind.
- Each waterbody was surveyed for 60 person-minutes and followed the general procedures for visual encounter surveys for amphibians (Crump & Scott 1994). Surveys commenced with a quiet observation from the waterline for a period of 10 minutes, listening for calling males. Call playback was also used to elicit a response from males that might be present in a waterbody but not calling spontaneously.
- The circumference of each off-stream waterbody was systematically searched for active GGF with the aid of headlamps. All habitat was searched including submerged and floating vegetation, bankside vegetation, rocks and logs within and on the margin of the waterbody and areas of bare ground around the margin of the waterbody. Active searching included lifting rocks and other potential refugia within 20 metres of the margin of the waterbody to locate inactive individuals.

Data recorded during each night time survey included:

- Site location.
- Date of survey and survey number (1 or 2).
- Start and finish time.
- Personnel involved.
- Weather conditions (air temperature and wind strength).
- Detection or non-detection of GGF during call survey.
- Detection or non-detection of GGF during visual encounter searching.

WORM alignment crossing points at Jacksons, Deep and Merri Creeks were not subject to survey as GGF is known to occur within these streams and in the case of Merri Creek, the crossing is within a GGF Conservation Area established under the BCS.

Details of all GGF surveys are provided in Table A5.8 in Appendix 5. Twenty-six waterbodies consisting of three (3) streams (Tame Street Drain, Kalkallo Creek and an adjacent unnamed channel) and 23 dams were surveyed during the day for potential habitat. Day time access to one dam at 2LP130112 was unavailable. Of the eight waterbodies recommended for targeted night time surveys, seven were surveyed. Night time access

to the parcel 2LP113763 which contains the eighth waterbody was not possible, however this parcel lies within the approved MSA area.

2.3 Limitations

Key limitations of the field assessments undertaken are detailed below:

- Flora, vegetation and GSM surveys on some parcels were not fully completed due to land access issues and / or survey windows closing. This was due primarily to access restrictions and, particularly for GSM, weather constraints.
- Some surveys for Spiny Rice-flower and late spring / summer targeted flora were not carried out during the ideal survey window to maximise detectability of the target species. Adjusted survey efforts to account for this were implemented in accordance with survey guidelines.
- Many of the waterbodies within 100 metres of the WORM alignment identified as potential GGF habitat were dry at the time of inspection and hence were not subject to targeted survey. The assessment coincided with an extended period of below average rainfall in the Melbourne region and this may have resulted in some of the waterbodies being dry or drying during the spring and summer of 2019/20 when in years of 'average' or above-average rainfall they might hold water throughout spring and summer.
- Database searches and associated conclusions are reliant upon external data sources and information managed by third parties.
- Mapping of native vegetation, habitat and ecological communities was conducted based on APA supplied digital mapping files for the construction footprint and KPs.

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3. Results

This section presents the results of the field assessments in the context of the Revision 5 construction footprint (Figure 3). Biodiversity values observed both within approved MSA areas and outside of the approved MSA areas are discussed.

3.1 Native vegetation and habitat

The construction footprint supports native and non-native vegetation including remnant and adventive native vegetation, planted native vegetation and introduced non-native vegetation.

The majority of the construction footprint has experienced some level of disturbance due to farming (predominantly cropping and grazing) and urban development. Despite this history of disturbance, surveys in recent decades have shown that areas of native vegetation persist within the agricultural and peri-urban landscape. Areas currently used for grazing, areas along roadsides, and long-uncultivated grasslands can still meet the definition of a patch of native vegetation. Areas that do not satisfy native vegetation patch criteria can still have scattered native trees. Although the habitat is often degraded and fragmented, threatened plants and animals can and do persist in the landscape. These features are described further below.

3.1.1 Habitat values

Habitat values within the construction footprint comprise of extensive areas of native and exotic grassland, small areas of woodland and scattered trees (both native and exotic), some of which are hollow-bearing and which provide a foraging resource and nesting and roosting habitat for fauna, dams and waterways, areas of embedded rock and rocky outcrops and cracking clay soils.

3.1.2 Ecological Vegetation Classes

Field assessments of native vegetation identified six EVCs within the construction footprint. As the construction footprint traverses two bioregions, the Victorian Volcanic Plain (VVP) and the Central Victorian Uplands (CVU), the six EVCs can be further divided into eight bioregional EVCs (BioEVCs). Bioregional EVCs are a combination of EVCs across different bioregions. These BioEVCs are listed in Table 2 with the relevant Bioregional Conservation Status (BCS).

Conservation status indicates the level of depletion of a particular EVC across a bioregion. Endangered EVCs are vegetation types that have been widely cleared and are now restricted to less than 10% of the pre-European settlement extent. Vulnerable EVCs are vegetation types where 10% to 30% of the pre-European settlement extent remains across a bioregion.

Table 2 Summary of BioEVCs mapped within the construction footprint

Ecological Vegetation Class	EVC Number	Bioregional Conservation Status
Central Victorian Uplands (CVU)		
Plains Grassland	EVC 132	Endangered
Riparian Woodland	EVC 641	Endangered
Victorian Volcanic Plains (VVP)		
Plains Grassy Woodland	EVC 55	Endangered
Plains Grassy Wetland	EVC 125	Endangered
Plains Grassland	EVC 132	Endangered

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Ecological Vegetation Class	EVC Number	Bioregional Conservation Status
Riparian Woodland	EVC 641	Endangered
Stony Knoll Shrubland	EVC 649	Endangered
Aquatic Herbland	EVC 653	Endangered

3.1.3 Native vegetation extent

The assessment of native vegetation within the construction footprint combines data from DELWP's Native Vegetation Time Stamping Dataset for areas within the MSA (KP 0 – 3.2 & KP 28.8 – 51.2) and Biosis field assessment data across the entire construction footprint. A summary of native vegetation mapped within the construction footprint via on-ground assessment along with DELWP timestamped native vegetation data for approved MSA areas is presented in Table 3. All EVCs mapped within the alignment have a BCS of Endangered.

3.1.3.1 Native Vegetation Time Stamping Dataset

DELWP's Native Vegetation Time Stamping Dataset forms part of the approvals issued under Part 10 of the EPBC Act. This dataset is used to calculate impacts to native vegetation from the Project within areas approved under the MSA (KP 0 – 3.2 and KP 28.8 – 51.2).

3.1.3.2 Field survey native vegetation mapping

The vegetation field assessment mapped patches of native vegetation across the Revision 5 construction footprint (both within and outside of the approved MSA areas). Mapped patches of native vegetation both within and outside of the approved MSA areas are considered below to inform the environmental impact assessment process. An assessment of native vegetation under the Guidelines is only required for patches of native vegetation outside of the MSA (KP 3.2 – 28.8). Consequently, only mapped patches of native vegetation outside of the approved MSA areas were used to generate the native vegetation removal (NVR) report (Appendix 6).

Within the Victorian Volcanic Plain bioregion Plains Grassland and can be split into two sub-EVCs (*Low-rainfall* or *Heavier-soils*) based on average annual rainfall. All patches of VVP Plains Grassland were mapped as *Heavier-soils* Plains Grassland (EVC 132_61) in line with DELWP's Native Vegetation Time Stamping Dataset for areas adjacent to the construction footprint. All patches of Plains Grassy Woodland in the VVP bioregion were mapped as EVC 55_61.

A patch of Plains Grassy Wetland (EVC 125) was mapped on parcel 2LP130112. As this patch was dry at the time of assessment the DELWP modelled condition score was used to estimate the condition of this patch as per the Guidelines (DELWP 2017a).

Native vegetation mapping was not completed on six parcels:

- 1TP829278
- 10LP215406
- 1LP200366
- 1TP212870
- 6LP136262
- 9LP136262.

To account for this uncertainty, a scenario was run assuming native vegetation is present in vegetated areas of these parcels which are also covered by the construction footprint. Ecological Vegetation Classes for these

areas were assigned based on Pre-1750 EVC mapping. Condition scores were assigned based on the highest the DELWP modelled condition score that overlapped with the construction footprint at each parcel. The results under this scenario are presented in brackets in Table 3.

A total of 16.3 hectares of native vegetation was mapped within the construction footprint. Most of this native vegetation (12.69 hectares) occurs outside of the approved MSA areas. Under the scenario assuming native vegetation on unsurveyed parcels a total of 23.3 hectares of native vegetation could be present within the construction footprint with 18.8 hectares of this occurring outside the approved MSA areas.

Table 3 Summary of DELWP MSA timestamped native vegetation and Biosis field assessment native vegetation mapped within the construction footprint

Ecological Vegetation Class	MSA Timestamped Data (ha)	Biosis Field Assessment Data (ha)*
Approved MSA areas (approved under Part 10 of the EPBC Act)		
(VVP_0055) Plains Grassy Woodland	6.14	0.11 (1.02)
(VVP_0125) Plains Grassy Wetland	0.17	-
(VVP_0132) Plains Grassland	2.10	3.17
(VVP_0641) Riparian Woodland	0.06	0.10
(VVP_0649) Stony Knoll Shrubland	1.43	0.21
(VVP_0654) Creekline Tussock Grassland	0.08	-
Sub-total	**9.98**	**3.60** **(4.51)**
Areas outside the MSA approvals		
(VVP_0055) Plains Grassy Woodland	-	2.85 (6.91)
(VVP_0125) Plains Grassy Wetland	-	0.26
(CVU_0132) Plains Grassland		0.46
(VVP_0132) Plains Grassland	-	8.92 (10.96)
(CVU_0641) Riparian Woodland		0.07
(VVP_0641) Riparian Woodland	-	0.07
(VVP_0653) Aquatic Herbland	-	0.06
Sub-total	-	**12.69** **(18.79)**
Total	-	**16.29** **(23.30)**

* values in parenthesis include assumed native vegetation in the six unsurveyed parcels

3.1.4 Native vegetation condition

Native vegetation condition is represented by the condition score which ranges from 0 to 1. The condition score of native vegetation is a measure of how close native vegetation is to its mature, natural state, as represented by benchmarks for the relevant EVC. A higher score indicates higher quality vegetation (DELWP 2017a). Condition scores for all patches of native vegetation both within and outside of the approved MSA areas are presented in Appendix 5 (Table 5A.1). Condition scores were used to inform the impact assessment for the Project including offset requirements. Condition scores for patches inside the approved MSA areas ranged from 0.17 to 0.42 (to 0.63 including DELWP modelled condition score). Native vegetation patches outside of the approved MSA areas ranged in condition from 0.18 to 0.53 (to 0.80 including DELWP modelled condition score).

For areas inside the MSA approvals, DELWP's Native Vegetation Time Stamped Dataset contains condition scores for native vegetation. Within the construction footprint these scores ranged from 0.11 to 0.60.

Three parcels were identified to contain patches of Plains Grassland with significantly higher biodiversity values than other native vegetation patches mapped within the construction footprint. This was primarily due to flora species diversity, fauna habitat value and lack of disturbance. This value is not always reflected in the VQA score due to factors such as lack of biomass control (which leads to a poor recruitment score). These parcels are identified in Table 4 below.

Riparian Woodland (EVC 641) was mapped at each of the three major stream crossings (Deep, Jacksons and Merri Creeks). Condition scores for these three patches ranged from 0.42 to 0.53 ranking them amongst the highest quality patches within the construction footprint. Large trees, which provide important habitat value, were also recorded in all three Riparian Woodland patches.

Table 4 Parcels / habitat zones with high biodiversity value

Parcel identifier	Habitat zone	VQA score
12LP92520	191119-2	48
13LP92520	191119-3	32
2LP119116	191118-5	23

3.1.5 Wetlands

The EPBC Protected Matters Search Tool identified one Ramsar site, the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site, as being within proximity (10-20 kilometres downstream) of the construction footprint. The construction footprint does not traverse any wetlands of international importance, and there are no records of any nationally significant wetlands. Given the distance of the construction footprint from any Ramsar wetland, the proposed action is highly unlikely to impact the ecological character of any Ramsar wetland.

DELWP's Current Wetland layer shows four mapped wetlands occur within the construction footprint:

- KP 41 – part of a single mapped wetland, within the approved MSA area.
- KP 44-45 – three small wetlands two of which are partially impacted by the construction footprint, within the approved MSA area.

Under the native vegetation regulations, mapped current wetlands are considered patches of native vegetation. The condition of the mapped wetlands could not be accurately assessed due to lack of rainfall. These wetlands are incorporated into the assessment of native vegetation removal using the modelled

condition score as per the Guidelines (DELWP 2017a). Much of the proposed area of impact to these wetlands from the Project is within the existing Victorian Northern Interconnect (VNI) pipeline easement, which has been subject to past disturbance under previous approvals. The construction footprint follows the VNI pipeline easement at this location (a 20 metre wide corridor previously cleared for construction of the VNI) and an additional 5 meters adjacent to the existing easement required to maintain a safe working distance to the existing pipeline while allowing construction of the WORM.

3.1.6 Native Trees

Native canopy trees were recorded within the construction footprint as both scattered trees and as trees within patches (Figure 7). Under the native vegetation regulations native canopy trees are classified as small or large depending on whether they meet the relevant EVC Benchmark diameter at breast height (DBH). EVC Benchmarks are available from https://www.environment.vic.gov.au/biodiversity/bioregions-and-evc-benchmarks.

Native canopy trees ranged in size from large old hollow-bearing specimens, which provide important local habitat, to small trees in areas of dense regrowth. Planted native and indigenous trees and shrubs also occur along roadsides and stream banks in the construction footprint.

Within the approved MSA areas all native canopy trees have been mapped and are included in the DELWP Environment Mitigation Dataset.

Large native canopy trees within patches of native vegetation and all scattered trees within and adjacent to the construction footprint were mapped. Impacts to native canopy trees can be either via direct loss or indirect loss, i.e. through encroachment into the tree protection zone (DELWP 2018).

A total of 21 scattered trees (12 large and nine small) and 15 large canopy trees will be impacted. Eleven of the 15 large canopy trees and ten of the 21 scattered trees (seven large and three small) occur outside of the approved MSA areas Table 5. Scattered trees and large canopy trees within patches impacted by the Project are summarised in Table 6 and Table 7 respectively. Tree loss is assessed either as direct loss or indirectly due to encroachment into a tree's Tree Protection Zone (TPZ). According to DELWP (2018) a tree is deemed indirectly lost if encroachment into the TPZ area is greater than 10 per cent.

Table 5 Summary of native canopy trees impacted by the construction footprint

Category	Inside approved MSA areas	Outside approved MSA areas	TOTAL
Large canopy tree	4	11	**15**
Scattered tree (large)	5	7	**12**
Scattered tree (small)	6	3	**9**
TOTAL	**15**	**21**	**36**

A standard condition score (0.2) and extent was assigned to all scattered trees impacted by the construction footprint outside of the MSA approved areas as per the Guidelines (DELWP 2017a). These data are presented in Table 8 with the total habitat hectare (Hha) loss from scattered trees outside the approved MSA areas being 0.117 Hha.

Table 6 Large canopy trees within patches impacted by the construction footprint

Scientific name	Common name	DBH (cm)	EVC	Inside approved MSA areas (Y/N)	Loss category
Eucalyptus camaldulensis	River Red Gum	121	VVP_0055_61	N	TPZ
Eucalyptus camaldulensis	River Red Gum	120	VVP_0055_61	N	TPZ
Eucalyptus camaldulensis	River Red Gum	90	VVP_0055_61	N	TPZ
Eucalyptus camaldulensis	River Red Gum	85	VVP_0055_61	Y	Direct
Eucalyptus camaldulensis	River Red Gum	85	VVP_0641	N	Direct
Eucalyptus camaldulensis	River Red Gum	125	VVP_0641	N	TPZ
Eucalyptus camaldulensis	River Red Gum	125	VVP_0641	N	Direct
Eucalyptus microcarpa	Grey Box	87	VVP_0055_61	N	Direct
Eucalyptus microcarpa	Grey Box	96	VVP_0055_61	N	TPZ
Eucalyptus camaldulensis	River Red Gum	137	CVU_0641	N	TPZ
Eucalyptus camaldulensis	River Red Gum	93	CVU_0641	N	TPZ
Eucalyptus camaldulensis	River Red Gum	120	VVP_0055_61	N	Direct
Eucalyptus camaldulensis	River Red Gum	95	VVP_0641	Y	Direct
Eucalyptus camaldulensis	River Red Gum	110	VVP_0641	Y	Direct
Eucalyptus camaldulensis	River Red Gum	113	VVP_0641	Y	TPZ

Table 7 Scattered trees impacted by the construction footprint

Scientific name	Common name	DBH (cm)	Size class	Inside approved MSA areas (Y/N)	Loss category
Eucalyptus microcarpa	Grey Box	103	Large	N	Direct
Eucalyptus microcarpa	Grey Box	5	Small	N	Direct
Eucalyptus camaldulensis	River Red Gum	75	Small	N	Direct
Eucalyptus microcarpa	Grey Box	100	Large	N	Direct
Eucalyptus camaldulensis	River Red Gum	98	Large	Y	Direct
Eucalyptus camaldulensis	River Red Gum	118	Large	N	Direct
Eucalyptus melliodora	Yellow Box	65	Small	N	Direct
Eucalyptus camaldulensis	River Red Gum	141	Large	N	TPZ
Eucalyptus camaldulensis	River Red Gum	10	Small	Y	Direct
Eucalyptus viminalis	Manna Gum	122	Large	Y	Direct
Eucalyptus viminalis	Manna Gum	126	Large	Y	TPZ
Eucalyptus camaldulensis	River Red Gum	125	Large	Y	TPZ
Eucalyptus camaldulensis	River Red Gum	143	Large	Y	TPZ
Eucalyptus melliodora	Yellow Box	86	Large	N	TPZ
Eucalyptus melliodora	Yellow Box	131	Large	N	Direct

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Scientific name	Common name	DBH (cm)	Size class	Inside approved MSA areas (Y/N)	Loss category
Eucalyptus melliodora	Yellow Box	121	Large	N	TPZ
Eucalyptus camaldulensis	River Red Gum	28	Small	Y	Direct
Eucalyptus camaldulensis	River Red Gum	37	Small	Y	Direct
Eucalyptus camaldulensis	River Red Gum	43	Small	Y	Direct
Eucalyptus camaldulensis	River Red Gum	30	Small	Y	Direct
Eucalyptus camaldulensis	River Red Gum	34	Small	Y	Direct

Table 8 Habitat hectare conversion for scattered trees within the construction footprint

Category	Number within construction footprint	Condition score	Standard extent (ha)	Habitat hectares (Hha)
Large scattered trees	7	0.2	0.070 ha	0.098
Small scattered trees	3	0.2	0.031 ha	0.019
TOTAL				**0.117**

3.1.7 Groundwater Dependent Ecosystems

The Alluvium (2019) desktop assessment of Surface Water and Groundwater within the WORM desktop study area identifies the potential for impact on groundwater to be very low for the following reasons:

- *The Activity of installing the pipeline will only intersect the shallowest aquifer, or potentially may not intersect any aquifer at all (depending on seasonal conditions).*
- *The groundwater resource in the areas is generally brackish, and the Activity will not result in the addition of salts to the aquifer. Consequently, the beneficial use, which is defined by the groundwater salinity, is unlikely to be at risk.*
- *The Activity does not involve depositing or releasing any potential contaminant to shallow aquifers.*

The Alluvium (2019) report indicates the predominant risk to groundwater from the Project is the potential to create preferential flow paths that may inadvertently change groundwater flow directions. The potential for this risk is likely to be higher where the water table is shallow, such as the wetlands around KP 40 to KP 45.

Given the depth to the water table is generally substantially deeper than the impact depth proposed, except in the Merri Creek catchment in the north near KP40-45 where much of the impact area has been subject to disturbance in the past, any impact to GDEs is likely to be highly localised provided the mitigation measures recommended in the Alluvium (2019) report are implemented.

3.2 Significant flora

A 5 kilometre buffered search of the EPBC Protected Matters Search Tool and VBA indicated 45 significant threatened flora species occur, or are predicted to occur, in the desktop report study area (Biosis 2019). Of these species, 19 are nationally significant and 44 are state significant.

An assessment of likelihood of occurrence identified a total of 29 threatened flora species (9 nationally significant and 28 State significant) with a medium or higher likelihood of occurring in the study area (Biosis 2019). Several species are considered both nationally and State significant. These 29 threatened flora species, detailed in Section 2.2.1 of this report and Table 9 below, formed the basis for targeted field surveys.

Areas of potential habitat for significant flora identified during the field surveys included areas of Plains Grassland, Plains Grassy Woodland, Grassy Woodland, Stony Knoll Shrubland, uncultivated areas along roadsides and within paddocks, along drainage lines and wetlands and areas of Riparian Woodland, Plains Grassy Wetland and Aquatic Herbland.

Table 9 Summary of EPBC Act, FFG Act and advisory listed flora species most likely to occur in the construction footprint (adapted from Biosis 2019)

Common name	Scientific name	Conservation status	Potential habitat	Survey timing
Matted Flax-lily	*Dianella amoena*	Endangered under the EPBC Act Listed under the FFG Act Endangered on a DELWP Advisory List.	Previously recorded from within the study area close to Merri Creek at Beveridge. Potential habitat in areas of uncultivated Plains Grassland, Grassy Woodland and Plains Grassy Woodland and in uncultivated grassy paddocks and roadsides in the desktop study area.	Late Spring/Summer
Spiny Rice-flower	*Pimelea spinescens* subsp. *spinescens*	Critically Endangered under the EPBC Act Listed under the FFG Act Endangered on a DELWP Advisory List.	Potential habitat in areas of uncultivated Plains Grassland and uncultivated grassy paddocks and roadsides in the west of the study area east of Deep Creek.	Winter
Small Golden Moths	*Diuris basaltica*	Endangered under the EPBC Act Listed under the FFG Act Endangered on a DELWP Advisory List.	Potential habitat in higher quality areas of uncultivated Plains Grassland, particularly where Kangaroo Grass and embedded rock is present.	Spring

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Common name	Scientific name	Conservation status	Potential habitat	Survey timing
Adamson's Blown-grass	*Lachnagrostis adamsonii*	Endangered under the EPBC Act Listed under the FFG Act Vulnerable on a DELWP Advisory List.	Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate.	Late Spring/Summer
Basalt Peppercress	*Lepidium hyssopifolium* s.s.	Endangered under the EPBC Act Listed under the FFG Act Endangered on a DELWP Advisory List.	Potential habitat in areas of uncultivated Plains Grassland and Plains Grassy woodland and uncultivated grassy paddocks and roadsides in the desktop study area.	Late Spring/Summer
Button Wrinklewort	*Rutidosis leptorhynchoides*	Endangered under the EPBC Act Listed under the FFG Act Endangered on a DELWP Advisory List.	Potential habitat in higher quality areas of Plains Grassland, Grassy Woodland and Plains Grassy Woodland.	Late Spring/Summer
River Swamp Wallaby-grass	*Amphibromus fluitans*	Vulnerable under the EPBC Act	Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate.	Late Spring/Summer

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Common name	Scientific name	Conservation status	Potential habitat	Survey timing
Clover Glycine	*Glycine latrobeana*	Vulnerable under the EPBC Act Listed under the FFG Act Vulnerable on a DELWP Advisory List.	Potential habitat in higher quality areas of Plains Grassland, Grassy Woodland and Plains Grassy Woodland, particularly where Kangaroo Grass is present.	Late Spring/Summer
Large-headed Fireweed	*Senecio macrocarpus*	Vulnerable under the EPBC Act Listed under the FFG Act Endangered on a DELWP Advisory List.	Potential habitat in areas of Plains Grassland and Plains Grassy woodland and uncultivated grassy paddocks and roadsides in the desktop study area.	Spring
Buloke	*Allocasuarina luehmannii*	Listed under the FFG Act Endangered on a DELWP Advisory List.	Potential to persist as scattered trees.	Year-round
Plump Swamp Wallaby-grass	*Amphibromus pithogastrus*	Listed under the FFG Act Endangered on a DELWP Advisory List.	Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate.	Late Spring/Summer
Curly Sedge	*Carex tasmanica*	Listed under the FFG Act Vulnerable on a DELWP Advisory List.	Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate.	Late Spring/Summer
Small Milkwort	*Comesperma polygaloides*	Listed under the FFG Act Vulnerable on a DELWP Advisory List.	Potential habitat in higher quality areas of Plains Grassland.	Late Spring/Summer

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Common name	Scientific name	Conservation status	Potential habitat	Survey timing
Small Scurf-pea	*Cullen parvum*	Listed under the FFG Act Endangered on a DELWP Advisory List.	Potential habitat in areas of Plains Grassland and uncultivated grassy paddocks and roadsides in the desktop study area.	Late Spring/Summer
Tough Scurf-pea	*Cullen tenax*	Listed under the FFG Act Endangered on a DELWP Advisory List.	Potential habitat in areas of Plains Grassland and uncultivated grassy paddocks and roadsides in the desktop study area.	Late Spring/Summer
Swamp Diuris	*Diuris palustris*	Listed under the FFG Act Vulnerable on a DELWP Advisory List.	Potential habitat in higher quality areas of Plains Grassland, Plains Grassy Woodland and Plains Grassy Wetland.	Spring
Purple Diuris	*Diuris punctata*	Listed under the FFG Act Vulnerable on a DELWP Advisory List.	Potential habitat in higher quality areas of Plains Grassland, Plains Grassy Woodland and Plains Grassy Wetland.	Spring
Large-flower Crane's-bill	*Geranium* sp. 1	Listed under the FFG Act Endangered on a DELWP Advisory List.	Potential habitat in areas of Plains Grassland within the VVP and uncultivated grassy paddocks and roadsides in the desktop study area.	Late Spring/Summer
Narrow Goodenia	*Goodenia macbarronii*	Listed under the FFG Act Vulnerable on a DELWP Advisory List.	Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate.	Late Spring/Summer
Cut-leaf Burr-daisy	*Calotis anthemoides*	Listed under the FFG Act	Potential habitat along drainage lines and wetlands and areas of Plains Grassy Wetland and Grey Clay Drainage-line Aggregate.	Late Spring/Summer

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Common name	Scientific name	Conservation status	Potential habitat	Survey timing
Plump Windmill Grass	*Chloris ventricose*	Vulnerable on a DELWP Advisory List.	Known only with confidence from northern Victoria where it is possibly an accidental introduction to Victoria.	Late Spring/Summer
Flax-lily	*Dianella longifolia* var. *grandis*	Vulnerable on a DELWP Advisory List.	Relatively intact grassland and grassy woodlands	Late Spring/Summer
Flat Spike-sedge	*Eleocharis plana*	Vulnerable on a DELWP Advisory List.	Wetlands and areas of Plains Grassy Wetland	Late Spring/Summer
Melbourne Yellow-gum	*Eucalyptus leucoxylon* subsp. *connata*	Vulnerable on a DELWP Advisory List.	Woodlands of the volcanic plains north and west of Melbourne	Year-round
Studley Park Gum	*Eucalyptus* X *studleyensis*	Endangered on a DELWP Advisory List.	Stream-sides and wetlands	Year-round
Austral Crane's bill	*Geranium solanderi* var. *solanderi* s.s.	Vulnerable on a DELWP Advisory List.	Relatively intact grassland and grassy woodlands	Late Spring/Summer
Plains Yam-daisy	*Microseris scapigera* s.s.	Vulnerable on a DELWP Advisory List.	Wetlands and Plains Grassy Wetland	Late Spring/Summer
Basalt Podolepis	*Podolepis linearifolia*	Endangered on a DELWP Advisory List.	Relatively intact grassland and grassy woodlands	Late Spring/Summer
Pale Swamp Everlasting	*Coronidium gunnianum*	Vulnerable on a DELWP Advisory List.	Wetlands and Plains Grassy Wetland	Late Spring/Summer

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3.2.1 EPBC Act listed flora

Nine EPBC Act species were determined to have a medium or higher likelihood of occurring within the construction footprint (Biosis 2019). These are:

- Matted Flax-lily *Dianella amoena*
- Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens*
- Small Golden Moths *Diuris basaltica*
- Adamson's Blown-grass *Lachnagrostis adamsonii*
- Basalt Peppercress *Lepidium hyssopifolium s.s.*
- Button Wrinklewort *Rutidosis leptorhynchoides*
- River Swamp Wallaby-grass *Amphibromus fluitans*
- Clover Glycine *Glycine latrobeana*
- Large-headed Fireweed *Senecio macrocarpus*

No EPBC Act listed species have been previously recorded within the construction footprint. One of these species, Matted Flax-lily, has been previously recorded within the desktop study area just south of Merri Creek within the approved MSA area (near KP 42.7) (Biosis 2019).

One EPBC Act listed flora species (Matted Flax-lily) was recorded during the late spring / summer phase of the targeted flora surveys (Table A5.4). A single Matted Flax-lily individual was identified within the fence line along an uncultivated area of roadside (218268306) adjacent to a paddock of Plains Grassy Woodland in 1PS733045 (Plate 1, Figure 6). The Matted Flax-lily recorded is on public land outside the approved MSA area.

No other EPBC Act listed flora species were recorded in the construction footprint during the field assessments.



Plate 1 Matted Flax-lily *Dianella amoena* recorded at 218268306

3.2.2 FFG Act listed flora

Nineteen FFG Act species were determined to have a medium or higher likelihood of occurring within the construction footprint (Biosis 2019). These are:

- Matted Flax-lily *Dianella amoena*
- Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens*
- Small Golden Moths *Diuris basaltica*
- Adamson's Blown-grass *Lachnagrostis adamsonii*
- Basalt Peppercress *Lepidium hyssopifolium s.s.*
- Button Wrinklewort *Rutidosis leptorhynchoides*
- Clover Glycine *Glycine latrobeana*
- Large-headed Fireweed *Senecio macrocarpus*
- Buloke *Allocasuarina luehmannii*
- Plump Swamp Wallaby-grass *Amphibromus pithogastrus*
- Curly Sedge *Carex tasmanica*
- Small Milkwort *Comesperma polygaloides*

- Small Scurf-pea *Cullen parvum*
- Tough Scurf-pea *Cullen tenax*
- Swamp Diuris *Diuris palustris*
- Purple Diuris *Diuris punctata*
- Large-flower Crane's-bill *Geranium* sp. 1
- Narrow Goodenia *Goodenia macbarronii*
- Cut-leaf Burr-daisy *Calotis anthemoides*.

No FFG Act listed species have been previously recorded within the construction footprint. One of these species has been previously recorded within the desktop study area, Matted Flax-lily (near KP 42.7) inside the approved MSA Area (Biosis 2019).

Two (2) FFG Act listed flora species were recorded within the construction footprint during field surveys. These are:

- Matted Flax-lily – one (1) individual at 218268306 (KP 23).
- Tough Scurf-pea – 48 individuals at 2LP130336 ()KP 51).

The Matted Flax-lily recorded during the field surveys is on public land outside the approved MSA area (Plate 1, Figure 6).

All Tough Scurf-pea individuals were recorded on private land within the approved MSA area (Table A5.4, Plate 2 and Figure 6). Each Tough Scurf-pea individual encountered was marked with a numbered yellow sand peg (1 - 48) to aid future detection for avoidance or translocation if desired. As this parcel is subject to grazing it is likely that there are more individuals than the 48 recorded during the field assessment.

No other FFG Act listed flora were recorded during the field assessments.



Plate 2 Tough Scurf-pea *Cullen tenax* at 2LP130336

3.2.3 FFG Act protected flora

Two FFG Act Protected flora species, including species declared to be protected under section 46 of the FFG Act, were recorded from field surveys on public land within the construction footprint (Table A1.1). These species are listed below:

- Matted Flax-lily
- Tough Scurf-pea.

Common Maidenhair *Adiantum aethiopicum* has previously been recorded within the construction footprint but was not recorded during the recent field surveys.

3.2.4 DELWP Advisory listed flora

The Biosis (2019) desktop report identified 42 DELWP Advisory listed flora species occur or are predicted to occur within the desktop study area. This included 27 with a medium or higher likelihood of occurring in the desktop study area as detailed in Table 9.

None of these species have been previously recorded within the construction footprint. Matted Flax-lily has been previously recorded within the desktop report study area (near KP 42.7) within the approved MSA area.

Three DELWP Advisory listed flora species were recorded within the construction footprint. These are:

- Flax-lily *Dianella longifolia* var. *grandis* (Vulnerable on DELWP Advisory List) – one (1) individual at 2PS343496 (KP 9).

- Matted Flax-lily (Endangered on DELWP Advisory List) – one (1) individual at 218268306 (KP 23).
- Tough Scurf-pea (Endangered on DELWP Advisory List) – 48 individuals at 2LP130336 (KP 51).

The single Flax-lily individual occurs on private land outside the approved MSA areas (Plate 3, Figure 6).

The single Matted Flax-lily individual recorded during the field surveys occurs on public land outside the approved MSA areas (Figure 6).

All Tough Scurf-pea individuals were recorded on private land within the approved MSA area (Figure 6).

No other DELWP Advisory listed flora species were recorded during the field assessments.



Plate 3 Flax-lily *Dianella longifolia* var. *grandis* recorded at 2PS343496

3.2.5 CaLP Act listed noxious weeds

CaLP Act listed noxious weeds were generally widespread throughout the length of the construction footprint. The species identified during the field assessment are listed in Table 10 below and in Appendix 4 (Table A4.1) and include:

- Eight Regionally Controlled species (Boneseed *Chrysanthemoides monlilfera*, Spear Thistle *Cirsium vulgare*, Artichoke Thistle *Cynara cardunculus* subsp. *flavescens*, African Box-thorn *Lycium ferocissimum*, Horehound *Marrubium vulgare*, Serrated Tussock *Nasella trichotoma*, Sweet Briar *Rosa rubiginosa*, Gorse *Ulex europaeus*).
- Two Restricted species (Chilean Needle-grass *Nasella neesiana* and Prickly Pear *Opuntia* spp.).
- One State Prohibited species (Lobed Needle-grass *Nasella charruana*) – recorded at 2LP130336 (KP 51).

Table 10 CaLP Act listed noxious weeds recorded within the construction footprint

Scientific name	Common name	Status
Chrysanthemoides monilifera	Boneseed	RC
Cirsium vulgare	Spear Thistle	RC
Cynara cardunculus subsp. *flavescens*	Artichoke Thistle	RC
Lycium ferocissimum	African Box-thorn	RC
Marrubium vulgare	Horehound	RC
Nassella charruana	Lobed Needle-grass	SP
Nassella neesiana	Chilean Needle-grass	R
Nassella trichotoma	Serrated Tussock	RC
Opuntia spp.	Prickly Pear	R
Rosa rubiginosa	Sweet Briar	RC
Ulex europaeus	Gorse	RC

3.3 Significant fauna

A 5 kilometre buffered search of the EPBC Protected Matters Search and VBA Tool indicated 58 significant threatened fauna species occur, or are predicted to occur, in the desktop report study area (Biosis 2019). Of these species, 26 are nationally significant and 58 are state significant. Migratory species that do not also have a threatened status, are considered separately in Section 3.3.4 below.

A summary of those species recorded from databases or with a medium or higher likelihood of occurring in the desktop study area is provided in Table 13 (Biosis 2019). This includes a total of 22 threatened fauna species comprising seven nationally significant fauna species and 22 state significant fauna species (i.e. all nationally significant fauna species are also listed as state significant). Areas of potential habitat for significant fauna include forest, grassland and grassy woodland habitat, pasture supporting spear grasses and wallaby grasses, grassland dominated by introduced tussock grasses, scattered indigenous and planted eucalypts within or adjacent to the proposed alignment, wetlands and farm dams within or adjacent to the alignment, and aquatic habitat along Merri Creek, Jacksons Creek and Deep Creek.

The locations of significant fauna recorded during the field surveys are presented in Figure 8 to Figure 10. With the exception of Tussock Skink *Pseudemoia pagenstecheri*, no significant fauna species for which targeted surveys were not conducted were observed incidentally during the field assessments.

3.3.1 EPBC Act listed fauna

Four of the seven species with a medium or higher likelihood of occurring in the study area have been previously recorded within either the desktop study area and / or the construction footprint:

- Growling Grass Frog (two records, within the construction footprint both near KP 40.5 within the approved MSA area).

- Golden Sun Moth (eight records, in desktop study area between KP 30.3 – KP 44.5 within the approved MSA area, four records in construction footprint at KP 30.9, 44.3, 44.5, 44.9 within the approved MSA area).
- White-throated Needletail (two records in airspace above construction footprint both near KP 40.45 within the approved MSA area).
- Grassland Earless Dragon (one record from 1990 within the construction footprint near KP 42.6 inside the approved MSA area).

White-throated Needletail is an aerial species that occurs in the airspace above many environments in south-eastern Australia and is not likely to be affected by the Project.

Extensive surveys for the Grassland Earless Dragon have been done at the 1990 record location and others to the north and west of Melbourne (Robertson and Evans 2009/2012) and the species has not been detected. The species is considered likely to be extinct within northern Melbourne and potentially within Victoria (Melville et al 2019). The likelihood of occurrence or potential for significant impact to this species resulting from the Project is therefore considered low.

Targeted surveys identified the presence of SLL, GSM and GGF within the construction footprint. Further details on the results of each targeted survey are provided below.

No other EPBC Act listed fauna species were incidentally recorded during the field assessments.

3.3.1.1 Striped Legless Lizard

Striped legless lizards were recorded in two of the 20 grids deployed across the construction footprint. The two grids were Grids 6 and 7 on 12LP92520 (Plate 4, Table A5.5). The parcel lies outside of the approved MSA areas. Individuals were detected on two separate occasions in Grid 6 (Checks 2 & 5) and three separate occasions in Grid 7 (Checks 2, 3 & 10). Slough from an SLL was also detected in Grid 6 on Check 9. Interpretation of head scales identified six unique individuals across these two grids.

Based on the definition of important populations in the conservation advice for the species, the population found on 12LP92520 is a significant population - "All populations of the striped legless lizard are likely to be important for the species recovery" and "....it is considered that when one or more individuals are found on a site that they are members of an important population" (TSSC 2016, p. 4).

Based on the results of the targeted surveys, all patches of native and non-native vegetation within the construction footprint in 12LP92520 are confirmed habitat. This is in accordance with the SLL referral guidelines "If the species is detected during a survey, all potentially suitable habitat at the site should be considered occupied by the species" (Commonwealth of Australia 2011). The native and non-native vegetation in the adjacent parcel (11LP92520) that is contiguous with (west of) the native vegetation in 12LP92520 is therefore also considered confirmed habitat. The total area of confirmed SLL habitat within the construction footprint is 0.82 hectares.

The highest quality habitat in the construction footprint was sampled and no SLL were detected at any of the other 18 tile arrays. This provides a high level of confidence that the species does not occur in any other habitat patches traversed by the construction footprint in parcels sampled with a tile array. The ten checks completed on Grids 16, 17 & 18 at B7PP2258 is considered to be sufficient to provide high confidence that the species is absent. It is important to note that the species may occur elsewhere within the parcel in areas outside the construction footprint. Parcels that were not sampled with one or more tile arrays are unlikely to support the species as they did not contain habitat of sufficient quality or extent to warrant a targeted survey.



Plate 4 Striped Legless-lizard *Delma impar* recorded at 12LP92520

3.3.1.2 Golden Sun Moth

Golden Sun Moths were detected within the construction footprint in 12 parcels (Table 11). Seven of these parcels lie within the approved MSA areas. One parcel where GSM were recorded have contiguous suitable habitat both within and outside of the approved MSA areas.

Table 11 Parcels within the construction footprint where Golden Sun Moth were recorded

Parcel identifier	# valid surveys	Total # GSM recorded	Inside approved MSA areas (Y / N)
1PS733043	4	18	N
1PS733045	4	1	N
2LP218323	4	1	N
32LP93445	1	1	N
PPS816942	2	2	Inside & outside MSA
CPS805151	3	1	Y
6TP394032	2	2	Y
1TP746632	3	1	Y
2LP133657	4	1	Y
1TP168481	4	4	Y
1TP710356	4	11	Y
2LP130336	4	4	Y

Where four valid surveys have been conducted and no moths were found, the species is considered absent for the purposes of this assessment (DEWHA 2009b). Based on the results of the 2019/20 surveys, GSM are

considered absent from 62 parcels within the construction footprint (Table A5.6). This is in addition to 20 parcels which were not surveyed due to lack of suitable habitat for the species.

In parcels where GSM are found, all similar habitat in that parcel connected by a distance of less than 200 metres was considered to be 'confirmed' GSM habitat. Where there are breaks of greater than 200 metres between habitat patches, the adjacent habitat patches were assumed to be not occupied (based on dispersal ability of the females). Breaks in habitat continuity can include features such as crops, ploughed land or grassland not supporting GSM food plants. The parcels where a patch of habitat extends into an adjacent parcel that has not had four valid surveys are listed below.

- 2LP67181
- 2TP843230
- PC372952
- 1LP208748.

These four parcels all occur around KP 45 and lie within the approved MSA area, which is covered through HCOs (see Section 4.1.1). Consequently, surveys of these parcels may not be required in the 2020/21 survey season.

Based on the survey data collected to date, the current estimate of confirmed GSM habitat within the construction footprint is 28.8 hectares.

3.3.1.3 Growling Grass Frog

Many of the waterbodies within 100 metres of the WORM alignment identified as potential GGF habitat were dry at the time of inspection and hence were not subject to targeted survey. A total of eight waterbodies were found to contain water and at least some habitat attributes known to be positively associated with occupancy by GGF at the time of assessment and thus warranted a targeted survey (Figure 10).

Of the waterbodies surveyed, GGF was recorded at two sites (Plate 5, Table A5.8 and Figure 10). The species was incidentally recorded in Deep Creek during the day on 28 January 2020 at 7:30 am. The species was also recorded in a farm dam supporting a high cover of submergent and floating aquatic vegetation at 10LP5364 on 17 February 2020. The presence of multiple individuals, including metamorphlings, indicates this waterbody is a breeding site. A dam less than 100 metres north-east of the GGF occupied dam was dry at the time of inspection but, due to its proximity, is considered likely to support the species when it contains water. This dam spans both 10LP5364 and 1LP113763. The 'typical' hydroperiod of this dam is not known, but it is possible that, at times, GGF successfully breed there. Regardless, the dam is suitable habitat for the species. Both dams lie within the approved MSA area.



Plate 5 Growling Grass Frog *Litoria raniformis* recorded at 10LP5364

3.3.1.4 Grey-headed Flying-fox

Targeted surveys for Grey-headed Flying-fox were not conducted however, the assessment of vegetation throughout the construction footprint was used to assess the importance of feeding habitat for the species. The vegetation within the construction footprint is not considered to constitute important or limiting habitat for the species and the proposed works are considered highly unlikely to have a significant impact on this highly mobile species.

3.3.2 FFG Act listed fauna

Four of the species with a medium or higher likelihood of occurring in the study area have been previously recorded within the desktop study area and two from the construction footprint:

- Growling Grass Frog (two records, within the construction footprint both near KP 40.5 within the approved MSA area).
- Golden Sun Moth (eight records, in desktop study area between KP 30.3 – KP 44.5 within the approved MSA area, four records in construction footprint at KP 30.9, 44.3, 44.5, 44.9 within the approved MSA area).
- Red-chested Button Quail (one record from desktop study area near KP 42.5 within the approved MSA area).
- Black Falcon (one record from desktop study area near KP 42.5 within the approved MSA area).

Field assessments recorded three FFG Act listed species within the construction footprint (see Table A2.1):

- Growling Grass Frog
- Golden Sun Moth
- Striped Legless Lizard.

As all three species are also EPBC Act listed please refer to section 3.3.1 for further details.

No other FFG Act listed fauna species were incidentally recorded during the field assessments.

3.3.3 DELWP Advisory listed fauna

Five DELWP Advisory listed threatened fauna species have been previously recorded within the desktop study area and / or the construction footprint:

- Growling Grass Frog (two records, within the construction footprint both near KP 40.5 within the approved MSA area).
- Golden Sun Moth (eight records, in desktop study area between KP 30.3 – KP 44.5 within the approved MSA area, four records in construction footprint at KP 30.9, 44.3, 44.5, 44.9 within the approved MSA area).
- Red-chested Button Quail (one record from desktop study area near KP 42.5 within the approved MSA area).
- Black Falcon (one record from desktop study area near KP 42.5 within the approved MSA area).
- White-throated Needletail (two records in airspace above construction footprint both near KP 40.45 within the approved MSA area).

Tussock Skink *Pseudemoia pagenstecheri* was recorded indirectly as a result of the SLL tile surveys (Figure 8). Tussock skink was recorded 93 times across ten of the 20 SLL tile grids (Table 12). The majority of these records (64) were from Grid 5 on parcel 2LP90878. Two of the grids in which the species was observed lie within the MSA (Grids 11 & 15), while the remaining eight grids, including Grid 5, are outside the MSA.

Table 12 Summary of Tussock Skinks recorded within the construction footprint

Parcel identifier	Grid	Number of records
Approved MSA areas (approved under Part 10 of the EPBC Act)		
2LP130336	11	9
2LP67181	15	1
Areas outside the MSA approvals		
2LP119116	3	2
2PS343496	4	1
2LP90878	5	64
12LP92520	6	6
	7	3
1TP333383	9	1
	10	5
B7PP2258	18	1
Total	**10**	**93**

White-throated Needletail is an aerial species that occurs in the airspace above many environments in south-eastern Australia and is not likely to be affected by the Project. The species was not detected during the field assessments.

No other DELWP Advisory listed fauna species were incidentally recorded during the field assessments.

3.3.4 Migratory species

A total of twenty migratory species have been recorded from or are predicted to occur within the desktop report study area (Biosis 2019). The majority of these species are unlikely to make significant use of or have

significant habitat within the construction footprint, with the exception of Latham's Snipe, listed as a Migratory species under the EPBC Act, which may occur in seasonal wetlands supporting tussock-grasses and rushes as well as vegetated farm dams. Important habitat for Latham's Snipe is described as areas that have previously been identified as internationally important for the species, or areas that support at least 18 individuals of the species. No internationally important areas of habitat occur within the construction footprint and the likelihood of 18 individuals being recorded from seasonal wetlands or farm dams within the study area is considered low due to the limited size of these habitat types within the study area.

No listed migratory species were observed within the construction footprint during the field assessment campaign.

3.3.5 CaLP Act listed pest animals

No CaLP Act listed pest animals have been previously recorded from the construction footprint however European Rabbit *Oryctolagus cuniculus* and Fox *Vulpes vulpes* are known to be established across the proposed construction footprint.

Table 13 Summary of EPBC Act, FFG Act and advisory listed fauna species most likely to occur in the construction footprint (adapted from Biosis 2019)

Common name	Scientific name	Conservation status	Potential habitat	Survey timing
Golden Sun Moth	*Synemon plana*	Critically Endangered under the EPBC Act Listed under the FFG Act Endangered on DELWP's Advisory List	Species recorded within the desktop study area at Mickleham and Donnybrook. High likelihood of occurring elsewhere in the study area in areas of suitable grassland habitat including natural temperate grassland, grassy woodland and pasture supporting spear grasses and wallaby grasses and exotic grassland dominated by Chilean needle grass. Previously recorded from previously cultivated recolonised grasslands.	Early November through to the end of December. Survey may be able to be continued in early January if the species is still flying in the local area.
Swift Parrot	*Lathamus discolour*	Critically Endangered under the EPBC Act Listed under the FFG Act Endangered on a DELWP Advisory List	Likely to make occasional use of scattered indigenous and planted eucalypts within or adjacent to the Study area on rare occasions. The Project is unlikely to pose a significant risk to the species and the desktop study area does not constitute important habitat.	Between March and July, when the species is present on mainland Australia. Species unlikely to be detected. Survey for the species not considered necessary as an assessment of vegetation can be used to predict and rank the importance of feeding habitat.

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Common name	Scientific name	Conservation status	Potential habitat	Survey timing
Grey-headed Flying-fox	*Pteropus poliocephalus*	Vulnerable under the EPBC Act Listed under the FFG Act Vulnerable on a DELWP Advisory List.	Species likely to utilise flowering indigenous and planted trees within and adjacent to the desktop study area for foraging.	Roosts (camps) in the Melbourne area are well-documented and it is unlikely that any occur within or near the Study area. Survey for the species not considered necessary as an assessment of vegetation can be used to predict and rank the importance of feeding habitat.
Striped Legless Lizard	*Delma impar*	Vulnerable under the EPBC Act Listed under the FFG Act Endangered on a DELWP Advisory List.	Known to occur in the local area; potentially present in habitat dominated by native or introduced tussock grasses throughout the desktop study area. Unlikely to occur in previously cultivated areas.	Tiles deployed during June and July; must be in place by August. Survey undertaken from September to December.
Growling Grass Frog	*Litoria raniformis*	Vulnerable under the EPBC Act Listed under the FFG Act Endangered on a DELWP Advisory List.	Species has been recorded in all creeks bisected by the alignment, and has potential to occur in all wetlands and farm dams within or adjacent to the alignment.	October-March. The appropriate period to detect Growling Grass Frogs is concentrated in November to January when males call, however the frogs are still Active until March.

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Common name	Scientific name	Conservation status	Potential habitat	Survey timing
Australian Grayling	*Prototroctes maraena*	Vulnerable under the EPBC Act Listed under the FFG Act Vulnerable on a DELWP Advisory List.	Species is present throughout the Maribyrnong and Yarra River, however Deep Creek is the only waterway within the desktop study area that contains suitable habitat.	Targeted survey not required. The Project is considered unlikely to pose a significant risk to the species provided appropriate sediment management and site remediation measures are implemented. The species is most susceptible to construction related impacts immediately upstream of estuaries during spawning in April-May. The alignment crosses Deep Creek >10km upstream of the estuary.
White-throated Needletail	*Hirundapus caudacutus*	Vulnerable under the EPBC Act Vulnerable on a DELWP Advisory List.	As an almost exclusively aerial species within Australia, it occurs over most types of habitat, particularly wooded areas. Potential to use the aerial space over much of the desktop study area.	Species can only be detected within the study area in summer (December to March) when the species migrates from Asia, however the Project is unlikely to pose a significant risk to the species and the desktop study area does not constitute important habitat, and therefore targeted survey is not considered warranted.

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Common name	Scientific name	Conservation status	Potential habitat	Survey timing
Eastern Great Egret	*Ardea alba modesta*	Listed under the FFG Act Vulnerable on a DELWP Advisory List.	Known to occur within the local area and likely to utilise a range of wetlands within or immediately adjacent to the desktop study area.	Species can be detected at any time of the year, however the Project is unlikely to pose a significant risk to the species and the desktop study area does not constitute important habitat, and therefore targeted survey is not considered warranted.
Little Egret	*Egretta garzetta*	Listed under the FFG Act Endangered on a DELWP Advisory List.	Potential wetland habitat located within and immediately adjacent to the desktop study area.	Species can be detected at any time of the year, however the Project is unlikely to pose a significant risk to the species and the desktop study area does not constitute important habitat, and therefore targeted survey is not considered warranted.
Freckled Duck	*Stictonetta naevosa*	Listed under the FFG Act Endangered on a DELWP Advisory List.	Potential wetland habitat located within and immediately adjacent to the desktop study area.	Species can be detected at any time of the year, however the Project is unlikely to pose a significant risk to the species and the desktop study area does not constitute important habitat, and therefore targeted survey is not considered warranted.

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Common name	Scientific name	Conservation status	Potential habitat	Survey timing
Blue-billed Duck	*Oxyura australis*	Listed under the FFG Act Endangered on a DELWP Advisory List.	Suitable wetland habitat located within and immediately adjacent to the desktop study area.	Species can be detected at any time of the year, however the Project is unlikely to pose a significant risk to the species and the desktop study area does not constitute important habitat, and therefore targeted survey is not considered warranted.
Latham's Snipe	*Gallinago hardwickii*	Listed as Migratory under the EPBC Act.	Likely to occur in seasonal wetlands supporting tussock-grasses and rushes as well as vegetated farm dams. Important habitat for Latham's Snipe is described as areas that have previously been identified as internationally important for the species, or areas that support at least 18 individuals of the species.	Species can be detected between October and February, however the Project is unlikely to pose a significant risk to the species, therefore targeted survey is not considered warranted.
Brown Toadlet	*Pseudophryne bibronii*	Listed under the FFG Act Endangered on a DELWP Advisory List.	Woodland, forest and grassland habitats within the Study area. It is likely that Brown Toadlet is now extinct in the Greater Melbourne area as the species has not been recorded for many years, despite targeted surveys at sites where it formerly occurred.	Survey in autumn and early winter. Targeted surveys are unlikely to detect the species, because it is likely to be locally extinct

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Common name	Scientific name	Conservation status	Potential habitat	Survey timing
Intermediate Egret	*Ardea intermedia*	Listed under the FFG Act Endangered on a DELWP Advisory List.	More commonly recorded in northern Victoria, however may utilise wetland habitat in the desktop study area.	Species can be detected at any time of the year, however the Project is unlikely to pose a significant risk to the species and the Study area does not constitute important habitat, and therefore targeted survey is not considered warranted.
Red-chested Buttonquail	*Turnix pyrrhothorax*	Listed under the FFG Act Vulnerable on a DELWP Advisory List.	Previously recorded within the Study area near Donnybrook. Potentially utilises grassland, crop and pasture habitat throughout the desktop study area. However, the species is very infrequently recorded in southern Victoria.	Survey can be undertaken at any time of the year. The probability of detection is low as the species is exceedingly rare in southern Victoria. The Project is unlikely to pose a significant risk to the species. If present within the Study area, this species may be detected while undertaking surveys for other species such as Golden Sun-moth, Striped Legless Lizard and Growling Grass Frog.

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Common name	Scientific name	Conservation status	Potential habitat	Survey timing
Lewin's Rail	*Lewinia pectoralis*	Listed under the FFG Act Vulnerable on a DELWP Advisory List.	Potentially occurs in any wetland in the Study area supporting dense, fringing, emergent long or tussock-grass, reeds and rushes including well-vegetated farm dams.	Can be detected at any time of the year, however more likely to be recorded during spring as the species is breeding at that time. If present within the Study area, this species may be detected while undertaking surveys for other species such as Golden Sun-moth, Striped Legless Lizard and Growling Grass Frog.
Baillon's Crake	*Porzana pusilla*	Listed under the FFG Act Vulnerable on a DELWP Advisory List.	Potentially occurs in any wetland in the study area supporting dense, fringing, emergent long or tussock-grass, reeds and rushes including well-vegetated farm dams.	Spring and summer. This species is thought to be migratory within Australia and is mainly recorded in spring and summer in southern Victoria. If present within the Study area, this species may be detected while undertaking surveys for other species such as Golden Sun-moth, Striped Legless Lizard and Growling Grass Frog.

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Common name	Scientific name	Conservation status	Potential habitat	Survey timing
Black Falcon	*Falco subniger*	Listed under the FFG Act Vulnerable on a DELWP Advisory List.	Suitable habitat present, but unlikely to make regular use of the desktop study area	Species can be detected at any time of the year, however the Project is unlikely to pose a significant risk to the species as it is unlikely to make regular use of the area and the desktop study area does not constitute important habitat. Therefore targeted survey is not considered warranted.
Common Bent-wing Bat (eastern ssp.)	*Miniopterus schreibersii oceanensis*	Listed under the FFG Act Vulnerable on a DELWP Advisory List.	Likely to utilise habitat within the PPA for foraging on rare occasions. Unlikely that any maternity caves occur within or immediately adjacent to the desktop study area.	Species can be detected at any time of the year, however the Project is unlikely to pose a significant risk to the species and the desktop study area does not constitute important habitat, and therefore targeted survey is not considered warranted.
Australasian Shoveler	*Spatula rhynchotis*	Vulnerable on a DELWP Advisory List.	Prefers large, permanent lakes and swamps with deep water, stable conditions and abundant aquatic vegetation. Potential wetland habitat located within and immediately adjacent to the desktop study area.	Species can be detected at any time of the year, however the Project is unlikely to pose a significant risk to the species and the desktop study area does not constitute important habitat, and therefore targeted survey is not considered warranted.

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Common name	Scientific name	Conservation status	Potential habitat	Survey timing
Hardhead	*Aythya australis*	Vulnerable on a DELWP Advisory List.	Prefers large, deep freshwater environments with abundant aquatic vegetation, including slow moving areas of rivers. Potential wetland habitat located within and immediately adjacent to the desktop study area.	Species can be detected at any time of the year, however the Project is unlikely to pose a significant risk to the species and the desktop study area does not constitute important habitat, and therefore targeted survey is not considered warranted.
Musk Duck	*Biziura lobata*	Vulnerable on a DELWP Advisory List.	Prefers deep water on large, permanent swamps, lakes and estuaries with abundant aquatic vegetation. Potential wetland habitat located within and immediately adjacent to the desktop study area.	Species can be detected at any time of the year, however the Project is unlikely to pose a significant risk to the species and the desktop study area does not constitute important habitat, and therefore targeted survey is not considered warranted.
Tussock Skink	*Pseudemoia pagenstecheri*	Vulnerable on a DELWP Advisory List.	Known to occur in the local area; potentially present in habitat dominated by native or introduced tussock grasses throughout the desktop study area.	Targeted survey for Striped Legless Lizard is suitable to detect Tussock Skink, if the species is present within the construction footprint.

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3.4 Significant ecological communities

3.4.1 Nationally significant ecological communities

Interrogation of the EPBC PMST during the desktop assessment indicated five threatened ecological communities occur or have the potential to occur in the construction footprint (Biosis 2019). These are:

- Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP).
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Grassy Woodland).
- Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVVP).
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (Grey Box Grassy Woodland).
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (SHWTLP).

3.4.1.1 Natural Temperate Grassland of the Victorian Volcanic Plain

Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) is listed as Critically Endangered. This community has the potential to occur in areas of grassland and may correlate with areas of Plains Grassland (EVC 132) and Creekline Tussock Grassland (EVC 654) but must meet the condition thresholds outlined in the key diagnostic characteristics and condition thresholds set out in the Listing Advice for the community (TSSC 2008).

Areas of NTGVVP mapped within the approved MSA areas and outside the approved MSA areas are summarised in Table 14.

Table 14 Areas of NTGVVP mapped within the construction footprint

Nationally significant ecological community	Inside approved MSA areas (KP 0 – 3.2 and KP 28.8 – 51.2) (ha)	Outside approved MSA areas (KP 3.2 – 28.8) (ha)	Total (ha)
Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP)	1.15	6.76	**7.91**

3.4.1.2 White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Box-Gum Grassy Woodland is listed as Critically Endangered. This community has the potential to occur in areas of woodland including Plains Grassy Woodland (EVC 55) or where scattered Yellow Box *Eucalyptus melliodora* is a dominant overstorey species. White Box *Eucalyptus albens* and Blakely's Red Gum *Eucalyptus blakelyi* do not occur around Melbourne, or records of these species are doubtful.

No occurrences of this ecological community were recorded during the field assessments.

3.4.1.3 Grassy Eucalypt Woodland of the Victorian Volcanic Plain

Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVVP) is listed as Critically Endangered. This community has the potential to occur in areas of woodland including Plains Grassy Woodland (EVC 55) and Stony Knoll Shrubland (EVC 649) or where scattered River Red-gum trees are present or likely to have been formerly present.

Areas of GEWVVP mapped within the approved MSA areas and outside the approved MSA areas are summarised in Table 15.

Table 15 Areas of GEWVVP mapped within the construction footprint

Nationally significant ecological community	Inside approved MSA areas (KP 0 – 3.2 and KP 28.8 – 51.2) (ha)	Outside approved MSA areas (KP 3.2 – 28.8) (ha)	Total (ha)
Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVVP)	0.10	2.39	**2.49**

3.4.1.4 Grey Box Grassy Woodlands and Derived Native Grasslands or South-Eastern Australia

Grey Box Grassy Woodland is listed as Endangered. This community contains a canopy layer dominated by Grey Box *Eucalyptus microcarpa* and most likely correlates with Plains Woodland/Herb-rich Gilgai Wetland Mosaic (EVC 235) in the Central Victorian Uplands bioregion or Plains Woodland (EVC 803) in the Central Victorian Uplands or Victorian Volcanic Plains bioregions.

One small (0.08 hectares) patch of Plains Woodland was mapped within the construction footprint at D16PP2761. This parcel is not within the approved MSA areas. However, to meet the community description the minimum patch size for the ecological community is 0.5 hectares (TSSC 2010). Consequently, no occurrences of this ecological community were recorded during the field assessments.

3.4.1.5 Seasonal Herbaceous Wetlands of the Temperate Lowland Plains

Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (SHWTLP) is listed as Critically Endangered. The wetlands occur on seasonally-filled drainage lines or depressions, are generally treeless and dominated by a herbaceous ground layer (TSSC 2012). A potential occurrence of this community was initially identified at 2LP130112 (KP 18) associated with EVC 125 Plains Grassy Wetland, which lies outside the approved MSA areas. Further assessment of this potential occurrence concluded that the ecological community is not present. Consequently, no occurrences of SHWLTP were recorded within the construction footprint.

3.4.2 State significant ecological communities

There are two FFG Act listed communities that were modelled within the desktop study area by DELWP's Modelled FFG Act Community dataset:

- Western (Basalt) Plains Grasslands Community
- Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland.

There is close alignment between the descriptions of these listed ecological communities and Plains Grassland and Plains Grassy Woodland EVCs (SAC 1991, SAC 2004). As all patches of these EVCs within the construction footprint occur on basalt, all patches of Plains Grassland were considered to also be occurrences of the Western (Basalt) Plains Grasslands Community. Similarly, all patches of Plains Grassy Woodland were considered to also be occurrences of Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland. The FFG Act descriptions of these communities are very broad and do not contain the clearly articulated key diagnostic features and conditions thresholds that EPBC listing advice documents contain for threatened ecological communities.

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The removal of these communities on public land outside the MSA will require a permit under the FFG Act. As such, the areas of the FFG Act listed communities mapped within the construction footprint on public land are presented in Table 16.

Table 16 FFG Act listed communities within the construction footprint

State significant ecological community	Inside approved MSA areas (KP 0 – 3.2 and KP 28.8 – 51.2) (ha)		Outside approved MSA areas (KP 3.2 – 28.8) (ha)		Total (ha)
	Public Land	Private Land	Public Land	Private Land	
Western (Basalt) Plains Grasslands Community (WPBGC)	-	3.06	0.24	7.17	**10.47**
Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland (WBPGW)	0.0096	0.10	0.056	2.80	**2.97**

3.5 Conservation Areas

The construction footprint traverses two BCS conservation areas:

- Conservation Area 34a - Northern Growth Corridor: Growling Grass Frog Corridor (between KP42 and KP43). This area has been classified as a Growling Grass Frog conservation, floodplain and open space area in the BCS. The key rationale for protection of the area is that it protects important populations of Growling Grass Frog and ensures connectivity between populations within the northern growth corridor. The construction footprint follows the existing VNI pipeline easement within the conservation area. Impacts to Growling Grass Frog habitat and or any other MNES outside the VNI pipeline easement should be avoided, where possible.
- Conservation Area 28b - Summerhill Road (East), Wollert (between KP48 and KP49). This area was originally classified as an open space area within the BCS to preserve areas of GEWVVP, NTGVVP and Striped Legless Lizard Habitat. This conservation area has since been assigned to a nature conservation area following a boundary revision in 2017 (DELWP 2017b). A small area of modelled NTGVVP and GEWVVP is impacted by the construction footprint. This is largely within the existing VNI pipeline easement. Impacts to NTGVVP and GEWVVP outside the existing VNI pipeline should be avoided, where possible.

A Works in Conservation Area (WICA) approval will be required for any works proposed in a Conservation Area. These requirements are considered further in Section 4.1.

3.6 Landscape context

The Project spans the north-eastern boundary of the Victorian Volcanic Plain bioregion adjacent to the Central Victorian Uplands. It traverses a landscape that has been highly fragmented by past land use including agricultural, infrastructure and urban development. Native vegetation within the landscape persists largely as

isolated patches and scattered trees with the exception of riparian corridors along creeks including Jacksons Creek, Deep Creek and Merri Creek which provide important habitat networks for fauna movement. Patches of trees within the northern extent of the construction footprint also contribute to a broader area of open woodland that is unique within the local landscape. These trees can serve as stepping stones for more mobile species such as birds and bats and provide some level of habitat continuity with reserves in the local area, such as the reserve system proposed under the BCS (DEPI 2013a).

Strategic Biodiversity Values (SBV) score combines information on important areas for threatened flora and fauna, levels of depletion, connectivity, vegetation types and condition to provide a view of relative biodiversity importance of all parts of the Victorian landscape. Strategic Biodiversity Values score ranges from a minimum of 0.1 to a maximum of 1.0. This integrated information provides decision-makers with a comprehensive and spatially explicit view of the importance of biodiversity assets to enable comparison of locations across Victoria. The SBV of the construction footprint varies from 0.190 to 0.960 indicating the highly variable condition of habitats and native vegetation based on landscape modelling techniques used by DELWP.

4. Biodiversity legislation and government policy

4.1 Commonwealth

4.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act applies to developments and associated activities that have the potential to significantly impact on MNES protected under the Act. Significant impact guidelines under the EPBC Act define what constitutes a significant impact on a MNES. A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity (Commonwealth of Australia 2013).

The information presented below is a preliminary treatment of significant impacts on MNES outside of the approved MSA areas. A detailed impact assessment will be required once the construction footprint is finalised and surveys for threatened biota are completed in locations where land access was an issue. From the preliminary assessment several threatened species and ecological communities may be significantly impacted and general advice regarding the quantum of EPBC offsets is provided later in the report (Section 5).

The Project has been referred under the EPBC Act (EPBC Ref. 2019/8569) based on information in the desktop report: *Western Outer Ring Main (WORM): Desktop biodiversity assessment* (Biosis 2019). A decision was reached on 21 February 2020 that the proposed action is a controlled action and therefore requires further environmental assessment and approval. The referral decision notice listed the following eight MNES as likely to be significantly impacted by the Project.

- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains
- Natural Temperate Grassland of the Victorian Volcanic Plain
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland
- Grassy Eucalypt Woodland of the Victorian Volcanic Plain
- Growling Grass Frog *Litoria raniformis*
- Matted Flax-lily *Dianella amoena*
- Golden Sun Moth *Synemon plana*
- Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens*.

A further 16 MNES (nine flora species and seven fauna species) were highlighted as having a real chance or possibility of being significantly impacted by the Project. These species were either also surveyed for or ruled out for surveys in the desktop report: *Western Outer Ring Main (WORM): Desktop biodiversity assessment* (Biosis 2019).

- Adamson's Blown-grass *Lachnagrostis adamsonii*
- Small Golden Moths *Diuris basaltica*
- Maroon Leek-orchid *Prasophyllum frenchii*
- Button Wrinklewort *Rutidosis leptorhynchoides*
- Hoary Sunray *Leucochrysum albicans* subsp. *tricolor*
- Australasian Bittern *Botarus poiciloptilus*
- Grassland Earless Dragon *Tympanocryptis pinguicolla*
- Large-fruit Fireweed *Senecio macrocarpus*

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- Clover Glycine *Glycine latrobeana*
- Swamp Everlasting *Xerochrysum palustre*
- River Swamp Wallaby-grass *Amphibromus fluitans*
- Painted Honeyeater *Grantiella picta*
- Grey-headed Flying-fox *Pteropus poliocephalus*
- Australian Grayling *Prototroctes maraena*
- Pink-tailed Worm-lizard *Aprasia parapulchella*
- Striped Legless Lizard *Delma impar*.

Matters of National Environmental Significance detected during the field assessment campaign are summarised in Table 17 with regard to significant impact criteria. The results of the field assessment campaign should be incorporated into future assessments (e.g. Preliminary documentation) to rigorously assess the potential for significant impacts on relevant MNES in areas of the construction footprint outside the approved MSA areas.

Part of the construction footprint is located within the areas approved under Part 10 of the EPBC Act. Urban development within these areas is subject to conditions of approval, which include the following.

- The requirement to comply with the BCS for Melbourne's Growth Corridors (DEPI 2013a) which identifies nominated Conservation Areas that require protection for conservation within the MSA area; and
- The requirement to meet HCOs to offset the loss or deemed loss of particular listed threatened species habitat and/or native vegetation which is not required to be retained for conservation as set out in the Habitat Compensation Obligation Guidelines under the BCS (DEPI 2013b) (HCO Guidelines).

Land covered by the BCS has been subject to vegetation and habitat mapping (timestamped dataset) conducted under the supervision of the DELWP and the Victorian Planning Authority (VPA). The BCS has been approved under Section 146B of the EPBC Act (Part 10 approval).

Habitat Compensation Obligations or biodiversity offsets are determined with reference to habitat data contained in the habitat compensation layer dataset (environment mitigation dataset) maintained by DELWP, and the applicable fee schedule.

The construction footprint contains habitat values that have associated HCOs. In accordance with the BCS habitat data, biodiversity offsets to be provided through payment of HCOs will be required for the Project where the MSA applies. Fees are payable to DELWP. The current fee schedule for each unit of obligation is set out in the HCO Guidelines (DEPI 2013b).

For all MNES within the areas approved under Part 10 of the EPBC Act (approved MSA areas), no further approvals are required under the EPBC Act for the Project provided the conditions of the EPBC Act approvals are adhered to.

Where scattered trees or patches of native vegetation are proposed to be retained within the construction footprint, there may be scope to reduce the HCOs. Any reduction in HCOs would need approval from DELWP and would need to be in accordance with the requirements outlined in the Guidance Note (DELWP 2015).

There are two BCS Conservation Areas intersected by the construction footprint:

- Conservation Area 34a - Northern Growth Corridor: Growling Grass Frog Corridor (between KP42 and KP43).

- Conservation Area 28b - Summerhill Road (East), Wollert (between KP48 and KP49).

Any new development or change in land use within a Conservation Area identified in the BCS will require approval. In these areas it will be necessary to submit a WICA application to DELWP as outlined in the *Guidance note: Implementing the Biodiversity Conservation Strategy for Melbourne's Growth Corridors* (the Guidance Note) (DELWP 2015).

Table 17 Assessment of the Project in relation to the EPBC Act

MNES	Outcome of field surveys	Significant impact Guidelines	Implications under the EPBC Act
Threatened species	Field surveys to date have recorded four species within the construction footprint: • Matted Flax-lily - Endangered under the EPBC Act. Recorded at one location outside of the MSA areas approved under Part 10 of the EPBC Act. • Golden Sun Moth - Critically Endangered under the EPBC Act. Recorded within and outside of the MSA areas approved under Part 10 of the EPBC Act. • Striped Legless Lizard - Vulnerable under the EPBC Act. Recorded at one location outside of the MSA areas approved under Part 10 of the EPBC Act. • Growling Grass Frog - Vulnerable under the EPBC Act. Recorded within and outside of the MSA areas approved under Part 10 of the EPBC Act.	As defined in the EPBC Act Policy Statement 1.1 Significant Impact Guidelines (Commonwealth of Australia 2013), an Action will require approval if the Action has, will have, or is likely to have a significant impact on a species listed in any of the following categories: • extinct in the wild • critically endangered • endangered, or • vulnerable Significant Impact Criteria of relevance to the Project are detailed below: **Critically endangered and endangered species: Significant impact criteria** An Action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will: • lead to a long-term decrease in the size of a population • reduce the area of occupancy of the species • fragment an existing population into two or more populations • adversely affect habitat critical to the survival of a species • disrupt the breeding cycle of a population • modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	For all listed significant species recorded within areas covered by the existing MSA approvals under Part 10 of the EPBC Act, no further approvals may be required under the EPBC Act, as long as the Project follows the Program Report and the conditions of approval. For areas outside the MSA areas approved under Part 10 of the EPBC Act, or where the Project is not in accordance with the conditions of approval, species recorded within the construction footprint, the proposed Action may constitute a significant impact. A detailed impact assessment will be required once the construction footprint is finalised and surveys for threatened biota are completed in locations where land access was an issue.

MNES	Outcome of field surveys	Significant impact Guidelines	Implications under the EPBC Act
		• result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat • introduce disease that may cause the species to decline, or • interfere with the recovery of the species. **Vulnerable species: Significant impact criteria** An Action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will: • lead to a long-term decrease in the size of an important population of a species • reduce the area of occupancy of an important population • fragment an existing important population into two or more populations • adversely affect habitat critical to the survival of a species • disrupt the breeding cycle of an important population • modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline • result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat • introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species. Significant impact guidelines have also been developed for the	

MNES	Outcome of field surveys	Significant impact Guidelines	Implications under the EPBC Act
		following species: • Significant impact guidelines for the critically endangered golden sun moth (Commonwealth of Australia 2009b). • Significant impact guidelines for the vulnerable Growling Grass Frog (Commonwealth of Australia 2009c)	
Threatened ecological communities	Two listed threatened communities were recorded within the construction footprint: • Grassy Eucalypt Woodland of the Victorian Volcanic Plain - listed as Critically Endangered • Natural Temperate Grassland of the Victorian Volcanic Plain - listed as Critically Endangered	As defined in the EPBC Act Policy Statement 1.1 Significant Impact Guidelines (Commonwealth of Australia 2013), an Action will require approval if the Action has, will have, or is likely to have a significant impact on an ecological community listed in any of the following categories: • critically endangered, or • endangered **Significant impact criteria** An Action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will: • reduce the extent of an ecological community • fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines • adversely affect habitat critical to the survival of an ecological community • modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of	For all areas of the listed GEWVVP and NTGVVP communities within the MSA areas covered by the existing MSA approvals under Part 10 of the EPBC Act, no further approvals may be required under the EPBC Act, as long as the Project follows the Program Report and the conditions of approval. For areas of the listed communities outside the areas approved under Part 10 of the EPBC Act, the proposed Action may constitute a significant impact. A detailed impact assessment will be required once the construction footprint is finalised and surveys for threatened ecological communities are completed in locations where land access was an issue.

MNES	Outcome of field surveys	Significant impact Guidelines	Implications under the EPBC Act
		groundwater levels, or substantial alteration of surface water drainage patterns • cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting • cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – assisting invasive species, that are harmful to the listed ecological community, to become established, or – causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or • interfere with the recovery of an ecological community.	
Migratory species	None of the 20 listed migratory species previously recorded or predicted to occur in the local area were recorded during field surveys.	As defined in the EPBC Act Policy Statement 1.1 Significant Impact Guidelines (Commonwealth of Australia 2013), 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	There are significant impact guidelines for this group of species in Commonwealth of Australia (2015). These include Actions that will substantially modify, destroy or isolate an area of important habitat or disrupt the lifecycle of an ecologically significant proportion of the population. While some of these species would be expected to use the construction footprint on

MNES	Outcome of field surveys	Significant impact Guidelines	Implications under the EPBC Act
		area of important habitat for the migratory species • seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	occasions, and some of them may do so regularly or may be resident, it does not provide important habitat for an ecologically significant proportion of any of these species.
Wetlands of international importance (Ramsar sites).	The construction footprint is identified as being within proximity (10-20 km upstream) of one Ramsar site: the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site.	Approval is required for an Action occurring within or outside a declared Ramsar wetland if the Action has, will have, or is likely to have a significant impact on the ecological character of the Ramsar wetland (commonwealth of Australia 2013).	There are significant impact guidelines specifically for Ramsar sites in Commonwealth of Australia (2013). These are defined as Actions that will have a significant impact on the ecological character of a declared Ramsar wetland. The construction footprint drains into the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site, but this site is located over 15 kilometres downstream of the construction footprint and the potential for the Project to have a significant impact on it is considered negligible.

4.2 State

4.2.1 Environment Effects Act 1978

The *Environment Effects Act* 1978 (EE Act) establishes a process to assess the environmental impacts of a project. Based on the referral submitted, a decision has been made by the Minister for Planning that the Project requires an Environment Effects Statement (EES) to be prepared under the EE Act. The EES is submitted to the Minister for Planning and enables them to assess the potential environmental effects of the Project.

4.2.2 Flora and Fauna Guarantee Act 1988 (FFG Act)

The FFG Act is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes. Under the FFG Act a permit is required from DELWP to 'take' protected flora species from public land. Protected flora are:

- Plants that have been declared to be protected under section 46 of the FFG Act.
- Plants that are listed as threatened under section 10 of the FFG Act.
- Plants that belong to communities that are listed as threatened under section 10 of the FFG Act.

A permit is generally not required for removal of protected flora from private land. Authorisation under the FFG Act is required to collect, kill, injure or disturb listed fish.

Link for further information: https://www.environment.vic.gov.au/conserving-threatened-species/flora-and-fauna-guarantee-act-1988.

Native vegetation in the construction footprint contains listed threatened communities (Section 3.4.2), including protected flora species (Section 3.2.3), listed threatened species (Sections 3.2.3 and 3.3.2) or habitat for them (Appendix 1 and 2).

For land that is privately owned, is not declared 'critical habitat' for the purposes of the FFG Act and the flora species are not being taken for the purpose of commercial sale, a protected flora permit is not required. There are currently no areas of declared 'critical habitat' under the FFG Act. Therefore, for areas of private land a protected flora permit will not be required.

Parts of the construction footprint are on public land (e.g. roadsides and Crown land). Protected flora species, threatened species and threatened communities are present (Sections 3.2, 3.3 and 3.4), and a protected flora permit from DELWP will be required for public land if any of these species or communities will be affected by the Project.

4.2.3 Flora and Fauna Guarantee Amendment Act 2019

The FFG Amendment Act amends the FFG Act to provide for a modern and strengthened framework for the protection of Victoria's biodiversity. More specifically the FFG Amendment Act:

- Retains the FFG Act's objective to 'guarantee' the future of Victoria's flora and fauna and updates it to recognise the importance of flora and fauna adapting to environmental change.
- Introduces principles to guide the implementation of the FFG Act, including consideration of the rights and interests of Traditional Owners and the impacts of climate change.
- Requires consideration of biodiversity across government to ensure decisions and policies are made with proper consideration of the potential impacts on biodiversity.

- Clarifies existing powers to determine critical habitat and improves their protection by encouraging cooperative management.
- Gives effect to a consistent national approach to assessing and listing threatened species, the Common Assessment Method, which will reduce duplication of effort between jurisdictions and facilitate the monitoring and reporting of species' conservation status.
- Modernises the FFG Act's enforcement framework including stronger penalties.

The amendments take effect on 1 June 2020.

The clarification of powers to determine critical habitat may result in the declaration of areas of 'critical habitat' under the FFG Act. Currently there are no areas of critical habitat declared under the FFG Act. Should areas of critical habitat be declared within the construction footprint this would trigger the requirement for a permit under the FFG Act regardless of land tenure (public or private).

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

The *Planning and Environment Act 1987* (PE Act) controls the planning and development of land in Victoria, and provides for the development of planning schemes for all municipalities. The P&E Act includes a statutory device, the Victoria Planning Provisions (a series of reference documents used to ensure a consistent strategic approach to planning issues throughout Victoria). As a result, responsibilities for the clearance of native vegetation are referenced under the PE Act as well as under the Victorian Government's Guidelines. These responsibilities are generally enacted under the relevant municipal planning scheme.

However, Section 85 of the Pipelines Act provides exemption from the need for a pipeline licensee to secure permits pursuant to the PE Act.

Of relevance to the Project, agreements between the pipeline regulator and other government departments, ensure that relevant government policies such as State Environment Protection Policies or those related to vegetation management still apply.

A planning permit under the PE Act will not be required for the Project given the Pipelines Act exemption. However the Project will need to address state government policy regarding assessing and compensating for the removal of native vegetation as set out in the *Guidelines for the removal, destruction or lopping of native vegetation* (Guidelines) (DELWP 2017a). This is addressed further in Section 4.2.5 below.

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

The Guidelines are incorporated into the Victoria Planning Provisions and all planning schemes in Victoria. The purpose of the Guidelines is to set out and describe the application of Victoria's statewide policy in relation to assessing and compensating for the removal of native vegetation. The objective for the Guidelines in Victoria is 'No net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation'.

The Guidelines should be applied or considered, as appropriate, in decision making under approval processes for the removal of native vegetation that fall outside planning schemes. These may include approval processes that allow exemptions from requiring a planning permit to remove native vegetation to be relied on, or approvals under the Pipelines Act or the *Mineral Resources (Sustainable Development) Act 1990*. In such instances, assessment under the Guidelines (and provision of offsets required under the guidelines) can be used as a mechanism for addressing the environmental mitigation requirements of a project relating to the proposed removal of native vegetation.

When making decisions about proposals that involve, or will lead to, the removal, destruction or lopping of native vegetation, the three step approach in accordance with the Guidelines will be applied:

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

Decision guidelines depend on the assessment pathway relevant to the proposal. The assessment pathway can be basic, intermediate or detailed, and is determined by reviewing the following information:

- The DELWP native vegetation location risk categories mapped in areas where native vegetation is proposed to be removed, which will be examined using the NVIM online tool.
  - Location 3 – includes locations where the removal of less than 0.5 hectares of native vegetation could have a significant impact on habitat for a rare or threatened species.
  - Location 2 – includes locations that are mapped as endangered EVCs and/or sensitive wetlands and coastal areas and are not included in Location 3.
  - Location 1 – includes all remaining locations in Victoria.
- The location and amount of vegetation proposed for removal.
- The location and number of large trees proposed for removal.
- The extent of past native vegetation removal on the same property, and under the same ownership, within the preceding five year period.

The assessment pathway is determined as outlined below and summarised in Table 18:

- Applications involving removal of less than 0.5 hectares of native vegetation from location category 1 will be assessed under the **basic** assessment pathway if no large trees are proposed for removal. If any large trees are proposed for removal, the application will be assessed under the **intermediate** pathway.
- Applications involving removal of less than 0.5 hectares of native vegetation from location category 2 will be assessed under the **intermediate** pathway.
- Applications for removal of 0.5 hectares or more will be assessed under the **detailed** pathway, as will all applications involving any extent of native vegetation removal from location category 3.

Table 18 Determining the assessment pathway under the Guidelines

Extent	Location category		
	Location 1	**Location 2**	**Location 3**
Less than 0.5 hectares and not including any large trees	Basic	Intermediate	Detailed
Less than 0.5 hectares and including one or more large trees	Intermediate	Intermediate	Detailed
0.5 hectares or more	Detailed	Detailed	Detailed

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Depending on the assessment pathway, an assessment of native vegetation removal must address specific Application requirements and Decision guidelines listed under the tables to Sections 6.4.1, 6.4.2 and Section 7 of the *Guidelines*.

Based on the current construction footprint and native vegetation mapping compiled in this assessment, the Project will be assessed under the detailed assessment pathway.

4.2.6 Catchment and Land Protection Act 1994 (CaLP Act)

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

Eleven declared noxious weeds have been identified within the construction footprint as listed in Appendix 4 (Table A4.1).

Key potential constraints include the State Prohibited Weed Lobed Needle-grass *Nassella charruana* recorded at 2LP130336 (KP 51). A previous record for this species also exists between KP 43-44.

No established pest animals have been recorded within 5 kilometres of the construction footprint however European rabbit and Fox are known to be established across the construction footprint.

The Act prohibits the movement and sale of noxious weeds of all categories anywhere in the State, and covers weed seeds occurring as contaminants in seed lots, plant products or on vehicles, machinery or animals. Specifically, it is an offence to:

- Remove or sell soil, sand, stone, gravel, fodder or grain likely to contain any part of a noxious weed without a permit. A person who contravenes any of these prohibitions may be directed to remove the noxious weed from any infested goods (animal, plants, vehicle, soil, sand, gravel and stone) or destroy them or restrict the movement if it is likely to spread weeds;
- Buy, sell, possess for sale, bring into the State or transport within the State without a permit noxious weeds, seeds of noxious weeds or any part of a noxious weed capable of growing;

A permit will be required under the CaLP Act if removal of soil, sand, stone, gravel, fodder or grain likely to contain any part of a noxious weed or transport of noxious weeds, seeds of noxious weeds or any part of a noxious weed capable of growing is proposed.

Link for further information: http://agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds.

4.2.7 Wildlife Act 1975 and associated Regulations

The *Wildlife Act 1975* and the Wildlife Regulations 2002, administered by DELWP, were established in order to protect wildlife throughout Victoria from extinction, while making provisions for regulated possession, trade and utilisation of wildlife for private and commercial purposes through licensing.

'Wildlife', as defined under the *Wildlife Act 1975*, includes:

- Any animal of a vertebrate taxon that is indigenous to Australia.
- All kinds of deer, nonindigenous quail, pheasants, and partridges.
- Any taxon of animal which the Governor in Council declares to be wildlife for the purposes of the *Wildlife Act 1975*.
- Any taxon of terrestrial invertebrate animal that is listed under the FFG Act.
- Any hybrids of a taxon of animal specified above.
- Includes any such animal or any member of a taxon which is bred or kept in captivity or confinement.

The term 'wildlife' refers to wildlife in any form whether dead or alive, and includes any individual part of an animal, however the Wildlife Act does not apply to fish, as defined under the *Fisheries Act 1995*.

It is an offence to kill, take, control or harm wildlife under the *Wildlife Act 1975*. Anyone wishing to manage wildlife must have an authorisation from DELWP. The Wildlife Regulations 2002 prescribe penalties for persons who wilfully damage, disturb or destroy any wildlife habitat without appropriate authorisation.

DELWP advises that exemption from the need to obtain a planning permit (under the planning scheme) constitutes appropriate authorisation and therefore the habitat protection provisions under the Wildlife Regulations 2002 are not applicable to the Project.

4.2.8 Fisheries Act 1995

The *Fisheries Act 1995* provides a legislative framework for the regulation, management and conservation of Victorian fisheries including aquatic habitats.

A person must not take, injure, damage, destroy or release any protected aquatic biota. Protected aquatic biota includes all species of the family Syngnathidae (seahorses, sea dragons and pipefish), and any fish or aquatic invertebrate or community that is listed under the FFG Act.

Protected aquatic biota that may be impacted by the Project include:

- Australian Grayling *Prototroctes maraena*
- Murray Cod *Maccullochella peelii.*

Providing mitigation measures outlined in this report are adhered to, the potential for protected aquatic biota as listed above, to be injured, damaged or destroyed is considered to be negligible and no Protected Aquatic Biota permit is required from DELWP. However, consultation with DELWP is recommended as it is an offence under Section 119 of the Fisheries Act to obstruct the free passage of fish, and a General permit may be required under Section 49 of the Act.

4.2.9 Water Act 1989

The primary purpose of the *Water Act 1989* is to provide a framework for the allocation and management of surface water and groundwater throughout Victoria. It provides a principal mechanism for maintenance of ecosystem functions including those of aquatic ecosystems. Under By-Laws created by the relevant Authority under the Act, the authorities regulate the works within and in the vicinity of waterways.

The Project will involve construction or maintenance activities that affect beds and banks of waterways, riparian vegetation or quality or quantity of water in Jacksons Creek, Deep Creek, Merri Creek, Tame Street Drain and Kalkallo Creek.

The Project will require approval from Melbourne Water / the Port Philip and Westernport CMA for the crossing of all designated waterways in the construction footprint. Guidelines and application forms are available from CMAs online, or can be obtained from Melbourne Water's Asset Service team – 03 9235 1414.

4.2.10 Environment Protection Act 1970: State Environmental Protection Policy (Waters) 2018

The Environment Protection Act underpins the State Environmental Protection Policy (SEPP) - Waters which provides a legal framework for the protection and rehabilitation of Victoria's surface water environments.

The Project may directly and/or indirectly impact upon Merri Creek, Jacksons Creek and Deep Creek and their associated aquatic ecosystems. The SEPP requires that aquatic ecosystem values be protected. Environmental quality objectives and indicators are defined to protect beneficial uses (i.e. the uses and values of the water environment) and an attainment program provides guidance on protection of the beneficial uses.

Impacts to surface water quality must not result in changes that exceed background levels and/or the water quality objectives specified for the Central Foothills and Coastal Plains segment to protect surface water uses and values. APA needs to ensure that direct and indirect (e.g. runoff) impacts to surface water quality do not exceed the background levels and/or water quality objectives.

Link to further information: https://www.epa.vic.gov.au/about-us/legislation/water-legislation/water-related-policies.

4.2.11 Regional Catchment Strategy and River Health Strategy

State Planning Policy Framework Clause 14.02-1 (Catchment planning and management) states that planning must consider as relevant, Regional Catchment Strategies (RCS) and any associated implementation plan or strategy including any regional river health and wetland strategies.

Strategies of relevance to the Project are the:

- Port Phillip & Western Port Region Regional Catchment Strategy https://www.ppwrcs.vic.gov.au/
- Melbourne Water Healthy Waterways Strategy 2018-2028 https://yoursay.melbournewater.com.au/healthy-waterways/document-library
- Melbourne Water Maribyrnong Catchment Region Program (Jacksons Creek and Deep Creek)
- Melbourne Water Yarra Catchment Region Program (Merri Creek)

These documents provide recommendations on the protection of existing high-value rivers and creeks that are in good condition and strategic improvement of other rivers and creeks. All three creeks, Jacksons Creek, Deep Creek and Merri Creek, are listed as important waterways in their respective catchments. In addition, all three waterways provide important aquatic habitat for local flora and fauna as well as hold important cultural values for current and past residents. Mitigation measures (Section 6) have been recommended to minimise disturbance to the bed and banks of waterways and reduce the temporal scale of impacts as far as practicable. The proposed works will result in short-term localised impacts, which are considered unlikely to affect the ecological character of the waterways crossed by the construction footprint.

5. Offset obligations

Estimates of Commonwealth and State offset obligations based on ecological information collected to date are provided below. Due to the Project traversing areas both within and outside of the MSA, different offset obligations apply at both Commonwealth and State levels. This assessment will be subject to finalisation once detailed Significant Impact Criteria assessment are undertaken for MNES based on the comprehensive survey results, a final construction footprint and a final vegetation clearing footprint. It is likely these assessments will take place as part of preparing the Project EES and EPBC assessment documentation.

5.1 Commonwealth

5.1.1 Inside the approved MSA areas

Habitat compensation obligations to offset the loss or deemed loss of particular listed threatened species habitat and/or native vegetation for the Revision 5 construction footprint is presented in Table 19. The HCO statement for the Project is available in Appendix 7. The total cost to meet HCOs under the MSA is $805,520.00 excluding GST.

The *Melbourne Strategic Assessment (Environment Mitigation Levy) Act 2020* (Levy Act) will commence on 1 July 2020. The Levy Act will introduce an environment mitigation levy scheme (Levy) to replace the HCOs that exist under the EPBC Act approval conditions. The levied funds will be used to pay for biodiversity conservation measures, such as the acquisition of the 15,000 hectare Western Grasslands Reserves and the 1,200 hectare Grassy Eucalypt Woodland Reserve.

It is unlikely HCOs will be paid prior to 1 July 2020, therefore the Levy Act will apply. The total cost to meet the Levy Act is $960,206.00 excluding GST. A review of the Levy amounts was undertaken and the results are shown in Table 19 below. It is noted the Levy unit fees will be indexed and updated over time (at the beginning of each financial year) to return the MSA offset obligations to full cost recovery by 2024–25. The below costs will be subject to change if payment is not made prior to 1 July 2021.

Table 19 HCO/Levy Act costs for the Project

Habitat type	Obligation	HCO unit fee ($ per ha)	HCO Cost (ex GST)	Levy Act unit fee (FY20/21) (ex GST)	Levy Act Cost (ex GST)
Native vegetation	4.498 ha	$ 95,075	$ 427,647.00	$113,441	$510,258.00
Spiny Rice-flower	1.065 ha	$ 7,937	$ 8,453.00	$8,522	$9,076.00
Matted Flax-lily	3.432 ha	$ 11,196	$ 38,425.00	$11,351	$38,957.00
Golden Sun Moth	32.418 ha	$ 7,914	$ 256,556.00	$10,005	$324,342.00
Growling Grass Frog	9.887 ha	$ 7,529	$ 74,439.00	$7,846	$77,573.00
		HCO Total (ex GST)	**$805,520.00**	**Levy Act Total (ex GST)**	**$960,206.00**

5.1.2 Outside the approved MSA areas

This section provides refined offset obligation estimates for potential impacts to threatened species and ecological communities based on the results of the field assessments and preliminary Significant Impact Criteria assessments. These preliminary assessments conclude that EPBC Act listed biota Matted Flax-lily, Striped Legless Lizard, Golden Sun Moth, Growling Grass Frog, Natural Temperate Grassland of the Victorian

Volcanic Plain and Grassy Eucalypt Woodland of the Victorian Volcanic Plain may be impacted by the project but whether this impact is significant will be subject to a final assessment. Both Revision 5 construction footprint options are considered in the offset discussion below.

5.1.2.1 Matted Flax-lily

Under the current alignment of the construction footprint the Matted Flax-lily identified at 218268306 would be directly impacted. This individual may be translocated to a suitable receptor site to minimise the likelihood of residual impacts to this MNES and thus any offset requirements. The level of residual impact will inform the decision as to whether EPBC offsets are required for this species.

5.1.2.2 Striped Legless Lizard

Under the current alignment of the construction footprint avoidance of the SLL habitat within 11LP92520 and 12LP92520 is not possible. As such there is a high risk of a significant impact on an important population and EPBC offsets are likely to be required for all SLL habitat on these two parcels. Habitat extent has been estimated as 0.82 hectares. Given that the impacted population is occupying high quality habitat, the offsets are likely to be in the order of 3 to 4 times the area of impact (i.e. an offset area of 2.5 to 3.3 hectares may be required) but would need to be subject to detailed assessment against the EPBC offset policy and calculator.

5.1.2.3 Golden Sun Moth

Under the current alignment of the construction footprint avoidance of recorded GSM habitat within areas outside of the MSA is not possible. As such there is a risk of a significant impact and EPBC offsets are likely to be required for all GSM habitat outside the approved MSA areas. In order to estimate offset requirements, all similar habitat in parcels where GSM were found that were connected by a distance of less than 200 metres was considered to be 'confirmed' GSM habitat. Where there are breaks of greater than 200 metres between habitat patches, they were assumed to be not occupied (based on dispersal ability of the females). Breaks in habitat continuity can include features such as crops, ploughed land or grassland not supporting GSM food plants.

Offsets for GSM are likely to be in the order of 3 to 5 times the area of impact (86.4 – 144.0 hectares) but would need to be subject to detailed assessment against the EPBC offset policy and calculator once all areas of suitable habitat within the construction footprint have been fully surveyed and final impacts are known.

5.1.2.4 Growling Grass Frog

Assessment and survey to date has identified known GGF habitat affected by the WORM project at Jacksons, Deep and Merri Creeks.

Habitat occupied offstream has been confirmed at one farm dam on 10LP5364. A nearby dam spanning both 10LP5364 and 1LP113763 is considered likely to be occupied. This dam is directly impacted by the construction footprint. Both of these dams are in the approved MSA area and are permitted to be removed as part of urban development. There are no HCOs for GGF on the parcels where these dams occur.

GGF were not recorded in any offline waterbodies outside the approved MSA areas surveyed during the 2019/20 Active season. Most of the dams surveyed were considered to have a low probability of supporting GGF due to their relative isolation (distance to known GGF populations) and low cover of aquatic vegetation. Offsets may be required should future surveys detect GGF in offline waterbodies outside the approved MSA areas.

With careful and well-planned construction protocols and mitigation measures, including erosion and sediment control and aquatic and terrestrial habitat reinstatement, it is likely that GGF will continue to use the

sections of stream affected by construction activities. For this reason, we consider EPBC offsets are not required for impacts to GGF habitat at the Jacksons and Deep Creek crossing locations. Impacts to habitat at the Merri Creek GGF conservation area crossing will need to be addressed as part of the protocols outlined in the BCS and associated supporting documentation. A detailed conservation management plan and WICA application will need to be prepared and payment of HCOs will be required for GGF habitat removed in the conservation area.

5.1.2.5 Natural Temperate Grassland of the Victorian Volcanic Plain

An average quality score for patches of NTGVVP within the areas outside the approved MSA areas was estimated at 4/10. This was determined by the weighted average quality of each patch based on patch size. Using this quality score and the area of NTGVVP mapped outside the approved MSA areas (6.76 ha), EPBC offset estimates for this community are estimated at 33 hectares with a quality score of 5/10 at the offset site.

5.1.2.6 Grassy Eucalypt Woodland of the Victorian Volcanic Plain

An average quality score for patches of GEWVVP within the areas outside the approved MSA areas was estimated at 3/10. This was determined by the weighted average quality of each patch based on patch size. Using this quality score and the area of GEWVVP mapped outside the approved MSA areas (2.39 ha), offset estimates for this community are estimated at 9 hectares with a quality score of 5/10 at the offset site.

5.2 State

5.2.1 Inside approved MSA areas

For areas inside the approved MSA areas, DELWP's Native Vegetation Time Stamped Dataset contains condition scores for native vegetation. Habitat compensation obligations or the Levy (whichever is applicable at the time of payment) to offset the loss or deemed loss of particular listed threatened species habitat and/or native vegetation, presented in Table 19 (Section 5.1.1), also cover State-based offset obligations.

5.2.2 Outside approved MSA areas

Biodiversity offset obligations for the removal of native vegetation are covered under the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017a). To ensure 'no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation' offset requirements are measured in either general habitat units (GHUs) or species habitat units (SHUs). For a detailed assessment pathway project, the species-general offset test will determine if a general offset, species offset or combination of both is required. Offsets require at least one large tree to be offset for every large tree removed or deemed lost through tree protection zone (TPZ) encroachment.

Two native vegetation removal scenarios were submitted to DELWP based on the two possible alignment options at KP 18 (parcels 2LP130112 and 1TP107502) (see Figure 3 for alignment options). Both alignment options require a combination of general and species specific offsets. The biodiversity offset obligations for the northern option (Project ID: 31496_VegClearing1), which traverses the dam on 2LP130112, are summarised in Table 20. Offset obligations for the southern option (Project ID: 31496_VegClearing2), which avoids the dam on 2LP130112, are summarised in Table 21. There are minor differences between the two options in terms of GHUs and SHUs. Native vegetation removal (NVR) reports for both options are provided in Appendix 6.

Table 20 Biodiversity offset obligations for the construction footprint (northern option – NVR Project ID: 31496_VegClearing1) outside of the approved MSA areas

Attribute	Outcome	Notes
Location category	3	-
Proposed native vegetation removal extent	19.340 ha	51 patches, 12 scattered trees
Extent of past removal	10.406 ha	-
Assessment pathway	Detailed	-
Strategic Biodiversity Value Score	0.190 - 0.960	SBV ranges depending on patch
Modelled habitat for rare or threatened species	Yes	Removal will have a significant impact on modelled habitat for the following rare or threatened species: Small Golden Moths *Diuris basaltica* Heath Spear-grass *Austrostipa exilis* Bacchus March Wattle *Acacia rostriformis*
Offset requirements	General and Species	-
General offsets		
Offset amount: general habitat units	4.430 units	-
General offset vicinity	Port Phillip and Westernport CMA or Hume City, Melton City Council	The offset site must be located within the same Catchment Management Authority boundary or municipal district as the native vegetation to be removed.
General offset minimum Strategic Biodiversity Value Score	0.449	-
Large trees	5 large trees	20 large trees in total to be protected in either the general, species or combination across all habitat units protected
Species offsets		
Offset amount: general habitat units	8.486 units for Small Golden Moths 8.616 units for Heath Spear-grass 6.662 units for Bacchus Marsh Wattle	-
Large trees	15 large trees	20 large trees in total to be protected in either the general, species or combination across all habitat units protected

Table 21 Biodiversity offset obligations for the construction footprint (southern option – NVR Project ID: 31496_VegClearing2) outside of the approved MSA areas

Attribute	Outcome	Notes
Location category	3	-
Proposed native vegetation removal extent	19.199 ha	51 patches, 12 scattered trees
Extent of past removal	10.406 ha	-
Assessment pathway	Detailed	-
Strategic Biodiversity Value Score	0.190 - 0.960	SBV ranges depending on patch
Modelled habitat for rare or threatened species	Yes	Removal will have a significant impact on modelled habitat for the following rare or threatened species: Small Golden Moths *Diuris basaltica* Heath Spear-grass *Austrostipa exilis* Bacchus March Wattle *Acacia rostriformis*
Offset requirements	General and Species	-
General offsets		
Offset amount: general habitat units	4.385 units	-
General offset vicinity	Port Phillip and Westernport CMA or Hume City, Melton City Council	The offset site must be located within the same Catchment Management Authority boundary or municipal district as the native vegetation to be removed.
General offset minimum Strategic Biodiversity Value Score	0.450	-
Large trees	5 large trees	20 large trees in total to be protected in either the general, species or combination across all habitat units protected
Species offsets		
Offset amount: general habitat units	8.527 units for Small Golden Moths 8.655 units for Heath Spear-grass 6.701 units for Bacchus Marsh Wattle	-
Large trees	15 large trees	20 large trees in total to be protected in either the general, species or combination across all habitat units protected

6. Constraints, recommendations and conclusions

6.1 Implications and recommendations

A number of biodiversity constraints are present across the construction footprint. These constraints stem largely from the presence of native vegetation, threatened ecological communities, threatened species and habitat within the construction footprint.

The identified constraints and how they may influence design, construction and approvals are summarised in Table 22. Recommendations and mitigation measures to avoid and minimise impacts to biodiversity values are also provided.

The primary measure to reduce impacts to biodiversity values within the construction footprint is to avoid and minimise removal of native vegetation and terrestrial and aquatic habitat. It is critical that this be considered during the final design phase of the Project, when key decisions are made about the alignment, location of ancillary infrastructure, site compounds, access roads, temporary material storage and stockpiles. The results of this assessment should therefore be incorporated into final project design and options to retain as much of the mapped vegetation/habitats as possible be investigated through construction methods, and micro-siting where possible. Priority should be given to highest value areas and retaining larger areas in preference to numerous smaller ones.

This report identifies a number of areas where on-ground biodiversity assessments were not able to be completed (as outlined in Section 2 and documented in Appendix 5) due to land access constraints. Further surveys will be required in these areas in order to assess the full impact of the Project on biodiversity. Where further surveys are required to determine the full impact of the Project on an identified constraint (value), this is also indicated in Table 22.

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Table 22 Biodiversity values and recommendations

No.	Value	Presence in the construction footprint	Implications	Recommendations
1.	**Native vegetation (Section 3.1, Figure 7)**	Native vegetation (estimated 23.3 ha) occurs within the construction footprint. Six parcels still require an assessment to determine the extent and condition of native vegetation (see Section 2.2.1.5).	Removal, destruction or lopping of native vegetation. Assessment in accordance with the Guidelines will be required. Offset requirements based on removal of all on-ground assessed or PNV modelled native vegetation within the construction footprint are outlined in Section 5. Native Vegetation Removal (NVR) reports are provided in Appendix 6 for Project options. Updated NVRs will be required if additional native vegetation is identified on parcels not surveyed to date or assumed presence is incorrect. The Project will need to demonstrate how impacts to areas of native vegetation have been avoided and minimised.	The mapped and modelled information provides a basis for refining a construction footprint that will avoid and minimise impacts to native vegetation. On-ground assessments will be required for those parcels not yet assessed to verify the full extent of native vegetation within the construction footprint outside the MSA approved areas. This report has used PNV mapping and modelled condition to assess impacts for these parcels. Updated NVR reports incorporating site data for these parcels will be required. Avoid and minimise impacts to native vegetation. Consideration should be given to: • role of native vegetation in land and water protection • any landscape value that the native vegetation has • the cultural heritage value of the native vegetation • the condition score of the native vegetation to be removed and any to be retained • the extent of native vegetation removal and any native vegetation being retained • the strategic biodiversity value score of the native vegetation to be removed and any to be retained • how many large trees are to be removed and if any are to be retained • whether the vegetation is an endangered Ecological Vegetation Class • whether the vegetation is a sensitive wetland or coastal area • whether the vegetation is habitat for rare or threatened species. Patches of native vegetation identified in Table 4 should be given the highest priority for avoid / minimise efforts. Construction techniques which minimise impacts in areas with high biodiversity value or other significant values(s) should be employed. This includes areas which: • support threatened species • have high condition (condition score 0.6-1) • have high strategic biodiversity value (0.8-1) • support large trees • have a threatened bioregional EVC status • are important for land or water protection (e.g. steep slopes or riparian areas) • will be significantly impacted or lead to fragmentation. Additional consideration is given to these values under items 2-7 and 13 below. Native vegetation immediately adjacent to the construction footprint will require protection for the duration of construction. This can be achieved through clear delineation of construction areas to minimise any impacts outside the construction footprint. All temporary ancillary areas disturbed should be rehabilitated to reinstate the landform and soil surface. Where temporary disturbance areas occur within, or immediately adjacent to, an area of native vegetation they should be revegetated with locally indigenous species to minimise potential for consequential impacts.

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No.	Value	Presence in the construction footprint	Implications	Recommendations
2.	**Native vegetation condition (Section 3.1.4)**	The construction footprint contains mapped and modelled native vegetation with condition scores ranging between 0.17 and 0.53 for on-ground assessments and 0.11 to 0.80 based on the Timestamped data. High condition score implies high quality native vegetation is present. High condition is classified as a score range of 0.6-1.0, moderate 0.3 to 0.6 and low below 0.3 (DELWP 2018).	Loss of native vegetation with moderate to high condition score. The condition score is a biodiversity value of native vegetation used in calculating biodiversity losses under the Guidelines. The Project will need to demonstrate how impacts to areas of higher quality vegetation have been avoided and minimised.	Avoid and minimise impacts to higher quality native vegetation. Avoid and minimise impacts to native vegetation and habitat in areas with a high SBV. On-ground assessments will be required to determine the condition of native vegetation within parcels for which no field assessment has been completed. Employ construction techniques that minimise impacts to areas of higher native vegetation condition score such as directional drilling.
3.	**Strategic biodiversity value (SBV) (Section 3.6)**	The SBV of the construction footprint ranges from 0.11-1.0.	Loss of areas of high SBV. The SBV is a biodiversity value of native vegetation used in calculating biodiversity losses under the Guidelines. SBV scores are in the high range, when above 0.8 (DELWP 2018). A higher score indicates a location where many values, that are not widespread or common, are found together. The Project will need to demonstrate how impacts to areas of high SBV have been avoided and minimised.	

No.	Value	Presence in the construction footprint	Implications	Recommendations
4.	**Wetlands and Groundwater Dependent Ecosystems (GDEs) (Sections 3.1.5 & 3.1.7)**	Wetlands and GDEs have been recorded from or are predicted to occur within the construction footprint.	The Project does not traverse any wetlands of international importance, and there are no records of any nationally significant wetlands within the construction footprint or likely to be adversely impacted by construction Activities. The Project will impact a number of mapped wetlands (DELWP Current Wetland layer) and areas of potential GDEs. Impacts are to areas previously disturbed (e.g. within the VNI easement) or are local and likely to be temporary provided appropriate mitigation measures are implemented. Wetlands shown in the DELWP Current Wetland layer could not be assessed in accordance with the Guidelines but have been incorporated into the native vegetation mapping with modelled condition scores. Native vegetation mapped as part of this assessment also overlaps with areas of potential GDEs identified in the Biosis (2019) desktop assessment.	Construction within or immediately adjacent to mapped wetlands should be undertaken during dry periods and appropriate sediment controls be implemented to avoid impact to adjacent wetland values. Environment controls should be documented in a Construction Environmental Management Plan (CEMP). All temporary disturbance areas should be rehabilitated to reinstate local hydrology, landform and soil surface. Where temporary disturbance areas occur within, or immediately adjacent to, a wetland they should be revegetated with locally indigenous wetland species to minimise potential for consequential impacts. Any impact to GDEs is likely to be highly localised provided the mitigation measures recommended in the Alluvium (2019) report are implemented.
5.	**Native trees and tree protection zones (TPZs) (Section 3.1.6, Figure 7, Appendix 5)**	Native canopy trees occur within the construction footprint as scattered trees and as trees within patches of native vegetation. 21 scattered trees and 15 large canopy trees within patches will be impacted. Six parcels still require an assessment to determine the presence of native canopy trees (see Section 2.2.1.5).	Loss of native canopy trees and habitat values (e.g. hollows, nectar sources, roosting sites). Under the Guidelines scattered trees contribute to native vegetation removal extent and large trees are considered a key biodiversity value of native vegetation. Key areas of constraint for native trees are listed in Section 3.1.5. TPZs for all scattered trees and large trees in patches are provided in Appendix 5. A tree is considered lost if greater than	Complete surveys on parcels where a site assessment has not yet been undertaken to determine any additional tree impacts within the construction footprint. Native canopy trees (both scattered and in patches) should be avoided where possible, particularly large trees and/or trees with hollows which provide important habitat value. Develop construction methods to avoid work in the TPZ where possible (e.g. under boring) . An arborist assessment should be obtained where impacts to greater than 10% of a TPZ are proposed and it is proposed to retain the tree. Trees adjacent to the construction footprint will require protection for the duration of construction. All tree protection during construction should be undertaken according to Australian Standards (Australian Standard 4373-2007 and Australian Standard 4970-2009).

No.	Value	Presence in the construction footprint	Implications	Recommendations
			10% of a TPZ is impacted/encroached by construction activities that result in soil disturbance and compaction, unless an arborist assessment determines otherwise. Updated NVRs will be required if additional scattered trees or large trees within patches are identified on parcels not surveyed to date. The Project will need to demonstrate how impacts to native canopy trees have been avoided and minimised. Each large tree removed will need to be offset with one other large tree.	
6.	**Endangered EVCs (Section 3.1.2)**	The construction footprint contains an estimated 23.30 ha of endangered EVCs.	Loss of bioregionally endangered vegetation classes. Endangered EVCs are considered as a biodiversity value of native vegetation used in calculating biodiversity losses under the Guidelines. The Project will need to demonstrate how impacts to areas endangered EVCs have been avoided and minimised.	Complete surveys on parcels where a site assessment has not yet been undertaken to determine any additional endangered EVC impacts within the construction footprint. Avoid and minimise impacts to native vegetation and habitat in areas of endangered EVCs Consideration should be given to construction techniques that minimise impacts in areas of endangered EVCs which have other identified biodiversity value(s).
7.	**Landscape context**	Native vegetation and habitat within the construction footprint has connectivity with other native vegetation and habitat in the broader landscape. This is primarily through the following drainage lines: • Jacksons Creek • Deep Creek • Kalkallo Creek • Merri Creek	The amount of native vegetation being removed and the context it is being removed from are considered when determining the biodiversity value of native vegetation proposed to be removed under the Guidelines. The Project will temporarily impact native vegetation and habitat connectivity within the landscape at a local level.	Where connectivity will be impacted by construction, native vegetation and habitat values should be reinstated as part of the site rehabilitation to ensure no long term fragmentation. Where connectivity for fauna movement will be restricted during construction a fauna management plan (FMP) should be implemented. At a minimum a Kangaroo Management Plan (KMP) is recommended.
8.	**Threatened species (Sections 3.2 and 3.3, Figures 4 – 6, and 8 - 10)**	Threatened species have been recorded from and are predicted to occur within the construction footprint. This includes seven threatened species	Impact to threatened species including loss of habitat, populations or individuals. Provisions of the federal EPBC Act and	Avoid and minimise impacts to threatened species. Where species or habitat cannot be avoided, mitigation measures should be implemented including translocation of threatened flora, relocation of threatened fauna during construction, reinstatement of habitat post-construction and implementation of appropriate offsets. On ground assessments will be required for those parcels not yet assessed, or where assessments were incomplete, to determine the full

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No.	Value	Presence in the construction footprint	Implications	Recommendations
		recorded during the current assessment: - Growling Grass Frog (EPBC Act, FFG Act, DELWP Advisory listed) - Golden Sun Moth (EPBC Act, FFG Act, DELWP Advisory listed) - Striped Legless Lizard (EPBC Act, FFG Act, DELWP Advisory listed) - Tussock Skink (DELWP advisory listed) - Matted Flax-lily (EPBC Act, FFG Act, DELWP Advisory listed) - Tough Scurf-pea (FFG Act, DELWP advisory listed) - Flax-lily (DELWP advisory listed) A number of parcels still require an assessment to determine the presence or extent of threatened species or habitat values (see Section 2.2 and Appendix 5).	state FFG Act apply. Detailed EPBC Significant Impact Criteria assessments are pending and will inform the need for offset for threatened biota outside the MSA. DELWP will need to be consulted regarding any impacts on FFG Act or threatened species on public land, and regarding impacts to Advisory listed species within the construction footprint. Statutory obligations are detailed in Section 4. The Project will need to demonstrate how impacts to threatened species have been avoided and minimised.	extent of potential threatened species impacts within the construction footprint. Complete Significant Impact Criteria assessments. Species specific recommendations are outlined below. **Growling Grass Frog** • Further GGF surveys in areas of potential habitat identified during the field assessments are recommended in order to more accurately determine whether a significant impact is likely on this species. • It is important to emphasise that waterbodies that are semi-permanent or permanent are of greatest value to the species (most likely to be occupied) and are more likely to be being breeding sites. Conversely, intermittent and ephemeral waterbodies are less likely to be occupied by that species and may not retain water long enough for the breeding cycle to be completed. • It is recommended that waterbodies that were dry at the time of assessment be analysed using historic Nearmap imagery to get a better understanding of their hydrology (permanency). The hydrology of waterbodies can also be gleaned by asking the landowners themselves, who are familiar with the filling and drying regimes of waterbodies on their property. • Waterbodies that are found to be consistently dry at all times are not likely to constitute important GGF habitat and do not warrant any additional survey for the species. Those that are considered to be ephemeral or intermittent (do not retain water over the critical spring-summer GGF active period) are also less likely to be occupied. • However, we recommend survey for the species in any waterbodies that are identified through Nearmap and landowner interrogation as being semi-permanent the definition of Heard and Scroggie (2010). That is, waterbodies that only dry out during periods of below average rainfall (as experienced during the current assessment). Ideally this could, if rainfall permits, be undertaken in the 2020/21 Active season for the species. • Impact to confirmed high value habitat for the species should be minimised. It is recommended that alternative construction techniques be considered to open cut construction methodology through Merri, Deep and Jacksons Creeks to reduce temporary impacts on GGF. • Where open trenching techniques are required within areas of confirmed high value habitat it is recommended appropriate impact mitigation measures be detailed in a fauna management plan (FMP) zoologist be present onsite during construction across confirmed habitat to ensure and individuals detected during construction are appropriately relocated. **Golden Sun Moth** • GSM surveys are required on parcels where surveys were unable to be completed due to access constraints. • Additional GSM surveys are recommended on parcels where surveys were incomplete to determine stocking rates for the species. • Where habitat for GSM will be impacted, it is recommended that the site be reinstated with GSM food source species as part of the site rehabilitation to ensure habitat connectivity is maintained in the longer term. **Striped Legless Lizard** • The population of SLL recorded within the construction footprint at property 12LP92520 constitutes an important population.

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No.	Value	Presence in the construction footprint	Implications	Recommendations
				Impacts to the species and habitat should be avoided and minimised within this property. • It is recommended that the construction footprint be realigned to avoid impact to the confirmed habitat for this species within Parcel 12LP92520. • Where impacts to SLL habitat cannot be avoided, it is recommended construction techniques which minimise impacts to the species and habitat be implemented e.g. directional drilling / boring techniques. • If open trenching is required within confirmed or potential habitat for the species it is recommended an FMP detail impact mitigation measures including the requirement for a zoologist to be present onsite during works in areas of potential or confirmed habitat, procedures for checking all excavation works as they progress and procedures for relocation of individual s detected during construction. • Habitat values in areas of confirmed or potential SLL habitat should be reinstated post construction. **Tussock Skink** • If open trenching is required within confirmed or potential habitat for the species it is recommended an FMP detail impact mitigation measures including the requirement for a zoologist to be present onsite during works in areas of potential or confirmed habitat, procedures for checking all excavation works as they progress and procedures for relocation of individual s detected during construction. • Habitat values in areas of Tussock Skink habitat should be reinstated post construction. **Matted Flax-lily** • A single Matted Flax-lily individual was identified within the fence line along an uncultivated area of roadside (218268306) adjacent to a paddock of Plains Grassy Woodland in 1PS733045. • Implement construction techniques which avoid direct impact to the Matted Flax-lily within the construction footprint e.g. micrositing. directional drilling / boring. • If direct impact to Matted Flax-lily cannot be avoided, develop and implement a translocation plan to mitigate impacts to the species. Determine whether a significant impact is likely on this species from these residual impacts. **Flax-lily** • One individual was recorded at 2PS343496. • Implement construction techniques which avoid direct impact to the Flax-lily within the construction footprint e.g. micrositing, directional drilling / boring. • If direct impact to the Flax-lily cannot be avoided, develop and implement a translocation plan to mitigate impacts to the species. **Tough Scurf-pea**

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No.	Value	Presence in the construction footprint	Implications	Recommendations
				• Implement construction techniques which avoid direct impact to the Tough Scurf-pea within the construction footprint e.g. micrositing, directional drilling / boring. • If direct impact to the Tough Scurf-pea cannot be avoided, develop and implement a translocation plan to mitigate impacts to the species.
9.	**Protected flora species (Section 3.2.3)**	Protected flora species have been recorded from the construction footprint.	Removal of protected flora. Provisions of state FFG Act apply. A permit to remove flora protected on public land (e.g. roadsides) under the FFG Act will be required.	Seek appropriate approval to remove protected flora on public land.
10.	**Threatened ecological communities (Section 3.4)**	Threatened ecological communities have been recorded from the construction footprint. This includes: • NTGVVP (EPBC Act listed) • GEWVVP (EPBC Act listed) • WPBGC (FFG Act listed) • WBPGW (FFG Act listed) Six parcels still require an assessment to determine the presence of threatened communities (see Section 2.2.1.5). • 1TP829278 • 11LP215406 • 1LP200366 • 1TP212870 • 6LP136262 • 9LP136262.	Impact to threatened ecological communities including potential reduction in extent or quality. Provisions of federal EPBC Act and state FFG Act apply. Detailed EPBC Significant Impact Criteria assessments are pending and will inform the need for offset for threatened communities outside the MSA DELWP will need to be consulted regarding any impacts on FFG Act threatened communities on public land.	Complete Significant Impact Criteria assessments. Avoid and minimise impacts to threatened ecological communities. Retain high quality vegetation and areas of vegetation critical to maintaining ecological value of the community wherever possible. Where impact to threatened ecological communities cannot be avoided mitigation measures should be implemented including micrositing around significant values (e.g. high quality native vegetation or large trees) during construction, reinstatement of ecological values (condition, extent, connectivity) post construction and implementation of appropriate offsets. On ground assessments will be required for those parcels not yet assessed, or where assessments were incomplete, to determine the full extent of potential threatened ecological community impacts within the construction footprint.
11.	**Conservation Areas (Section 3.5)**	There are two BCS Conservation Areas intersected by the construction footprint at approximately KP 42 – 43 and KP 48 – 49.	Works subject to the conditions of approval under the MSA. Requirement for no-net loss, for habitat for species or ecological communities listed under the EPBC Act. Where the Project intersects a Conservation Area identified in the BCS a Works in a Conservation Area (WICA) approval will be required as outlined in the *Guidance note: Implementing the Biodiversity Conservation Strategy for Melbourne's Growth Corridors* (the Guidance Note) (DELWP 2015).	Avoid and minimise impacts to habitat for species or ecological communities listed under the EPBC Act or to other significant values within the CAs, including large trees and other native vegetation. The construction footprint should be narrowed to the minimum extent required within the CAs. Wherever feasible stockpiles and ancillary construction areas should be located outside the CA. A WICA application should be submitted to DELWP for approval. The WICA will need to address the no net loss of habitat requirement for CAs. This could be through avoidance of habitat values, site rehabilitation post construction, or enhancement works elsewhere within the CA.

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No.	Value	Presence in the construction footprint	Implications	Recommendations
12.	**Noxious weeds and pest animals (Section 3.2.5 and 3.3.5)**	Records of noxious weeds within and adjacent to the construction footprint, including three State Prohibited weeds.	Control required under the CaLP Act.	The Project will need to comply with requirements to control/eradicate noxious weeds and pest species. Appropriate construction methods and contractor vehicle hygiene protocols will need to be developed and included in the Project's Construction Environmental Management Plan (CEMP). Restrictions may apply to the transport of material from land where State Prohibited noxious weeds are known to occur, such as Lobed Needle-grass. Controls will also apply to the introduction of weed and pathogens as a result of works. Post-works inspections will also be required to assess the presence of new weeds (i.e. within 12 months of completing construction)
13.	**Waterways**	Drainage lines and creeks are present throughout the construction footprint.	Disturbance of the structural integrity of the bed and banks of waterways and associated riparian and instream vegetation. Creation of potential short-term barriers to fish passage. Temporary impacts to known GGF habitat. Mobilisation of sediments and pollutants into waterways, which may negatively influence water quality. Need for approvals to disturb waterways.	Obtain relevant approvals for waterway disturbance. Appropriate safeguards and construction methods will need to be developed and implemented to avoid impacts to waterways. Any waterway crossings will need to be considered at a design stage and appropriate construction techniques and materials will be required to reduce impacts to creeks and drainage lines. Construction within the Merri Creek corridor should be limited to the existing VNI easement to minimise impacts to riparian vegetation and habitat. To ensure Activities associated with the proposed works result in minimal impacts to the aquatic ecological values of Merri Creek, Jackson Creek, Deep Creek, Kalkallo Creek and the Tame Street Drain the following recommendation are proposed: • Conducting construction during periods of low water levels and low local rainfall to reduce the movement of sediments/pollutants with the aim of minimising sediment loads exiting the site. Despite this,,sediment control measures are to be implemented during earthworks and should include sediment fencing around stockpiles and silt curtains installed downstream of the pipeline during instream works. • Ensure connectivity within the creek environments remains throughout the construction period to maintain fish passage. • Environment controls should be documented in a CEMP. The CEMP should include measures to monitor water quality within all three creeks pre, during and post construction. Furthermore, additional monitoring should be conducted during periods of high rainfall. • Minimise the removal of vegetation within the riparian zone to reduce sedimentation of all three creeks. • Reinstate the bed, banks, habitat and native vegetation within the waterways post-construction.

6.2 Conclusions

This assessment has identified the following biodiversity matters as critical to gaining approvals for the Project:

- Native vegetation removal requirements under Victoria's *Guidelines for the removal, destruction or lopping of native vegetation*.
- An EPBC Referral decision has ruled that the proposed action is a controlled action and therefore requires further environmental assessment and approval. Impacts on threatened species and ecological communities listed under the EPBC Act identified in this report should be considered. Detailed Significant Impact Criteria assessments should be completed based on the residual impacts of the final construction footprint, this will determine the need for EPBC offsets outside of the approved MSA areas.
- Protected flora permits under the FFG Act required for any removal of protected flora on public land.
- Crossing designs that minimise any impacts on local waterways.
- Approval for works on waterways required from Melbourne Water under the Victorian *Water Act 1989* for stream and river crossings and disturbance to aquatic habitats.
- Works in Conservation Area approvals required for works within BCS Conservation Areas.
- Requirements to prevent the spread of noxious weeds and pest animals under the CaLP Act, including restrictions on transport of noxious weeds.
- Requirement for an EES under the EE Act.

Due to the presence of significant native vegetation and habitat for significant species within the study area, the highest constraint to the Project is demonstrating avoidance and minimisation of biodiversity impacts, then finding and securing native vegetation and EPBC offsets that satisfy the requirements of the Project for any impacts that cannot be avoided. Developing an ecologically sensitive design and construction method will be critical in reducing the construction footprint and the native vegetation offset requirements of the Project.

Impacts to threatened species or communities protected under the EPBC Act or FFG Act may be minimised through a micro-siting process and developing a final pipeline alignment that avoids high quality habitat or the removal or disturbance of key habitat features.

6.3 Next steps

The primary measure to reduce impacts on biodiversity is to avoid and minimise the removal of native vegetation or habitat.

With this is mind the following steps should be considered:

1. Complete assessments on parcels which have not been surveyed to date and incorporate data into constraints mapping and advice.
2. Consider the cultural heritage value of native vegetation if identified in the CHMP for the Project.
3. Refining the construction footprint and/or the construction methods to avoid and minimise impacts to biodiversity values taking into consideration the ecological values present.
4. Where impacts to biodiversity cannot be avoided implement mitigation measures and offset as required.

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Acronyms

Acronyms	
API	Aerial Photo Interpretation
BCS	Biodiversity Conservation Strategy
CaLP	Catchment and Land Protection Act 1994
CAs	Conservation Areas
CEMP	Construction Environmental Management Plan
CVU	Central Victoria Uplands
DBH	Diameter at Breast Height
DAWE	Department of Agriculture, Water and the Environment
DELWP	Department of Environment, Land, Water, and Planning
DEPI	Department of Environment and Primary Industries
DEWHA	Department of the Environment, Water, Heritage & the Arts
DIWA	Directory of Important Wetlands in Australia
DoEE	Department of Energy and Environment
EE Act	Environment Effects Act 1978
EES	Environment Effects Statement
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EVC	Ecological Vegetation Class
FFG Act	Flora and Fauna Guarantee Act 1988
GDE	Groundwater Dependent Ecosystems
GEWVVP	Grassy Eucalypt Woodland of the Victorian Volcanic Plain
GGF	Growling Grass Frog
GSM	Golden Sun Moth
HCO	Habitat Compensation Obligations
KPs	Kilometre Points
MFL	Matted Flax-lily
MNES	Matters of National Environmental Significance
MSA	Melbourne Strategic Area
NTGVVP	Natural Temperate Grassland of the Victorian Volcanic Plain
NV Mapping	Natural Vegetation Mapping
NVRR	Native Vegetation Removal Report
OMR	Outer Metropolitan Ring
P&E Act	Planning and Environment Act 1987
PMST	Protected Matters Search Tool
PNV	Potential Native Vegetation
PPA	Preliminary Pipeline Alignment

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Acronyms	
PPWCMA	Port Philip and Western Port Catchment Management Authority
PSP	Precinct Structure Plan
RCS	Regional Catchment Strategies
SBV	Strategic Biodiversity Values
SEPP	State Environmental Protection Policy
SHWTLP	Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains
SLL	Striped Legless Lizard
TPZ	Tree Protection Zone
VBA	Victorian Biodiversity Atlas
VNI	Victorian Northern Interconnect
VNIE	Victorian Northern Interconnect Expansion
VTS	Victorian Transmission System
VVP	Victorian Volcanic Plains
WBGW	White Box Grassy Woodland
WBYB	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland
WICA	Works in a Conservation Area
WORM	Western Outer Ring Main

Appendices

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Appendix 1 Flora

Notes to tables:

EPBC Act: CR - Critically Endangered EN - Endangered VU - Vulnerable PMST – Protected Matters Search Tool	**DEPI 2014a:** e - endangered v - vulnerable r - rare k - poorly known
FFG Act: L - listed as threatened under FFG Act P - protected under the FFG Act (public land only) I - determined ineligible for listing	**Noxious weed status:** SP - State prohibited species RP - Regionally prohibited species RC - Regionally controlled species R - Regionally restricted species # - Native species outside natural range

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A1.1 Listed flora species

The following table includes the flora species recorded within the construction footprint as a result of the field assessments campaign.

Table A1.1 Flora species recorded within the construction footprint

Status	Scientific Name	Common Name
Indigenous species		
	Acacia melanoxylon	Blackwood
	Acacia paradoxa	Hedge Wattle
	Acaena echinata	Sheep's Burr
	Alternanthera spp.	Joyweed
	Anthosachne scabra s.l.	Common Wheat-grass
	Asperula conferta	Common Woodruff
	Atriplex semibaccata	Berry Saltbush
	Austrostipa bigeniculata	Kneed Spear-grass
	Austrostipa rudis	Veined Spear-grass
	Austrostipa scabra subsp. *falcata*	Rough Spear-grass
	Austrostipa spp.	Spear Grass
	Azolla pinnata	Ferny Azolla
	Bolboschoenus medianus	Marsh Club-sedge
	Bothriochloa macra	Red-leg Grass
	Caesia calliantha	Blue Grass-lily
	Callistemon spp.	Bottlebrush
	Carex breviculmis	Common Grass-sedge
	Cassinia aculeata subsp. *aculeata*	Common Cassinia
	Chloris truncata	Windmill Grass
k	*Convolvulus angustissimus* subsp. *omnigracilis*	Slender Bindweed
	Crassula decumbens var. *decumbens*	Spreading Crassula
	Crassula spp.	Crassula
L, P, e	*Cullen tenax*	Tough Scurf-pea
	Cyperus gunnii subsp. *gunnii*	Flecked Flat-sedge
k	*Desmodium varians*	Slender Tick-trefoil
EN, L, P, e	*Dianella amoena*	Matted Flax-lily
	Dianella longifolia var. *grandis s.l.*	Glaucous Flax-lily
	Dianella revoluta s.l.	Black-anther Flax-lily
	Dichelachne spp.	Plume Grass
	Dichondra repens	Kidney-weed
	Einadia nutans subsp. *nutans (s.s.)*	Nodding Saltbush
	Enchylaena tomentosa var. *tomentosa*	Ruby Saltbush
	Epilobium billardiereanum	Variable Willow-herb
	Epilobium spp.	Willow Herb

Status	Scientific Name	Common Name
I	*Eucalyptus camaldulensis*	River Red-gum
	Eucalyptus melliodora	Yellow Box
	Eucalyptus microcarpa	Grey Box
	Eucalyptus oleosa (planted)	Acorn Mallee
	Eucalyptus ovata	Swamp Gum
	Eucalyptus viminalis	Manna Gum
	Euchiton spp.	Cudweed
	Geranium retrorsum s.s.	Grassland Crane's-bill
	Geranium spp.	Crane's Bill
	Hypnum spp.	Plait Moss
	Isolepis fluitans var. *fluitans*	Floating Club-sedge
	Juncus spp.	Rush
	Lachnagrostis spp.	Blown Grass
	Laphangium luteoalbum	Jersey Cudweed
	Liliaceae spp. (sensu lato)	Lily
	Lomandra filiformis	Wattle Mat-rush
	Lomandra multiflora subsp. *multiflora*	Many-flowered Mat-rush
	Lythrum hyssopifolia	Small Loosestrife
	Melicytus dentatus s.l.	Tree Violet
	Microlaena stipoides var. *stipoides*	Weeping Grass
	Myriophyllum spp.	Water Milfoil
	Oxalis perennans	Grassland Wood-sorrel
	Persicaria decipiens	Slender Knotweed
	Phragmites australis	Common Reed
	Poa labillardierei var. *labillardierei*	Common Tussock-grass
	Rhagodia candolleana subsp. *candolleana*	Seaberry Saltbush
	Rubus parvifolius	Small-leaf Bramble
	Rumex brownii	Slender Dock
	Rytidosperma caespitosum	Common Wallaby-grass
	Rytidosperma duttonianum	Brown-back Wallaby-grass
	Rytidosperma pilosum	Velvet Wallaby-grass
	Rytidosperma racemosum var. *racemosum*	Slender Wallaby-grass
	Rytidosperma setaceum var. *setaceum*	Bristly Wallaby-grass
	Schoenoplectus tabernaemontani	River Club-sedge
	Senecio quadridentatus	Cotton Fireweed
	Themeda triandra	Kangaroo Grass
	Tricoryne elatior	Yellow Rush-lily
	Triglochin spp.	Arrowgrass
	Typha spp.	Bulrush
k	*Veronica grosseserrata*	Eastern Speedwell

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Status	Scientific Name	Common Name
	Wahlenbergia luteola	Bronze Bluebell
Introduced species		
	Aira spp.	Hair Grass
	Arctotheca calendula	Cape weed
	Avena spp.	Oat
	Brassica spp.	Turnip
	Briza maxima	Large Quaking-grass
	Bromus hordeaceus	Soft Brome
	Cerastium glomeratum s.l.	Common Mouse-ear Chickweed
RC	*Chrysanthemoides monilifera*	Boneseed
RC	*Cirsium vulgare*	Spear Thistle
RC	*Cynara cardunculus* subsp. *flavescens*	Artichoke Thistle
	Dactylis glomerata	Cocksfoot
	Erodium cicutarium	Common Heron's-bill
	Eucalyptus cladocalyx	Sugar Gum
	Galenia pubescens var. *pubescens*	Galenia
	Geranium dissectum	Cut-leaf Crane's-bill
	Helminthotheca echioides	Ox-tongue
	Hypochaeris glabra	Smooth Cat's-ear
	Hypochaeris radicata	Flatweed
	Leontodon saxatilis subsp. *saxatilis*	Hairy Hawkbit
	Lepidium africanum	Common Peppercress
	Lolium spp.	Rye Grass
RC	*Lycium ferocissimum*	African Box-thorn
	Lysimachia arvensis	Pimpernel
	Malva sylvestris	Tall Mallow
RC	*Marrubium vulgare*	Horehound
SP	*Nassella charruana*	Lobed Needle-grass
R	*Nassella neesiana*	Chilean Needle-grass
RC	*Nassella trichotoma*	Serrated Tussock
R	*Opuntia* spp.	Prickly Pear
	Petrorhagia dubia	Velvety Pink
	Phalaris spp.	Canary Grass
	Plantago coronopus	Buck's-horn Plantain
	Plantago lanceolata	Ribwort
	Poa bulbosa	Bulbous Meadow-grass
	Polygonatum multiflorum	
	Romulea spp.	Onion Grass
RC	*Rosa rubiginosa*	Sweet Briar
	Sonchus oleraceus	Common Sow-thistle

Status	Scientific Name	Common Name
	Trifolium angustifolium var. *angustifolium*	Narrow-leaf Clover
	Trifolium spp.	Clover
RC	*Ulex europaeus*	Gorse
	Vicia spp.	Vetch
	Vulpia bromoides	Squirrel-tail Fescue

Appendix 2 Fauna

Notes to tables:

EPBC Act:	**DSE 2009, DSE 2013:**
EX - Extinct CR - Critically Endangered EN - Endangered VU - Vulnerable CD - Conservation dependent	ex - extinct cr - critically endangered en - endangered vu - vulnerable nt - near threatened dd - data deficient rx - regionally extinct
FFG Act:	**Introduced species**
L - listed as threatened under FFG Act N - nominated for listing as threatened I - determined ineligible for listing	PS - pest species listed under the CaLP Act * - introduced species
Most recent database records are from the Victorian Biodiversity Atlas unless otherwise specified as follows PMST – Protected Matters Search Tool BA – Birds Australia	

A2.1 Listed fauna species

The following table includes the flora species recorded within the construction footprint as a result of the field assessments campaign.

Table A2.1 Fauna species recorded within the construction footprint

Status	Scientific Name	Common Name
Indigenous species		
	Cherax destructor destructor	Common Yabby
	Vanellus miles	Masked Lapwing
	Chenonetta jubata	Australian Wood Duck
	Trichoglossus haematodus	Rainbow Lorikeet
	Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo
	Podargus strigoides	Tawny Frogmouth
	Cisticola exilis	Golden-headed Cisticola
	Artamus cyanopterus	Dusky Woodswallow
	Anthochaera carunculata	Red Wattlebird
	Anthus novaeseelandiae	Australasian Pipit
	Cracticus tibicen	Australian Magpie
	Corvus coronoides	Australian Raven
	Macropus giganteus	Eastern Grey Kangaroo
	Lerista bougainvillii	Bougainville's Skink
	Tiliqua scincoides	Common Blue-tongued Lizard
	Pseudonaja textilis	Eastern Brown Snake
	Parasuta flagellum	Little Whip Snake
	Ctenotus spaldingi	Spalding's Skink
	Limnodynastes peronii	Striped Marsh Frog
	Limnodynastes tasmaniensis	Spotted Marsh Frog (race unknown)
	Crinia signifera	Common Froglet
	Limnodynastes dumerilii dumerilii	Pobblebonk Frog
CR, L, e	*Synemon plana*	Golden Sun Moth
VU, L, e	*Delma impar*	Striped Legless Lizard
VU, L, e	*Litoria raniformis*	Growling Grass Frog
v	*Pseudemoia pagenstecheri*	Tussock Skink
Introduced species		
	Gambusia holbrooki	Eastern Gambusia
	Sturnus vulgaris	Common Starling
	Mus musculus	House Mouse
	Oryctolagus cuniculus	European Rabbit
	Lepus europaeus	European Brown Hare
	Vulpes vulpes	Red Fox

Appendix 3 Significant Ecological Communities

Notes to tables:

EPBC Act:
CR - Critically Endangered
EN - Endangered
VU - Vulnerable

PMST – Protected Matters Search Tool

FFG Act:
L - listed as threatened under FFG Act

A3.1 Significant Ecological Communities

The following table includes the significant ecological communities that have been recorded within the construction footprint from the field assessments campaign.

Table A3.1 Listed of significant ecological communities recorded within the construction footprint

Scientific name	EPBC	FFG	Type of Presence	Vegetation associations
National significance				
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	CR		Recorded in areas within and outside of the approved MSA areas	The Grassy Eucalypt Woodland of the Victorian Volcanic Plain correlates with the following EVCs or Floristic Communities identified from the Victorian Volcanic Plain bioregion (although the description and condition thresholds of the listed community must be met) (Threatened Species Scientific Committee 2009): • EVC 55_61 Plains Grassy Woodland • EVC 55-04 Western Basalt Plains Grassy Woodland • EVC 55_63 Higher Rainfall Plains Grassy Woodland • EVC 651 Plains Swampy Woodland • EVC 649 Stony Knoll Shrubland. • EVC 897 Plains Grassland/Plains Grassy Woodland Mosaic. • FFG Act listed *Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland*
Natural Temperate Grassland of the Victorian Volcanic Plain	CR		Recorded in areas within and outside the approved MSA areas	The Natural Temperate Grassland of the Victorian Volcanic Plain community correlates with the following EVCs or Floristic Communities identified from the Victorian Volcanic Plain and adjacent bioregions (although the description and condition thresholds of the listed community must be met) (Threatened Species Scientific Committee 2008): • EVC 132 Plains Grassland; • EVC 654 Creekline Tussock Grassland • FFG Act listed *Western (Basalt) Plains Grasslands Community*.

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Scientific name	EPBC	FFG	Type of Presence	Vegetation associations
State significance				
Western (Basalt) Plains Grasslands Community		L	Recorded in areas within and outside the approved MSA areas	The Western (Basalt) Plains Grasslands Community is an open grassland community found mainly on undisturbed, poorly-drained heavy clay soils on the basalt plains of western Victoria. The vegetation is characteristically dominated by perennial native grasses, with very few eucalypts and shrubs (DSE 2003).
Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland		L	Recorded in areas within and outside the approved MSA areas	Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland is an endemic Victorian community restricted to an area approximately bounded by Whittlesea, Craigieburn and Epping. It forms part of the Plains Grassy Woodland Ecological Vegetation Class (EVC 55), but is distinguished ecologically by its occurrence on fertile clay soils derived from Quaternary basalts. It is floristically characterised by an overstorey of River Red-gum *Eucalyptus camaldulensis* with various wattles (e.g. *Acacia implexa, A. pycnantha*). The ground layer is dominated by grasses (SAC 2004).

Appendix 4 Noxious weeds

Notes to tables:

Noxious weed status:

SP	- State prohibited species
RP	- Regionally prohibited species
RC	- Regionally controlled species
R	- Regionally restricted species
#	- Native species outside natural range

A4.1 CaLP Act listed noxious weeds

The following table includes the CaLP Act listed flora species that have been recorded from within the construction footprint during the field assessments campaign. The list of species is sourced from the Victorian Biodiversity Atlas.

Table A4.1 CaLP listed noxious weeds recorded within the construction footprint

Scientific name	Common name	Status
Chrysanthemoides monilifera	Boneseed	RC
Cirsium vulgare	Spear Thistle	RC
Cynara cardunculus subsp. *flavescens*	Artichoke Thistle	RC
Lycium ferocissimum	African Box-thorn	RC
Marrubium vulgare	Horehound	RC
Nassella charruana	Lobed Needle-grass	SP
Nassella neesiana	Chilean Needle-grass	R
Nassella trichotoma	Serrated Tussock	RC
Opuntia spp.	Prickly Pear	R
Rosa rubiginosa	Sweet Briar	RC
Ulex europaeus	Gorse	RC

Appendix 5 Field survey data

Table A5.1 VQA scores for patches of native vegetation mapped within the construction footprint

Habitat Zone ID			191010-1	191010-2	191022-1	191022-2	191118-1	191118-2	191118-3	191118-4
EVC #			55_61	55_61	132_61	132_61	132_61	132_61	132_61	132_61
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	0	0	0	0	0	0	0	0
	Canopy Cover	5	0	0	0	0	0	0	0	0
	Lack of Weeds	15	0	0	4	4	7	2	2	4
	Understorey	25	5	5	5	5	5	5	5	5
	Recruitment	10	5	5	6	6	3	6	6	0
	Organic Matter	5	3	3	2	2	4	2	4	3
	Logs	5	0	0	0	0	0	0	0	0
	Total Site Score		13	13	23	23	26	20	23	16
Landscape Value	Patch Size	10	1	1	1	1	1	1	1	1
	Neighbourhood	10	2	2	2	2	0	0	0	1
	Distance to Core	5	1	1	1	1	1	1	1	1
	Total Landscape Score		4	4	4	4	2	2	2	3
Standardiser			1.00	1.00	1.36	1.36	1.36	1.36	1.36	1.36
HABITAT SCORE		100	17	17	27	27	28	22	25	19
Habitat points = #/100		1	0.17	0.17	0.27	0.27	0.28	0.22	0.25	0.19
Habitat Zone area (ha)			0.03	0.30	0.10	0.22	0.06	0.06	0.03	0.04
Habitat hectares (Hha)			0.01	0.05	0.03	0.06	0.02	0.01	0.01	0.01

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Table A5.1 VQA scores for patches of native vegetation mapped within the construction footprint

Habitat Zone ID			191118-5	191118-6	191119-1	191119-2	191119-3	191119-4	191119-5	191119-6
EVC #			132_61	132_61	132_61	132_61	132_61	132_61	132_61	132_61
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	0	0	0	0	0	0	0	0
	Canopy Cover	5	0	0	0	0	0	0	0	0
	Lack of Weeds	15	7	6	2	7	7	0	4	7
	Understorey	25	5	5	5	15	5	5	5	5
	Recruitment	10	0	3	3	6	6	6	3	6
	Organic Matter	5	3	2	5	5	3	4	5	5
	Logs	5	0	0	0	0	0	0	0	0
	Total Site Score		20	22	20	45	29	20	23	31
Landscape Value	Patch Size	10	1	1	1	1	1	1	1	1
	Neighbourhood	10	1	0	1	1	1	1	1	3
	Distance to Core	5	1	1	1	1	1	1	1	1
	Total Landscape Score		3	2	3	3	3	3	3	5
Standardiser			1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36
HABITAT SCORE		100	23	24	23	48	32	23	26	36
Habitat points = #/100		1	0.23	0.24	0.23	0.48	0.32	0.23	0.26	0.36
Habitat Zone area (ha)			0.10	0.10	0.05	0.52	0.12	0.03	0.05	0.27
Habitat hectares (Hha)			0.02	0.02	0.01	0.25	0.04	0.01	0.01	0.10

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Table A5.1 VQA scores for patches of native vegetation mapped within the construction footprint

Habitat Zone ID			191119-7	191119-8	191126-1	191126-2	191126-3	191203-1	191203-2	191203-3
EVC #			132_61	641	125	132_61	132_61	55_61	55_61	55_61
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	0	10	-	0	0	0	0	0
	Canopy Cover	5	0	5	-	0	0	0	0	0
	Lack of Weeds	15	7	0	-	7	7	6	7	7
	Understorey	25	5	15	-	5	5	15	5	5
	Recruitment	10	3	3	-	3	6	3	0	0
	Organic Matter	5	2	5	-	2	5	4	4	4
	Logs	5	0	0	-	0	0	0	0	0
	Total Site Score		23	38	-	23	31	28	16	16
Landscape Value	Patch Size	10	1	1	-	1	1	1	1	1
	Neighbourhood	10	2	3	-	3	3	1	1	1
	Distance to Core	5	1	1	-	1	1	1	1	1
	Total Landscape Score		4	5		5	5	3	3	3
Standardiser			1.36	1.00	1.36	1.36	1.36	1.00	1.00	1.00
HABITAT SCORE		100	27	43	20*	28	36	31	19	19
Habitat points = #/100		1	0.27	0.43	0.20	0.28	0.36	0.31	0.19	0.19
Habitat Zone area (ha)			0.44	0.07	0.26	0.09	0.03	0.03	0.03	0.03
Habitat hectares (Hha)			0.12	0.03	0.05	0.02	0.01	0.01	0.01	0.01

* DELWP modelled condition score

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Table A5.1 VQA scores for patches of native vegetation mapped within the construction footprint

Habitat Zone ID			191203-4	191203-5	191203-6	191206-1	191206-2	191206-3	191206-4	191211-1
EVC #			132_61	55_61	132_61	132_61	55_61	132_61	132_61	132_61
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	0	0	0	0	4	0	0	0
	Canopy Cover	5	0	3	0	0	3	0	0	0
	Lack of Weeds	15	0	0	4	2	4	7	9	6
	Understorey	25	5	5	5	5	5	10	5	5
	Recruitment	10	3	5	6	6	5	6	6	3
	Organic Matter	5	4	4	4	4	4	5	5	4
	Logs	5	0	0	0	0	0	0	0	0
	Total Site Score		16	17	26	23	25	38	34	24
Landscape Value	Patch Size	10	1	1	1	1	1	1	1	1
	Neighbourhood	10	0	1	1	1	2	1	1	0
	Distance to Core	5	1	1	1	1	1	1	1	1
	Total Landscape Score		2	3	3	3	4	3	3	2
Standardiser			1.36	1.00	1.36	1.36	1.00	1.36	1.36	1.36
HABITAT SCORE		100	18	20	29	26	29	41	37	26
Habitat points = #/100		1	0.18	0.20	0.29	0.26	0.29	0.41	0.37	0.26
Habitat Zone area (ha)			0.08	0.31	0.05	1.78	2.39	0.67	0.81	0.47
Habitat hectares (Hha)			0.01	0.06	0.01	0.47	0.69	0.27	0.30	0.12

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Table A5.1 VQA scores for patches of native vegetation mapped within the construction footprint

Habitat Zone ID			191211-2	191211-3	191212-1	191212-2	191212-3	191212-4	191213-1	191213-2
EVC #			649	649	132_61	132_61	132_61	132_61	641	132_61
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	0	0	0	0	0	0	10	0
	Canopy Cover	5	0	0	0	0	0	0	3	0
	Lack of Weeds	15	6	6	2	2	6	2	6	2
	Understorey	25	5	5	5	5	5	5	15	5
	Recruitment	10	6	6	3	3	3	3	3	3
	Organic Matter	5	4	4	2	4	5	4	2	2
	Logs	5	0	0	0	0	0	0	0	0
	Total Site Score		29	29	16	19	26	19	39	16
Landscape Value	Patch Size	10	1	1	1	1	1	1	1	1
	Neighbourhood	10	0	0	0	0	0	0	1	0
	Distance to Core	5	1	1	0	1	1	1	1	1
	Total Landscape Score		2	2	1	2	2	2	3	2
Standardiser			1.36	1.36	1.36	1.36	1.36	1.36	1.00	1.36
HABITAT SCORE		100	31	31	17	21	28	21	42	18
Habitat points = #/100		1	0.31	0.31	0.17	0.21	0.28	0.21	0.42	0.18
Habitat Zone area (ha)			0.02	0.04	0.03	0.06	0.08	0.23	0.10	0.18
Habitat hectares (Hha)			0.01	0.01	0.01	0.01	0.02	0.05	0.04	0.03

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Table A5.1 VQA scores for patches of native vegetation mapped within the construction footprint

Habitat Zone ID			191213-3	191213-4	191214-1	191214-2	191214-3	191214-4	191214-5	191214-6
EVC #			132_61	132_61	132_61	653	132_61	132_61	132_61	132_61
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	0	0	0	0	0	0	0	0
	Canopy Cover	5	0	0	0	0	0	0	0	0
	Lack of Weeds	15	4	4	6	9	6	6	7	6
	Understorey	25	5	5	5	5	5	5	5	5
	Recruitment	10	3	3	3	3	3	3	6	3
	Organic Matter	5	4	4	4	5	4	3	3	5
	Logs	5	0	0	0	0	0	0	0	0
	Total Site Score		22	22	24	30	24	23	29	26
Landscape Value	Patch Size	10	1	1	1	1	1	1	1	1
	Neighbourhood	10	1	1	3	0	3	1	1	1
	Distance to Core	5	1	1	1	1	1	1	1	1
	Total Landscape Score		3	3	5	2	5	3	3	3
Standardiser			1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36
HABITAT SCORE		100	25	25	29	32	29	26	32	29
Habitat points = #/100		1	0.25	0.25	0.29	0.32	0.29	0.26	0.32	0.29
Habitat Zone area (ha)			0.37	0.04	0.04	0.06	0.06	0.27	0.03	0.08
Habitat hectares (Hha)			0.09	0.01	0.01	0.02	0.02	0.07	0.01	0.02

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Table A5.1 VQA scores for patches of native vegetation mapped within the construction footprint

Habitat Zone ID			191214-7	191214-8	191217-1	191217-2	191217-3	191217-4	191217-5	191218-1
EVC #			132_61	803	649	55_61	132_61	55_61	649	132_61
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	0	10	0	0	0	6	0	0
	Canopy Cover	5	0	3	0	0	0	5	0	0
	Lack of Weeds	15	6	0	6	7	7	0	9	2
	Understorey	25	5	5	5	5	10	5	5	5
	Recruitment	10	3	10	3	0	10	5	6	3
	Organic Matter	5	5	2	2	5	4	5	4	4
	Logs	5	0	0	0	0	0	0	0	0
	Total Site Score		26	30	22	17	42	26	33	19
Landscape Value	Patch Size	10	1	1	1	1	1	1	1	1
	Neighbourhood	10	1	0	0	1	2	1	0	1
	Distance to Core	5	1	1	1	1	1	1	1	1
	Total Landscape Score		3	2	2	3	4	3	2	3
Standardiser			1.36	1.00	1.36	1.00	1.36	1.00	1.36	1.36
HABITAT SCORE		100	29	32	24	20	46	29	35	22
Habitat points = #/100		1	0.29	0.32	0.24	0.20	0.46	0.29	0.35	0.22
Habitat Zone area (ha)			0.04	0.07	0.09	0.01	1.50	0.10	0.06	0.39
Habitat hectares (Hha)			0.01	0.02	0.02	0.00	0.69	0.03	0.02	0.09

Table A5.1 VQA scores for patches of native vegetation mapped within the construction footprint

Habitat Zone ID			191218-2	191218-3	200109-1	200109-2	200128-1	200130-1	200214-1	200214-2
EVC #			132_61	132_61	132_61	132_61	641	132_61	132_61	132_61
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	0	0	0	0	10	0	0	0
	Canopy Cover	5	0	0	0	0	5	0	0	0
	Lack of Weeds	15	2	9	4	7	4	6	4	4
	Understorey	25	5	5	5	5	15	10	5	5
	Recruitment	10	3	3	6	6	10	6	6	6
	Organic Matter	5	4	5	3	3	5	2	2	4
	Logs	5	0	0	0	0	0	0	0	0
	Total Site Score		19	30	24	29	49	33	23	26
Landscape Value	Patch Size	10	1	1	1	1	1	1	1	1
	Neighbourhood	10	1	1	0	0	2	3	0	0
	Distance to Core	5	1	1	1	1	1	1	1	1
	Total Landscape Score		3	3	2	2	4	5	2	2
Standardiser			1.36	1.36	1.36	1.36	1.00	1.36	1.36	1.36
HABITAT SCORE		100	22	33	26	31	53	38	25	28
Habitat points = #/100		1	0.22	0.33	0.26	0.31	0.53	0.38	0.25	0.28
Habitat Zone area (ha)			0.57	0.30	0.04	0.12	0.07	0.48	0.02	0.47
Habitat hectares (Hha)			0.13	0.10	0.01	0.04	0.04	0.18	0.00	0.13

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Table A5.1 VQA scores for patches of native vegetation mapped within the construction footprint

Habitat Zone ID			200214-3	1TP829278	10LP215406	1LP200366	1TP212870	6LP136262	9LP136262
EVC #			132_61	132_61	132_61	55_61	132_61	132_61	132_61
		Max Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	0	-	-	-	-	-	-
	Canopy Cover	5	0	-	-	-	-	-	-
	Lack of Weeds	15	9	-	-	-	-	-	-
	Understorey	25	5	-	-	-	-	-	-
	Recruitment	10	6	-	-	-	-	-	-
	Organic Matter	5	5	-	-	-	-	-	-
	Logs	5	0	-	-	-	-	-	-
	Total Site Score		34	-	-	-	-	-	-
Landscape Value	Patch Size	10	1	-	-	-	-	-	-
	Neighbourhood	10	0	-	-	-	-	-	-
	Distance to Core	5	1	-	-	-	-	-	-
	Total Landscape Score		2	-	-	-	-	-	-
Standardiser			1.36	1.36	1.36	1.00	1.36	1.36	1.36
HABITAT SCORE		100	36	75*	80*	75*	72*	63*	20*
Habitat points = #/100		1	0.36	0.75	0.80	0.75	0.72	0.63	0.20
Habitat Zone area (ha)			0.68	0.10	0.32	4.05	1.63	0.50	0.40
Habitat hectares (Hha)			0.25	0.07	0.25	3.04	1.17	0.32	0.08

* DELWP modelled condition score

Table A5.2 Survey results from Spiny Rice-flower surveys

Parcel identifier	Survey date
APS709426	22/11/2019
8BPP3061	24/07/2019
218165707	24/07/2019
10LP116565	24/07/2019
425711870	24/07/2019
218160972	24/07/2019
1TP132544	24/07/2019
1TP710684	24/07/2019
1TP901066	24/07/2019
218162378	24/07/2019
218162862	24/07/2019
2LP119116	24/07/2019
1TP946706	24/07/2019
2PS343496	24/07/2019
218166927	14/02/2020
218257150	14/02/2020
1TP829278	-
1TP710576	9/09/2019
2LP90878	24/07/2019
2015PP2761	18/12/2019
5LP92520	9/09/2019
6LP92520	9/09/2019
10LP215406	9/09/2019
11LP215406	14/12/2019
11LP92520	18/11/2019
12LP92520	24/07/2019
218265274	18/12/2019
13LP92520	24/07/2019
218260126	18/12/2019
2LP137651	14/12/2019
1LP137651	14/12/2019

Parcel identifier	Survey date
D16PP2761	14/12/2019
3PS635728	19/11/2019
1TP333383	24/07/2019
2029PP2761	24/07/2019
2010PP2258	11/12/2019
1TP909157	11/12/2019
218261530	18/12/2019
218261878	18/12/2019
1LP200366	-
4LP200366	2/10/2019
3LP200366	22/10/2019
2002PP2258	28/01/2020
1TP424528	19/11/2019

	SRF detected
-	No survey

Table A5.3 Survey results from spring targeted flora surveys

Parcel identifier	Survey date
APS709426	N/A
8BPP3061	N/A
218165707	N/A
10LP116565	N/A
425711870	N/A
218160972	N/A
1TP132544	N/A
1TP710684	N/A
1TP901066	N/A
218162378	N/A
218162862	N/A
2LP119116	30/09/2019
1TP946706	30/09/2019
2PS343496	30/09/2019
218166927	N/A
218257150	N/A
1TP829278	-
1TP710576	N/A
2LP90878	N/A
2015PP2761	N/A
5LP92520	N/A
6LP92520	N/A
10LP215406	N/A
11LP215406	-
11LP92520	-
12LP92520	30/09/2019
218265274	30/09/2019
13LP92520	30/09/2019
218260126	N/A
2LP137651	N/A
1LP137651	N/A
D16PP2761	N/A

Parcel identifier	Survey date
3PS635728	30/09/2019
1TP333383	30/09/2019
2029PP2761	N/A
2010PP2258	N/A
1TP909157	N/A
218261530	N/A
218261878	N/A
1LP200366	-
4LP200366	2/10/2019
3LP200366	22/10/2019
2002PP2258	N/A
1TP424528	N/A
218265262	N/A
1TP107502	2/10/2019
2LP130112	2/10/2019
1LP130112	2/10/2019
218268694	2/10/2019
218261314	2/10/2019
B7PP2258	3/10/2019
218264222	N/A
5LP88261	2/10/2019
10LP110642	2/10/2019
2LP218160	2/10/2019
1TP212870	-
218271946	N/A
1TP104933	N/A
2LP68808	N/A
1PS733043	2/10/2019
218266378	2/10/2019
218268306	2/10/2019
1PS733045	2/10/2019

	Spring flora target species detected
-	No survey
N/A	No suitable habitat

Table A5.3 Survey results from spring targeted flora surveys

Parcel identifier	Survey date
2PS503800	2/10/2019
3PS503800	2/10/2019
1PS503800	2/10/2019
2LP218323	2/10/2019
218263730	2/10/2019
218260106	N/A
32LP93445	N/A
33LP93445	N/A
5LP92893	N/A
4LP92893	1/10/2019
1TP108439	1/10/2019
218271310	1/10/2019
1TP947284	1/10/2019
1LP211254	N/A
PPS816942	9/10/2019
426092500	9/10/2019
AAPS746088	N/A
1LP126752	9/10/2019
2PS714700	9/10/2019
2PS714688	9/10/2019
CPS805151	9/10/2019
4LP126752	9/10/2019
2TP215633	9/10/2019
1TP201330	1/10/2019
218258374	1/10/2019
29PP3100	1/10/2019
1LP136262	1/10/2019
2LP136262	1/10/2019
3LP136262	1/10/2019
4LP136262	1/10/2019
5LP136262	1/10/2019
6LP136262	1/10/2019
7LP136262	1/10/2019
8LP136262	1/10/2019
9LP136262	1/10/2019
10LP136262	1/10/2019
218299285	1/10/2019
218266966	N/A
218263378	N/A
2LP123742	N/A
1LP221466	-
2LP221466	N/A
10LP5364	N/A
1LP113763	8/10/2019
2LP113763	8/10/2019
1TP599592	N/A
1TP332315	N/A
6TP394032	10/10/2019
1TP709372	10/10/2019
2LP67181	1/10/2019
2TP843230	7/10/2019
1TP746632	7/10/2019
PC372952	7/10/2019
1LP208748	7/10/2019
218359831	7/10/2019
1LP38239	8/10/2019
1TP709759	8/10/2019
2LP133657	8/10/2019
218355271	8/10/2019
1TP168481	1/10/2019
1TP710356	1/10/2019
2LP130336	1/10/2019

	Spring flora target species detected
-	No survey
N/A	No suitable habitat

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Table A5.4 Survey results from late spring / summer targeted flora surveys

Parcel identifier	Survey date
APS709426	22/11/2019
8BPP3061	18/11/2019
218165707	9/01/2020
10LP116565	18/11/2019
425711870	9/01/2020
218160972	9/01/2020
1TP132544	9/12/2019
1TP710684	9/12/2019
1TP901066	18/11/2019
218162378	9/01/2020
218162862	9/01/2020
2LP119116	18/11/2019
1TP946706	18/11/2019
2PS343496	18/11/2019 (1 x *D. longifolia* var. *grandis*)
218166927	14/02/2020
218257150	14/02/2020
1TP829278	-
1TP710576	14/12/2019
2LP90878	14/12/2019
2015PP2761	18/12/2019
5LP92520	-
6LP92520	N/A
10LP215406	-
11LP215406	14/12/2019
11LP92520	19/11/2019
12LP92520	19/11/2019
218265274	18/12/2019
13LP92520	19/11/2019
218260126	18/12/2019
2LP137651	14/12/2019
1LP137651	14/12/2019

Parcel identifier	Survey date
D16PP2761	14/12/2019
3PS635728	19/11/2019
1TP333383	19/11/2019
2029PP2761	19/11/2019
2010PP2258	11/12/2019
1TP909157	11/12/2019
218261530	18/12/2019
218261878	18/12/2019
1LP200366	-
4LP200366	20/11/2019
3LP200366	20/11/2019
2002PP2258	28/01/2020
1TP424528	20/11/2019
218265262	18/12/2019
1TP107502	26/11/2019
2LP130112	26/11/2019
1LP130112	26/11/2019
218268694	26/11/2019
218261314	26/11/2019
B7PP2258	6/12/2019
218264222	18/12/2019
5LP88261	6/12/2019
10LP110642	14/02/2020
2LP218160	30/01/2020
1TP212870	-
218271946	18/12/2019
1TP104933	18/12/2019
2LP68808	18/12/2019
1PS733043	18/12/2019
218266378	18/12/2019
218268306	18/12/2019 (1 x *D. amoena*)

	Late spring / summer flora target species detected
-	No survey
N/A	No suitable habitat

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Table A5.4 Survey results from late spring / summer targeted flora surveys

Parcel identifier	Survey date
1PS733045	6/12/2019
2PS503800	30/01/2020
3PS503800	30/01/2020
1PS503800	6/12/2019
2LP218323	3/12/2019
218263730	17/12/2019
218260106	17/12/2019
32LP93445	3/12/2019
33LP93445	3/12/2019
5LP92893	3/12/2019
4LP92893	3/12/2019
1TP108439	3/12/2019
218271310	3/12/2019
1TP947284	3/12/2019
1LP211254	3/12/2019
PPS816942	18/12/2019
426092500	18/12/2019
AAPS746088	13/12/2019
1LP126752	18/12/2019
2PS714700	13/12/2019
2PS714688	13/12/2019
CPS805151	13/12/2019
4LP126752	18/12/2019
2TP215633	12/12/2019
1TP201330	12/12/2019
218258374	12/12/2019
29PP3100	12/12/2019
1LP136262	30/01/2020
2LP136262	30/01/2020
3LP136262	14/02/2020
4LP136262	14/02/2020
5LP136262	13/12/2019
6LP136262	-
7LP136262	13/12/2019
8LP136262	13/12/2019
9LP136262	-
10LP136262	12/12/2019
218299285	17/12/2019
218266966	17/12/2019
218263378	17/12/2019
2LP123742	12/12/2019
1LP221466	12/12/2019
2LP221466	12/12/2019
10LP5364	12/12/2019
1LP113763	18/12/2019
2LP113763	18/12/2019
1TP599592	13/12/2019
1TP332315	13/12/2019
6TP394032	13/12/2019
1TP709372	13/12/2019
2LP67181	11/12/2019
2TP843230	11/12/2019
1TP746632	11/12/2019
PC372952	11/12/2019
1LP208748	11/12/2019
218359831	17/12/2019
1LP38239	11/12/2019
1TP709759	11/12/2019
2LP133657	11/12/2019
218355271	17/12/2019
1TP168481	17/12/2019
1TP710356	17/12/2019
2LP130336	17/12/2019 (48 x *Cullen tenax*)

	Late spring / summer flora target species detected
-	No survey
N/A	No suitable habitat

Table A5.5 Survey results from Striped Legless Lizard tile grids

Parcel identifier	Grid count	Grid reference	Check 1	Check 2	Check 3	Check 4	Check 5	Check 6	Check 7
Western section									
2LP119116	4	1	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
		2	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
		3	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
		19	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
2PS343496	1	4	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
North-western section									
2LP90878	1	5	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
12LP92520	2	6	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
		7	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
13LP92520	1	8	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
1TP333383	2	9	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
		10	5/09/2019	12/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	17/10/2019
B7PP2258	3	16	6/09/2019	13/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	18/10/2019
		17	6/09/2019	13/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	18/10/2019
		18	6/09/2019	13/09/2019	19/09/2019	26/09/2019	3/10/2019	9/10/2019	18/10/2019
1PS733043	1	20	6/09/2019	13/09/2019	19/09/2019	26/09/2019	3/10/2019	8/10/2019	18/10/2019

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Table A5.5 Survey results from Striped Legless Lizard tile grids

Parcel identifier	Grid count	Grid reference	Check 1	Check 2	Check 3	Check 4	Check 5	Check 6	Check 7
Northern section									
2LP67181	3	13	6/09/2019	13/09/2019	19/09/2019	30/09/2019	4/10/2019	8/10/2019	18/10/2019
		14	6/09/2019	13/09/2019	19/09/2019	30/09/2019	4/10/2019	8/10/2019	18/10/2019
		15	6/09/2019	13/09/2019	19/09/2019	30/09/2019	4/10/2019	8/10/2019	18/10/2019
2LP130336	2	11	6/09/2019	13/09/2019	19/09/2019	30/09/2019	4/10/2019	8/10/2019	18/10/2019
		12	6/09/2019	13/09/2019	19/09/2019	30/09/2019	4/10/2019	8/10/2019	18/10/2019

Evidence of SLL detected

\- No survey

Table A5.5 Survey results from Striped Legless Lizard tile grids

Parcel identifier	Grid reference	Check 8	Check 9	Check 10	Check 11	Check 12	Check 13	Check 14	Check 15
Western section									
2LP119116	1	25/10/2019	31/10/2019	6/11/2019	14/11/2019	21/11/2019	27/11/2019	5/12/2019	19/12/2019
	2	25/10/2019	31/10/2019	6/11/2019	14/11/2019	21/11/2019	27/11/2019	5/12/2019	19/12/2019
	3	25/10/2019	31/10/2019	6/11/2019	14/11/2019	21/11/2019	27/11/2019	5/12/2019	19/12/2019
	19	25/10/2019	31/10/2019	6/11/2019	14/11/2019	21/11/2019	27/11/2019	5/12/2019	19/12/2019
2PS343496	4	25/10/2019	31/10/2019	6/11/2019	14/11/2019	21/11/2019	27/11/2019	5/12/2019	19/12/2019
North-western section									
2LP90878	5	25/10/2019	31/10/2019	6/11/2019	14/11/2019	22/11/2019	27/11/2019	5/12/2019	19/12/2019
12LP92520	6	25/10/2019	31/10/2019	6/11/2019	14/11/2019	22/11/2019	27/11/2019	5/12/2019	19/12/2019
	7	25/10/2019	31/10/2019	6/11/2019	14/11/2019	22/11/2019	27/11/2019	5/12/2019	19/12/2019
13LP92520	8	25/10/2019	31/10/2019	6/11/2019	14/11/2019	22/11/2019	27/11/2019	5/12/2019	19/12/2019
1TP333383	9	24/10/2019	1/11/2019	6/11/2019	14/11/2019	22/11/2019	27/11/2019	5/12/2019	19/12/2019
	10	24/10/2019	1/11/2019	6/11/2019	14/11/2019	22/11/2019	27/11/2019	5/12/2019	19/12/2019
B7PP2258	16	25/10/2019	-	-	-	-	29/11/2019	6/12/2019	-
	17	25/10/2019	-	-	-	-	29/11/2019	6/12/2019	-
	18	25/10/2019	-	-	-	-	29/11/2019	6/12/2019	-
1PS733043	20	24/10/2019	1/11/2019	7/11/2019	13/11/2019	22/11/2019	27/11/2019	5/12/2019	19/12/2019

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Table A5.5 Survey results from Striped Legless Lizard tile grids

Parcel identifier	Grid reference	Check 8	Check 9	Check 10	Check 11	Check 12	Check 13	Check 14	Check 15
Northern section									
2LP67181	13	24/10/2019	1/11/2019	7/11/2019	13/11/2019	22/11/2019	27/11/2019	6/12/2019	19/12/2019
	14	24/10/2019	1/11/2019	7/11/2019	13/11/2019	22/11/2019	27/11/2019	6/12/2019	19/12/2019
	15	24/10/2019	1/11/2019	7/11/2019	13/11/2019	22/11/2019	27/11/2019	6/12/2019	19/12/2019
2LP130336	11	24/10/2019	1/11/2019	7/11/2019	13/11/2019	22/11/2019	27/11/2019	6/12/2019	19/12/2019
	12	24/10/2019	1/11/2019	7/11/2019	13/11/2019	22/11/2019	27/11/2019	6/12/2019	19/12/2019

Evidence of SLL detected

\- No survey

Table A5.6 Survey results for Golden Sun Moth

Parcel identifier	Survey 1	Survey 2	Survey 3	Survey 4	# valid surveys	Total # GSM recorded
APS709426	22/11/2019	N/A	N/A	N/A	No suitable habitat	-
8BPP3061	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218165707	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
10LP116565	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
425711870	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218160972	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1TP132544	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1TP710684	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1TP901066	18/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218162378	18/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218162862	18/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
2LP119116	18/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1TP946706	18/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
2PS343496	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218166927	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218257150	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1TP829278					0 (No access)	-
1TP710576	N/A	N/A	N/A	N/A	No suitable habitat	-
2LP90878	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
2015PP2761	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
5LP92520					0 (No access)	-

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Table A5.6 Survey results for Golden Sun Moth

Parcel identifier	Survey 1	Survey 2	Survey 3	Survey 4	# valid surveys	Total # GSM recorded
6LP92520	N/A	N/A	N/A	N/A	No suitable habitat	-
10LP215406					0 (No access)	-
11LP215406					0 (No access)	-
11LP92520	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
12LP92520	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218265274	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
13LP92520	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218260126	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
2LP137651	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1LP137651	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
D16PP2761					0 (No access)	-
3PS635728	N/A	N/A	N/A	N/A	No suitable habitat	-
1TP333383	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
2029PP2761	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
2010PP2258	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1TP909157					0 (No access)	-
218261530	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218261878	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1LP200366	25/11/2019	17/12/2019			2	0
4LP200366	20/11/2019				1	0
3LP200366	20/11/2019				1	0

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Table A5.6 Survey results for Golden Sun Moth

Parcel identifier	Survey 1	Survey 2	Survey 3	Survey 4	# valid surveys	Total # GSM recorded
2002PP2258	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1TP424528	20/11/2019	N/A	N/A	N/A	No suitable habitat	-
218265262	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
1TP107502	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
2LP130112	20/11/2019	25/11/2019			2	0
1LP130112	20/11/2019	25/11/2019			2	0
218268694	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
218261314	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
B7PP2258					0 (No access)	-
218264222	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
5LP88261	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
10LP110642	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	0
2LP218160					0 (No access)	-
1TP212870	20/11/2019				1	0
218271946	20/11/2019				1	0
1TP104933	20/11/2019				1	0
2LP68808	20/11/2019	N/A	N/A	N/A	No suitable habitat	-
1PS733043	20/11/2019	25/11/2019	5/12/2019	9/12/2019	4	18
218266378	20/11/2019	25/11/2019	5/12/2019	9/12/2019	4	0
218268306	20/11/2019	25/11/2019	5/12/2019	9/12/2019	4	0
1PS733045	20/11/2019	25/11/2019	9/12/2019	17/12/2019	4	1

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Table A5.6 Survey results for Golden Sun Moth

Parcel identifier	Survey 1	Survey 2	Survey 3	Survey 4	# valid surveys	Total # GSM recorded
2PS503800	N/A	N/A	N/A	N/A	No suitable habitat	-
3PS503800	N/A	N/A	N/A	N/A	No suitable habitat	-
1PS503800	20/11/2019	29/11/2019	9/12/2019	17/12/2019	4	0
2LP218323	20/11/2019	3/12/2019	9/12/2019	17/12/2019	4	1
218263730	20/11/2019	3/12/2019	9/12/2019	17/12/2019	4	0
218260106	20/11/2019	3/12/2019	9/12/2019	17/12/2019	4	0
32LP93445	3/12/2019				1	1
33LP93445	3/12/2019	N/A	N/A	N/A	No suitable habitat	-
5LP92893	2/12/2019	N/A	N/A	N/A	No suitable habitat	-
4LP92893	20/11/2019	N/A	N/A	N/A	No suitable habitat	-
1TP108439	20/11/2019	N/A	N/A	N/A	No suitable habitat	-
218271310	20/11/2019	N/A	N/A	N/A	No suitable habitat	-
1TP947284	20/11/2019	N/A	N/A	N/A	No suitable habitat	-
1LP211254	20/11/2019	N/A	N/A	N/A	No suitable habitat	-
PPS816942	14/12/2019	17/12/2019	23/12/2019		2	2
426092500	14/12/2019	18/12/2019	23/12/2019		2	0
AAPS746088	14/12/2019	18/12/2019	23/12/2019		2	0
1LP126752	14/12/2019	18/12/2019	23/12/2019		2	0
2PS714700	18/12/2019	N/A	N/A	N/A	No suitable habitat	-
2PS714688	18/12/2019	N/A	N/A	N/A	No suitable habitat	-
CPS805151	13/12/2019	18/12/2019	23/12/2019		3	1

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Table A5.6 Survey results for Golden Sun Moth

Parcel identifier	Survey 1	Survey 2	Survey 3	Survey 4	# valid surveys	Total # GSM recorded
4LP126752	14/12/2019	18/12/2019	23/12/2019		2	0
2TP215633	14/12/2019	18/12/2019	23/12/2019		2	0
1TP201330	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
218258374	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
29PP3100	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
1LP136262	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
2LP136262	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
3LP136262	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
4LP136262	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
5LP136262	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
6LP136262	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
7LP136262	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
8LP136262	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
9LP136262	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
10LP136262	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
218299285	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
218266966	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
218263378	29/11/2019	9/12/2019	18/12/2019	23/12/2019	4	0
2LP123742	18/12/2019	N/A	N/A	N/A	No suitable habitat	-
1LP221466	18/12/2019	23/12/2019			2	0
2LP221466	18/12/2019	N/A	N/A	N/A	No suitable habitat	-

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Table A5.6 Survey results for Golden Sun Moth

Parcel identifier	Survey 1	Survey 2	Survey 3	Survey 4	# valid surveys	Total # GSM recorded
10LP5364	18/12/2019	N/A	N/A	N/A	No suitable habitat	-
1LP113763	17/12/2019				1	0
2LP113763	17/12/2019				1	0
1TP599592	9/12/2019	23/12/2019			2	0
1TP332315	9/12/2019	23/12/2019			2	0
6TP394032	9/12/2019	23/12/2019			2	2
1TP709372	9/12/2019	23/12/2019			2	0
2LP67181	9/12/2019	18/12/2019	23/12/2019		3	0
2TP843230	9/12/2019	18/12/2019	23/12/2019		3	0
1TP746632	9/12/2019	18/12/2019	23/12/2019		3	1
PC372952	9/12/2019	18/12/2019	23/12/2019		3	0
1LP208748	9/12/2019	18/12/2019	23/12/2019		3	0
218359831	25/11/2019	9/12/2019	17/12/2019	23/12/2019	4	0
1LP38239	25/11/2019	9/12/2019	17/12/2019	23/12/2019	4	0
1TP709759	25/11/2019	9/12/2019	17/12/2019	23/12/2019	4	0
2LP133657	25/11/2019	9/12/2019	17/12/2019	23/12/2019	4	1
218355271	25/11/2019	9/12/2019	17/12/2019	23/12/2019	4	0
1TP168481	25/11/2019	9/12/2019	17/12/2019	23/12/2019	4	4
1TP710356	25/11/2019	9/12/2019	17/12/2019	23/12/2019	4	11
2LP130336	25/11/2019	9/12/2019	17/12/2019	23/12/2019	4	4

	GSM recorded
-	Survey conditions invalid
N/A	No suitable habitat

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Table A5.7 Survey condition data for Golden Sun Moth

Parameter	18/11/2019	20/11/2019	25/11/2019	29/11/2019	3/12/2019	5/12/2019	9/12/2019
GSM observed during survey	N	N	Y	N	Y	Y	N
GSM observed at reference site	Y	Y	Y	Y	-	N	Y
Reference site	Broadmeadows Valley Park	Broadmeadows Valley Park	Parcel 1PS733043 Craigieburn Grassland	Parcel 2LP130336	Parcels 2LP218323 & 32LP93445	Parcel 1PS733043	Broadmeadows Valley Park
GSM abundance at reference site	-	20	20	10	-	-	72
Days since last rain	2	4	2	2	0	-	7
Volume last rain (mm)	0	0	0	5	1	3	3
Time - start	12:00	10:33	10:46	12:25	10:00	12:33	10:00
Time - end	15:03	14:13	15:27	13:55	15:00	12:58	13:00
Temp - start (°C)	24	20	27	25	15	21	30
Temp - middle (°C)	26	26	28	25	21	21	33
Temp - end (°C)	27	30	22	23	21	22	35
Wind direction - start	WSW	E	NNW	SSW	W	W	NNE
Wind direction - middle	W	SE	WNW	W	W	W	N
Wind direction - end	WSW	SE	SSW	SW	W	W	N
Wind speed - start (km/h)	28	9	26	13	35	37	25
Wind speed - middle (km/h)	20	13	22	15	35	35	25
Wind speed - end (km/h)	20	15	22	15	46	32	25
Cloud cover - start (%)	20	0	5	5	7	60	5
Cloud cover - middle (%)	20	0	8	20	7	70	5
Cloud cover - end (%)	20	0	8	10	6	80	5
Humidity - start (%)	25	48	12	29	59	40	16
Humidity - middle (%)	24	30	11	29	40	40	16
Humidity - end (%)	23	27	22	41	34	39	14
Soil condition - start	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Soil condition - middle	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Soil condition - end	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Valid survey date	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**

Table A5.7 Survey condition data for Golden Sun Moth

Parameter	13/12/2019	14/12/2019	16/12/2019	17/12/2019	17/12/2019	18/12/2019	23/12/2019
GSM observed during survey	Y	N	N	N	N	Y	Y
GSM observed at reference site	-	N	Y	Y	Y	Y	Y
Reference site	Parcel CPS805151	-	Broadmeadows Valley Park	Broadmeadows Valley Park	Mt Ridley Grassland Extension	Parcels 1TP746632 & 2LP133657 Mt Ridley Grassland Extension	Parcel 6TP394032 Broadmeadows Valley Park
GSM abundance at reference site	-	-	6	15	20	39	27
Days since last rain	3	4	6	7	7	8	13
Volume last rain (mm)	0	0	0	0	0	0	0
Time - start	10:00	10:00	10:00	13:05	10:20	10:14	11:03
Time - end	15:00	15:00	12:30	13:49	14:00	14:20	12:05
Temp - start (°C)	14	16	20	28	33	29	20
Temp - middle (°C)	22	19	22	29	36	34	20
Temp - end (°C)	24	21	25	29	38	39	22
Wind direction - start	SSW	SW	SE	SE	NNE	ENE	SEE
Wind direction - middle	SSW	SW	SE	SE	NNW	NW	SSW
Wind direction - end	SSW	SW	ESE	SE	W	WNW	SW
Wind speed - start (km/h)	20	19	7	15	33	9	19
Wind speed - middle (km/h)	22	19	5	10	12	15	13
Wind speed - end (km/h)	24	19	2	9	4	15	15
Cloud cover - start (%)	7	8	2	30	5	0	5
Cloud cover - middle (%)	7	8		5	5	0	10
Cloud cover - end (%)	7	8	50	20	20	0	3
Humidity - start (%)	52	67	56	23	20	37	53
Humidity - middle (%)	40	50	50	23	21	22	53
Humidity - end (%)	34	47	34	23	15	13	34
Soil condition - start	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Soil condition - middle	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Soil condition - end	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Valid survey date	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**

Table A5.8 Survey results for Growling Grass Frog

Parcel identifier	Habitat feature(s)	Day survey	Potential habitat	Suitable condition for night survey	Night survey 1	Night survey 1
2PS343496	Tame Street Drain	10/12/2019	Y	Y	17/12/2019	22/01/2020
1TP710576	1x dam	10/12/2019	Y	N	N/A	N/A
11LP92520	1x dam	10/12/2019	Y	N	N/A	N/A
12LP92520	1x dam	10/12/2019	Y	N	N/A	N/A
13LP92520	1x dam	10/12/2019	Y	Y	17/12/2019	22/01/2020
2LP137651	1x dam	10/12/2019	Y	N	N/A	N/A
1LP137651	1x dam	10/12/2019	Y	N	N/A	N/A
D16PP2761	1x dam	10/12/2019	Y	N	N/A	N/A
1TP333383	1x dam	10/12/2019	Y	N	N/A	N/A
2029PP2761	Jacksons Creek	Assume presence				
2010PP2258	Jacksons Creek	Assume presence				
2002PP2258	Deep Creek	Assume presence + recorded 28/01/2020				
2LP130112	1x dam	Unassessed (no access)				
1LP130112	1x dam	10/12/2019	Y	N	N/A	N/A
B7PP2258	2x dam	10/12/2019	Y	N	N/A	N/A
5LP88261	1x dam	10/12/2019	Y	N	N/A	N/A
10LP110642	1x dam	10/12/2019	Y	Y	17/12/2019	22/01/2020
1PS733045	1x dam	10/12/2019	Y	Y	17/12/2019	22/01/2020
32LP93445	1x dam	10/12/2019	Y	N	N/A	N/A
PPS816942	1x dam	10/12/2019	Y	Y	17/12/2019	22/01/2020

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Table A5.8 Survey results for Growling Grass Frog

Parcel identifier	Habitat feature(s)	Day survey	Potential habitat	Suitable condition for night survey	Night survey 1	Night survey 1
1TP201330	1x dam	10/12/2019	Y	N	N/A	N/A
29PP3100	Kalkallo Creek & adjacent unnamed channel	10/12/2019	Y	N	N/A	N/A
1LP136262	1x dam	10/12/2019	Y	N	N/A	N/A
9LP136262	1x dam	6/02/2020	Y	N	N/A	N/A
10LP5364	1x dam	6/02/2020	Y	Y	17/02/2020	-
1LP113763	1x dam	6/02/2020	Y	N	N/A	N/A
2LP113763	1x dam	6/02/2020	Y	Y	No access	
1TP709372	Merri Creek			Assume presence		
2LP67181	Merri Creek			Assume presence		
1TP709759	1x dam	10/12/2019	Y	Y	17/12/2019	22/01/2020

	GGF recorded
N/A	Dry - unsuitable for night survey

Appendix 6 Native vegetation removal report

Native vegetation removal report

This report provides information to support an application to remove, destroy or lop native vegetation in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation*. The report **is not an assessment by DELWP** of the proposed native vegetation removal. Native vegetation information and offset requirements have been determined using spatial data provided by the applicant or their consultant.

Date of issue: **01/04/2020**
Time of issue: **12:49 pm**

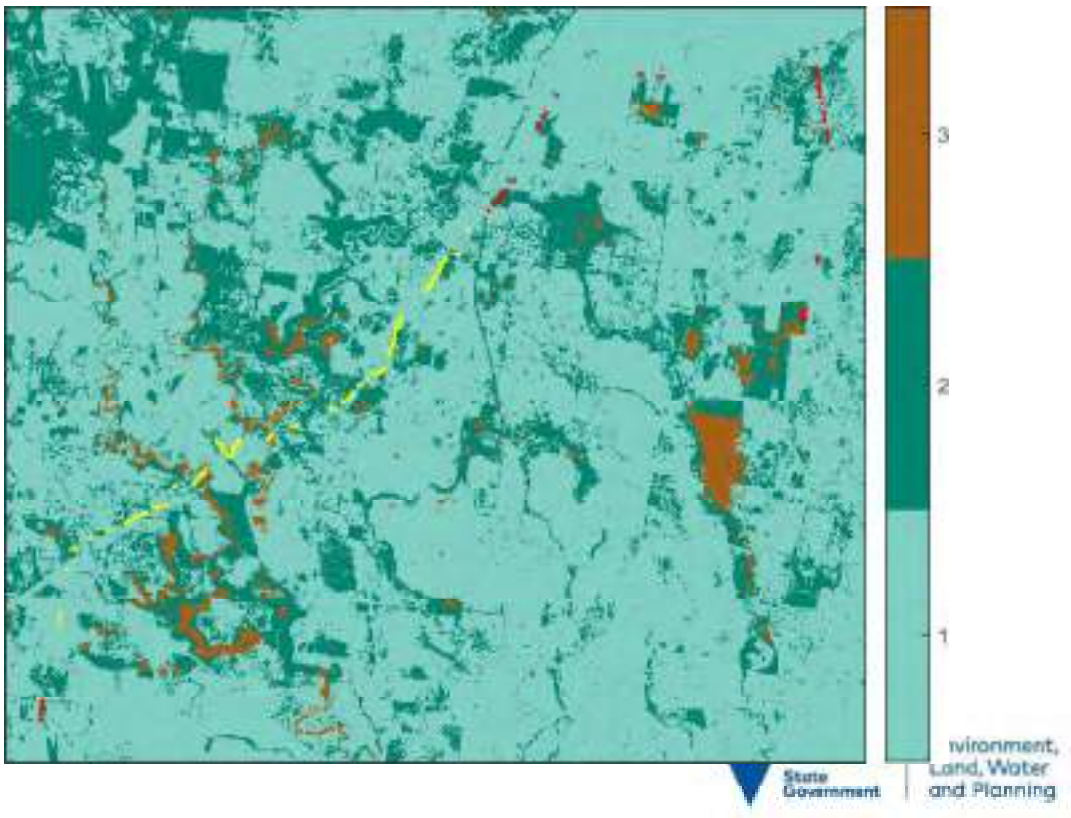
Report ID: BIO_2020_018

Project ID	31496_VegClearing1_MS01_00683A_edit

Assessment pathway

Assessment pathway	**Detailed Assessment Pathway**
Extent including past and proposed	29.746 ha
Extent of past removal where past = areas of native vegetation to be removed within the Melbourne Strategic Assessment (MSA) Program	10.406 ha
Extent of proposed removal	19.340 ha
No. Large trees proposed to be removed	20
Location category of proposed removal	Location 3 The native vegetation is in an area where the removal of less than 0.5 hectares could have a significant impact on habitat for one or more rare or threatened species.The native vegetation is also in an area mapped as an endangered Ecological Vegetation Class (as per the statewide EVC map).

1. Location map



Offset requirements if a permit is granted

Any approval granted will include a condition to obtain an offset that meets the following requirements:

General offset amount[1]	4.430 general habitat units
Vicinity	Port Phillip and Westernport Catchment Management Authority (CMA) or Hume City, Melton City Council
Minimum strategic biodiversity value score[2]	0.449
Large trees*	5 large trees
Species offset amount[3]	8.486 species units of habitat for Small Golden Moths, *Diuris basaltica* 8.616 species units of habitat for Heath Spear-grass, *Austrostipa exilis* 6.662 species units of habitat for Bacchus Marsh Wattle, *Acacia rostriformis*
Large trees*	15 trees
*** The total number of large trees that the offset must protect**	20 large trees to be protected in either the general, species or combination across all habitat units protected

NB: values within tables in this document may not add to the totals shown above due to rounding

Appendix 1 includes information about the native vegetation to be removed

Appendix 2 includes information about the rare or threatened species mapped at the site.

Appendix 3 includes maps showing native vegetation to be removed and extracts of relevant species habitat importance maps

1 The general offset amount required is the sum of all general habitat units in Appendix 1.

2 Minimum strategic biodiversity score is 80 per cent of the weighted average score across habitat zones where a general offset is required

3 The species offset amount(s) required is the sum of all species habitat units in Appendix 1.

Next steps

Any proposal to remove native vegetation must meet the application requirements of the Detailed Assessment Pathway and it will be assessed under the Detailed Assessment Pathway.

If you wish to remove the mapped native vegetation you are required to apply for a permit from your local council. Council will refer your application to DELWP for assessment, as required. **This report is not a referral assessment by DELWP.**

This *Native vegetation removal report* must be submitted with your application for a permit to remove, destroy or lop native vegetation.

Refer to the *Guidelines for the removal, destruction or lopping of native* vegetation (the Guidelines) for a full list of application requirements This report provides information that meets the following application requirements:

- The assessment pathway and reason for the assessment pathway
- A description of the native vegetation to be removed (partly met)
- Maps showing the native vegetation and property (partly met)
- Information about the impacts on rare or threatened species.
- The offset requirements determined in accordance with section 5 of the Guidelines that apply if approval is granted to remove native vegetation.

Additional application requirements must be met including:

- Topographical and land information
- Recent dated photographs
- Details of past native vegetation removal
- An avoid and minimise statement
- A copy of any Property Vegetation Plan that applies
- A defendable space statement as applicable
- A statement about the Native Vegetation Precinct Plan as applicable
- A site assessment report including a habitat hectare assessment of any patches of native vegetation and details of trees
- An offset statement that explains that an offset has been identified and how it will be secured.

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Obtaining this publication does not guarantee that an application will meet the requirements of Clauses 52.16 or 52.17 of the Victoria Planning Provisions and Victorian planning schemes or that a permit to remove native vegetation will be granted.

Notwithstanding anything else contained in this publication, you must ensure that you comply with all relevant laws, legislation, awards or orders and that you obtain and comply with all permits, approvals and the like that affect, are applicable or are necessary to undertake any action to remove, lop or destroy or otherwise deal with any native vegetation or that apply to matters within the scope of Clauses 52.16 or 52.17 of the Victoria Planning Provisions and Victorian planning schemes.

Appendix 1: Description of native vegetation to be removed

The species-general offset test was applied to your proposal. This test determines if the proposed removal of native vegetation has a proportional impact on any rare or threatened species habitats above the species offset threshold. The threshold is set at 0.005 per cent of the mapped habitat value for a species. When the proportional impact is above the species offset threshold a species offset is required. This test is done for all species mapped at the site. Multiple species offsets will be required if the species offset threshold is exceeded for multiple species.

Where a zone requires species offset(s), the species habitat units for each species in that zone is calculated by the following equation in accordance with the Guidelines:

Species habitat units = extent x condition x species landscape factor x 2, where the species landscape factor = 0.5 + (habitat importance score/2)

The species offset amount(s) required is the sum of all species habitat units per zone

Where a zone does not require a species offset, the general habitat units in that zone is calculated by the following equation in accordance with the Guidelines:

General habitat units = extent x condition x general landscape factor x 1.5, where the general landscape factor = 0.5 + (strategic biodiversity value score/2)

The general offset amount required is the sum of all general habitat units per zone.

Native vegetation to be removed

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
3-1	Patch	vvp_0132	Endangered	0	no	0.250	0.032	0.032	0.190		0.007	General
6-2	Patch	vvp_0132	Endangered	0	no	0.240	0.097	0.097	0.270		0.022	General
5-3	Patch	vvp_0132	Endangered	0	no	0.280	0.057	0.057	0.250		0.015	General
4-4	Patch	vvp_0132	Endangered	0	no	0.220	0.055	0.055	0.250		0.011	General
8-5	Patch	vvp_0132	Endangered	0	no	0.190	0.037	0.037	0.920	0.820	0.013	501473 Small Golden Moths *Diuris basaltica*
										0.820	0.013	503984 Heath Spear-grass *Austrostipa exilis*
7-6	Patch	vvp_0132	Endangered	0	no	0.230	0.098	0.098	0.925	0.832	0.041	501473 Small Golden Moths *Diuris basaltica*
										0.832	0.041	503984 Heath Spear-grass *Austrostipa exilis*
										0.218	0.041	505136 Bacchus Marsh Wattle *Acacia rostriformis*
18-7	Patch	vvp_0132	Endangered	0	no	0.230	0.027	0.027	0.740	0.790	0.011	501473 Small Golden Moths *Diuris basaltica*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
										0.790	0.011	503984 Heath Spear-grass *Austrostipa exilis*
15-8	Patch	vvp_0132	Endangered	0	no	0.480	0.523	0.523	0.446	0.729	0.434	501473 Small Golden Moths *Diuris basaltica*
										0.643	0.434	503984 Heath Spear-grass *Austrostipa exilis*
										0.270	0.432	505136 Bacchus Marsh Wattle *Acacia rostriformis*
23-9	Patch	vvp_0132	Endangered	0	no	0.360	0.268	0.268	0.900	0.740	0.168	501473 Small Golden Moths *Diuris basaltica*
										0.736	0.167	503984 Heath Spear-grass *Austrostipa exilis*
										0.736	0.167	505136 Bacchus Marsh Wattle *Acacia rostriformis*
14-10	Patch	vvp_0132	Endangered	0	no	0.230	0.047	0.047	0.450	0.760	0.019	501473 Small Golden Moths *Diuris basaltica*
										0.574	0.019	503984 Heath Spear-grass *Austrostipa exilis*
24-11	Patch	vvp_0132	Endangered	0	no	0.270	0.443	0.443	0.869	0.660	0.198	501473 Small Golden Moths *Diuris basaltica*
										0.708	0.204	503984 Heath Spear-grass *Austrostipa exilis*
										0.708	0.204	505136 Bacchus Marsh Wattle *Acacia rostriformis*
25-12	Patch	vvp_0641	Endangered	3	no	0.430	0.075	0.075	0.880	0.680	0.054	501473 Small Golden Moths *Diuris basaltica*
										0.680	0.054	503984 Heath Spear-grass *Austrostipa exilis*
										0.680	0.054	505136 Bacchus Marsh Wattle *Acacia rostriformis*
16-13	Patch	vvp_0132	Endangered	0	no	0.320	0.123	0.123	0.641	0.746	0.069	501473 Small Golden Moths *Diuris basaltica*
										0.277	0.069	503984 Heath Spear-grass *Austrostipa exilis*
										0.243	0.069	505136 Bacchus Marsh Wattle *Acacia rostriformis*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
10-14	Patch	cvu_0132	Endangered	0	no	0.290	0.079	0.079	0.710	0.420	0.033	501473 Small Golden Moths *Diuris basaltica*
										0.420	0.033	503984 Heath Spear-grass *Austrostipa exilis*
13-15	Patch	cvu_0132	Endangered	0	no	0.320	0.036	0.036	0.580	0.778	0.021	501473 Small Golden Moths *Diuris basaltica*
										0.778	0.021	503984 Heath Spear-grass *Austrostipa exilis*
21-16	Patch	vvp_0653	Endangered	0	no	0.320	0.064	0.064	0.430	0.650	0.034	501473 Small Golden Moths *Diuris basaltica*
										0.650	0.034	503984 Heath Spear-grass *Austrostipa exilis*
19-17	Patch	vvp_0132	Endangered	0	no	0.290	0.063	0.063	0.648	0.744	0.032	501473 Small Golden Moths *Diuris basaltica*
										0.312	0.032	503984 Heath Spear-grass *Austrostipa exilis*
										0.312	0.032	505136 Bacchus Marsh Wattle *Acacia rostriformis*
20-18	Patch	vvp_0132	Endangered	0	no	0.290	0.040	0.040	0.440		0.012	General
12-19	Patch	vvp_0132	Endangered	0	no	0.260	0.272	0.272	0.867	0.811	0.128	501473 Small Golden Moths *Diuris basaltica*
										0.217	0.128	503984 Heath Spear-grass *Austrostipa exilis*
11-20	Patch	cvu_0132	Endangered	0	no	0.290	0.043	0.043	0.756	0.715	0.021	501473 Small Golden Moths *Diuris basaltica*
										0.715	0.021	503984 Heath Spear-grass *Austrostipa exilis*
37-21	Patch	vvp_0055_61	Endangered	4	no	0.290	2.507	2.507	0.562		0.852	General
17-22	Patch	vvp_0132	Endangered	0	no	0.260	0.054	0.054	0.740		0.018	General
9-23	Patch	vvp_0132_61	Endangered	0	no	0.250	0.020	0.020	0.960	0.742	0.009	501473 Small Golden Moths *Diuris basaltica*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.742	0.009	503984 Heath Spear-grass *Austrostipa exilis*
22-24	Patch	vvp_0055_61	Endangered	2	no	0.320	0.077	0.077	0.526	0.734	0.043	501473 Small Golden Moths *Diuris basaltica*
										0.734	0.043	503984 Heath Spear-grass *Austrostipa exilis*
										0.734	0.043	505136 Bacchus Marsh Wattle *Acacia rostriformis*
28-25	Patch	vvp_0125	Endangered	0	no	0.200	0.256	0.256	0.470		0.056	General
44-26	Patch	vvp_0055_61	Endangered	0	no	0.190	0.030	0.030	0.620		0.007	General
45-27	Patch	vvp_0055_61	Endangered	0	no	0.190	0.031	0.031	0.620		0.007	General
43-28	Patch	vvp_0055_61	Endangered	0	no	0.310	0.027	0.027	0.620		0.010	General
30-29	Patch	vvp_0132	Endangered	0	no	0.410	0.668	0.668	0.627		0.334	General
39-30	Patch	vvp_0132	Endangered	0	no	0.370	0.806	0.806	0.529	0.556	0.464	501473 Small Golden Moths *Diuris basaltica*
										0.275	0.464	503984 Heath Spear-grass *Austrostipa exilis*
1-31	Patch	vvp_0132	Endangered	0	no	0.310	0.117	0.117	0.880	0.814	0.066	501473 Small Golden Moths *Diuris basaltica*
										0.814	0.066	503984 Heath Spear-grass *Austrostipa exilis*
42-32	Patch	vvp_0132	Endangered	0	no	0.180	0.077	0.077	0.460		0.015	General
33-33	Patch	vvp_0132	Endangered	0	no	0.380	0.477	0.477	0.939	0.780	0.323	501473 Small Golden Moths *Diuris basaltica*
										0.778	0.323	503984 Heath Spear-grass *Austrostipa exilis*
										0.778	0.323	505136 Bacchus Marsh Wattle *Acacia rostriformis*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
31-34	Patch	vvp_0132_61	Endangered	0	no	0.280	0.474	0.474	0.811		0.180	General
32-35	Patch	vvp_0132_61	Endangered	0	no	0.360	0.684	0.684	0.813		0.335	General
27-A	Patch	vvp_0132	Endangered	0	no	0.360	0.001	0.001	0.410		0.000	General
40-B	Patch	vvp_0132	Endangered	0	no	0.290	0.042	0.042	0.920	0.655	0.020	503984 Heath Spear-grass *Austrostipa exilis*
40-A	Patch	vvp_0132	Endangered	0	no	0.290	0.007	0.007	0.920	0.650	0.003	501473 Small Golden Moths *Diuris basaltica*
										0.650	0.003	503984 Heath Spear-grass *Austrostipa exilis*
41-36	Patch	vvp_0055_61	Endangered	0	no	0.200	0.313	0.313	0.912	0.681	0.105	503984 Heath Spear-grass *Austrostipa exilis*
38-B	Patch	vvp_0132	Endangered	0	no	0.260	0.526	0.526	0.763	0.651	0.226	501473 Small Golden Moths *Diuris basaltica*
										0.597	0.226	503984 Heath Spear-grass *Austrostipa exilis*
38-A	Patch	vvp_0132	Endangered	0	no	0.260	1.255	1.255	0.367		0.335	General
36-B	Patch	vvp_0132	Endangered	0	no	0.460	1.136	1.136	0.463		0.573	General
36-A	Patch	vvp_0132	Endangered	0	no	0.460	0.362	0.362	0.678		0.210	General
2-A	Patch	vvp_0132	Endangered	0	no	0.260	0.011	0.011	0.880	0.750	0.005	501473 Small Golden Moths *Diuris basaltica*
										0.750	0.005	503984 Heath Spear-grass *Austrostipa exilis*
2-B	Patch	vvp_0132	Endangered	0	no	0.260	0.024	0.024	0.880	0.750	0.011	501473 Small Golden Moths *Diuris basaltica*
										0.750	0.011	503984 Heath Spear-grass *Austrostipa exilis*
26-A	Patch	cvu_0641	Endangered	2	no	0.530	0.112	0.112	0.960	0.500	0.089	501473 Small Golden Moths *Diuris basaltica*
										0.500	0.089	503984 Heath Spear-grass *Austrostipa exilis*
26-B	Patch	cvu_0641	Endangered	0	no	0.530	0.002	0.002	0.960	0.530	0.002	501473 Small Golden Moths *Diuris basaltica*
										0.530	0.002	503984 Heath Spear-grass *Austrostipa exilis*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
										0.530	0.002	505136 Bacchus Marsh Wattle *Acacia rostriformis*
1-ST	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.070	0.430	0.720	0.024	501473 Small Golden Moths *Diuris basaltica*
										0.720	0.024	503984 Heath Spear-grass *Austrostipa exilis*
10-ST	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.070	0.900	0.670	0.023	501473 Small Golden Moths *Diuris basaltica*
										0.670	0.023	503984 Heath Spear-grass *Austrostipa exilis*
8-ST	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.930	0.680	0.011	501473 Small Golden Moths *Diuris basaltica*
										0.680	0.011	503984 Heath Spear-grass *Austrostipa exilis*
9-ST	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.052	0.930	0.680	0.017	501473 Small Golden Moths *Diuris basaltica*
										0.680	0.017	503984 Heath Spear-grass *Austrostipa exilis*
2-ST	Scattered Tree	vvp_0803	Endangered	1	no	0.200	0.070	0.070	0.760	0.750	0.025	501473 Small Golden Moths *Diuris basaltica*
										0.750	0.025	503984 Heath Spear-grass *Austrostipa exilis*
										0.750	0.025	505136 Bacchus Marsh Wattle *Acacia rostriformis*
3-ST	Scattered Tree	vvp_0803	Endangered	0	no	0.200	0.031	0.031	0.900	0.750	0.011	501473 Small Golden Moths *Diuris basaltica*
										0.750	0.011	503984 Heath Spear-grass *Austrostipa exilis*
										0.750	0.011	505136 Bacchus Marsh Wattle *Acacia rostriformis*
6-ST	Scattered Tree	cvu_0055_61	Endangered	1	no	0.200	0.070	0.061	0.960	0.553	0.019	501473 Small Golden Moths *Diuris basaltica*
										0.553	0.019	503984 Heath Spear-grass *Austrostipa exilis*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
										0.553	0.019	505136 Bacchus Marsh Wattle *Acacia rostriformis*
5-ST	Scattered Tree	cvu_0055_61	Endangered	1	no	0.200	0.070	0.062	0.960	0.550	0.019	501473 Small Golden Moths *Diuris basaltica*
										0.550	0.019	503984 Heath Spear-grass *Austrostipa exilis*
										0.550	0.019	505136 Bacchus Marsh Wattle *Acacia rostriformis*
7-ST	Scattered Tree	cvu_0055_61	Endangered	1	no	0.200	0.070	0.070	0.960	0.566	0.022	501473 Small Golden Moths *Diuris basaltica*
										0.566	0.022	503984 Heath Spear-grass *Austrostipa exilis*
										0.566	0.022	505136 Bacchus Marsh Wattle *Acacia rostriformis*
4-ST	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.880	0.680	0.011	501473 Small Golden Moths *Diuris basaltica*
										0.680	0.011	503984 Heath Spear-grass *Austrostipa exilis*
										0.680	0.011	505136 Bacchus Marsh Wattle *Acacia rostriformis*
2-Z	Patch	vvp_0132_61	Endangered	0	no	0.800	0.316	0.316	0.844	0.778	0.450	501473 Small Golden Moths *Diuris basaltica*
										0.778	0.450	503984 Heath Spear-grass *Austrostipa exilis*
4-Z	Patch	vvp_0132_61	Endangered	0	no	0.720	1.626	1.626	0.610		1.413	General
1-Z	Patch	vvp_0132_61	Endangered	0	no	0.750	0.099	0.099	0.936	0.750	0.130	501473 Small Golden Moths *Diuris basaltica*
										0.521	0.130	503984 Heath Spear-grass *Austrostipa exilis*
3-Z	Patch	vvp_0055_61	Endangered	0	no	0.750	4.054	4.054	0.566	0.708	5.192	501473 Small Golden Moths *Diuris basaltica*
										0.413	5.192	503984 Heath Spear-grass *Austrostipa exilis*
										0.404	5.190	505136 Bacchus Marsh Wattle *Acacia rostriformis*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
0-84	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.052	0.930	0.680	0.017	501473 Small Golden Moths *Diuris basaltica*
										0.680	0.017	503984 Heath Spear-grass *Austrostipa exilis*
0-87	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.070	0.430		0.015	General

Appendix 2: Information about impacts to rare or threatened species' habitats on site

This table lists all rare or threatened species' habitats mapped at the site.

Species common name	Species scientific name	Species number	Conservation status	Group	Habitat impacted	% habitat value affected
Bacchus Marsh Wattle	*Acacia rostriformis*	505136	Vulnerable	Dispersed	Habitat importance map	0.0096
Small Golden Moths	*Diuris basaltica*	501473	Endangered	Dispersed	Habitat importance map	0.0063
Heath Spear-grass	*Austrostipa exilis*	503984	Rare	Dispersed	Habitat importance map	0.0060
Fragrant Saltbush	*Rhagodia parabolica*	502929	Rare	Dispersed	Habitat importance map	0.0046
Large-headed Fireweed	*Senecio macrocarpus*	503116	Endangered	Dispersed	Habitat importance map	0.0037
Large-flower Crane's-bill	*Geranium sp. 1*	505342	Endangered	Dispersed	Habitat importance map	0.0035
Plump Swamp Wallaby-grass	*Amphibromus pithogastrus*	503624	Endangered	Dispersed	Habitat importance map	0.0032
Brackish Plains Buttercup	*Ranunculus diminutus*	504314	Rare	Dispersed	Habitat importance map	0.0029
Melbourne Yellow-gum	*Eucalyptus leucoxylon subsp. connata*	504484	Vulnerable	Dispersed	Habitat importance map	0.0027
Werribee Blue-box	*Eucalyptus baueriana subsp. thalassina*	507580	Endangered	Dispersed	Habitat importance map	0.0027
Grassland Earless Dragon	*Tympanocryptis pinguicolla*	12922	Critically endangered	Dispersed	Habitat importance map ; special site	0.0022
Matted Flax-lily	*Dianella amoena*	505084	Endangered	Dispersed	Habitat importance map	0.0018
Tough Scurf-pea	*Cullen tenax*	502776	Endangered	Dispersed	Habitat importance map	0.0018
Pale-flower Crane's-bill	*Geranium sp. 3*	505344	Rare	Dispersed	Habitat importance map	0.0018
Small Golden Moths	*Diuris basaltica*	501473	Endangered	Dispersed	Top ranking map	0.0015
Rye Beetle-grass	*Tripogon loliiformis*	503455	Rare	Dispersed	Habitat importance map	0.0015
Arching Flax-lily	*Dianella sp. aff. longifolia (Benambra)*	505560	Vulnerable	Dispersed	Habitat importance map	0.0014
Heath Spear-grass	*Austrostipa exilis*	503984	Rare	Dispersed	Top ranking map	0.0014

Spiny Rice-flower	*Pimelea spinescens subsp. spinescens*	504823	Endangered	Dispersed	Habitat importance map	0.0014
Small Scurf-pea	*Cullen parvum*	502773	Endangered	Dispersed	Habitat importance map	0.0014
Pale Swamp Everlasting	*Coronidium gunnianum*	504655	Vulnerable	Dispersed	Habitat importance map	0.0013
Austral Tobacco	*Nicotiana suaveolens*	502275	Rare	Dispersed	Habitat importance map	0.0012
Rosemary Grevillea	*Grevillea rosmarinifolia subsp. rosmarinifolia*	504066	Rare	Dispersed	Habitat importance map	0.0012
Curly Sedge	*Carex tasmanica*	500650	Vulnerable	Dispersed	Habitat importance map	0.0011
Golden Sun Moth	*Synemon plana*	15021	Critically endangered	Dispersed	Habitat importance map ; special site	0.0011
Basalt Podolepis	*Podolepis linearifolia*	504658	Endangered	Dispersed	Top ranking map	0.0011
Plains Yam-daisy	*Microseris scapigera s.s.*	504657	Vulnerable	Dispersed	Habitat importance map	0.0011
Velvet Daisy-bush	*Olearia pannosa subsp. cardiophylla*	502317	Vulnerable	Dispersed	Habitat importance map	0.0010
Cane Spear-grass	*Austrostipa breviglumis*	503268	Rare	Dispersed	Habitat importance map	0.0010
Growling Grass Frog	*Litoria raniformis*	13207	Endangered	Dispersed	Habitat importance map	0.0010
Western Golden-tip	*Goodia medicaginea*	501518	Rare	Dispersed	Habitat importance map	0.0010
Fragrant Saltbush	*Rhagodia parabolica*	502929	Rare	Dispersed	Top ranking map	0.0009
Snowy Mint-bush	*Prostanthera nivea var. nivea*	502746	Rare	Dispersed	Habitat importance map	0.0009
Purple Blown-grass	*Lachnagrostis punicea subsp. punicea*	504206	Rare	Dispersed	Habitat importance map	0.0009
Swamp Fireweed	*Senecio psilocarpus*	504659	Vulnerable	Dispersed	Habitat importance map	0.0008
Basalt Podolepis	*Podolepis linearifolia*	504658	Endangered	Dispersed	Habitat importance map	0.0008
Button Wrinklewort	*Rutidosis leptorhynchoides*	502982	Endangered	Dispersed	Habitat importance map	0.0008
Button Wrinklewort	*Rutidosis leptorhynchoides*	502982	Endangered	Dispersed	Top ranking map	0.0008
Small Milkwort	*Comesperma polygaloides*	500798	Vulnerable	Dispersed	Habitat importance map	0.0007
Austral Crane's-bill	*Geranium solanderi var. solanderi s.s.*	505337	Vulnerable	Dispersed	Habitat importance map	0.0007

Dark Wire-grass	*Aristida calycina var. calycina*	503630	Rare	Dispersed	Habitat importance map	0.0006
Swamp Everlasting	*Xerochrysum palustre*	503763	Vulnerable	Dispersed	Habitat importance map	0.0006
Brittle Greenhood	*Pterostylis truncata*	502821	Endangered	Dispersed	Habitat importance map	0.0006
Clover Glycine	*Glycine latrobeana*	501456	Vulnerable	Dispersed	Habitat importance map	0.0005
Large-headed Fireweed	*Senecio macrocarpus*	503116	Endangered	Dispersed	Top ranking map	0.0005
Melbourne Yellow-gum	*Eucalyptus leucoxylon subsp. connata*	504484	Vulnerable	Dispersed	Top ranking map	0.0004
Late-flower Flax-lily	*Dianella tarda*	505085	Vulnerable	Dispersed	Habitat importance map	0.0004
Branching Groundsel	*Senecio cunninghamii var. cunninghamii*	503104	Rare	Dispersed	Habitat importance map	0.0003
Bearded Dragon	*Pogona barbata*	12177	Vulnerable	Dispersed	Habitat importance map	0.0003
Striped Legless Lizard	*Delma impar*	12159	Endangered	Dispersed	Habitat importance map	0.0003
Hairy Tails	*Ptilotus erubescens*	502825	Vulnerable	Dispersed	Habitat importance map	0.0003
Waterbush	*Myoporum montanum*	502240	Rare	Dispersed	Habitat importance map	0.0003
Black Falcon	*Falco subniger*	10238	Vulnerable	Dispersed	Habitat importance map ; special site	0.0003
Shiny Leionema	*Leionema lamprophyllum subsp. obovatum*	505478	Rare	Dispersed	Habitat importance map	0.0002
Purple Diuris	*Diuris punctata*	501084	Vulnerable	Dispersed	Habitat importance map	0.0002
Clumping Golden Moths	*Diuris gregaria*	504887	Endangered	Dispersed	Habitat importance map	0.0002
Buloke	*Allocasuarina luehmannii*	500678	Endangered	Dispersed	Habitat importance map	0.0002
Dwarf Brooklime	*Gratiola pumilo*	503753	Rare	Dispersed	Habitat importance map	0.0001
Golden Cowslips	*Diuris behrii*	501061	Vulnerable	Dispersed	Habitat importance map	0.0001
Port Lincoln Snake	*Parasuta spectabilis*	12813	Vulnerable	Dispersed	Habitat importance map	0.0001
Lewin's Rail	*Lewinia pectoralis pectoralis*	10045	Vulnerable	Dispersed	Habitat importance map	0.0001
Yellow Burr-daisy	*Calotis lappulacea*	500598	Rare	Dispersed	Habitat importance map	0.0001
Silky Kidney-weed	*Dichondra sp. 1*	505786	Rare	Dispersed	Habitat importance map	0.0001

Australian Painted Snipe	*Rostratula australis*	10170	Critically endangered	Dispersed	Habitat importance map	0.0000
Brown Toadlet	*Pseudophryne bibronii*	13117	Endangered	Dispersed	Habitat importance map	0.0000
Australian Little Bittern	*Ixobrychus dubius*	10195	Endangered	Dispersed	Habitat importance map	0.0000
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	10226	Vulnerable	Dispersed	Habitat importance map	0.0000
Floodplain Fireweed	*Senecio campylocarpus*	507136	Rare	Dispersed	Habitat importance map	0.0000
Buloke Mistletoe	*Amyema linophylla subsp. orientalis*	500217	Vulnerable	Dispersed	Habitat importance map	0.0000
Musk Duck	*Biziura lobata*	10217	Vulnerable	Dispersed	Habitat importance map	0.0000
Hardhead	*Aythya australis*	10215	Vulnerable	Dispersed	Habitat importance map	0.0000
Painted Honeyeater	*Grantiella picta*	10598	Vulnerable	Dispersed	Habitat importance map	0.0000
Baillon's Crake	*Porzana pusilla palustris*	10050	Vulnerable	Dispersed	Habitat importance map	0.0000
Australasian Shoveler	*Anas rhynchotis*	10212	Vulnerable	Dispersed	Habitat importance map	0.0000
Little Egret	*Egretta garzetta nigripes*	10185	Endangered	Dispersed	Habitat importance map	0.0000
Australasian Bittern	*Botaurus poiciloptilus*	10197	Endangered	Dispersed	Habitat importance map	0.0000
Blue-billed Duck	*Oxyura australis*	10216	Endangered	Dispersed	Habitat importance map	0.0000
Freckled Duck	*Stictonetta naevosa*	10214	Endangered	Dispersed	Habitat importance map	0.0000
Swift Parrot	*Lathamus discolor*	10309	Endangered	Dispersed	Habitat importance map	0.0000
Brolga	*Grus rubicunda*	10177	Vulnerable	Dispersed	Habitat importance map	0.0000
Eastern Great Egret	*Ardea modesta*	10187	Vulnerable	Dispersed	Habitat importance map	0.0000
Intermediate Egret	*Ardea intermedia*	10186	Endangered	Dispersed	Habitat importance map	0.0000
Barking Owl	*Ninox connivens connivens*	10246	Endangered	Dispersed	Habitat importance map	0.0000
Slender Mint-bush	*Prostanthera saxicola var. bracteolata*	502750	Rare	Dispersed	Habitat importance map	0.0000
Grey Goshawk	*Accipiter novaehollandiae novaehollandiae*	10220	Vulnerable	Dispersed	Habitat importance map	0.0000
Speckled Warbler	*Chthonicola sagittatus*	10504	Vulnerable	Dispersed	Habitat importance map	0.0000

White-throated Needletail	*Hirundapus caudacutus*	10334	Vulnerable	Dispersed	Habitat importance map	0.0000

Habitat group

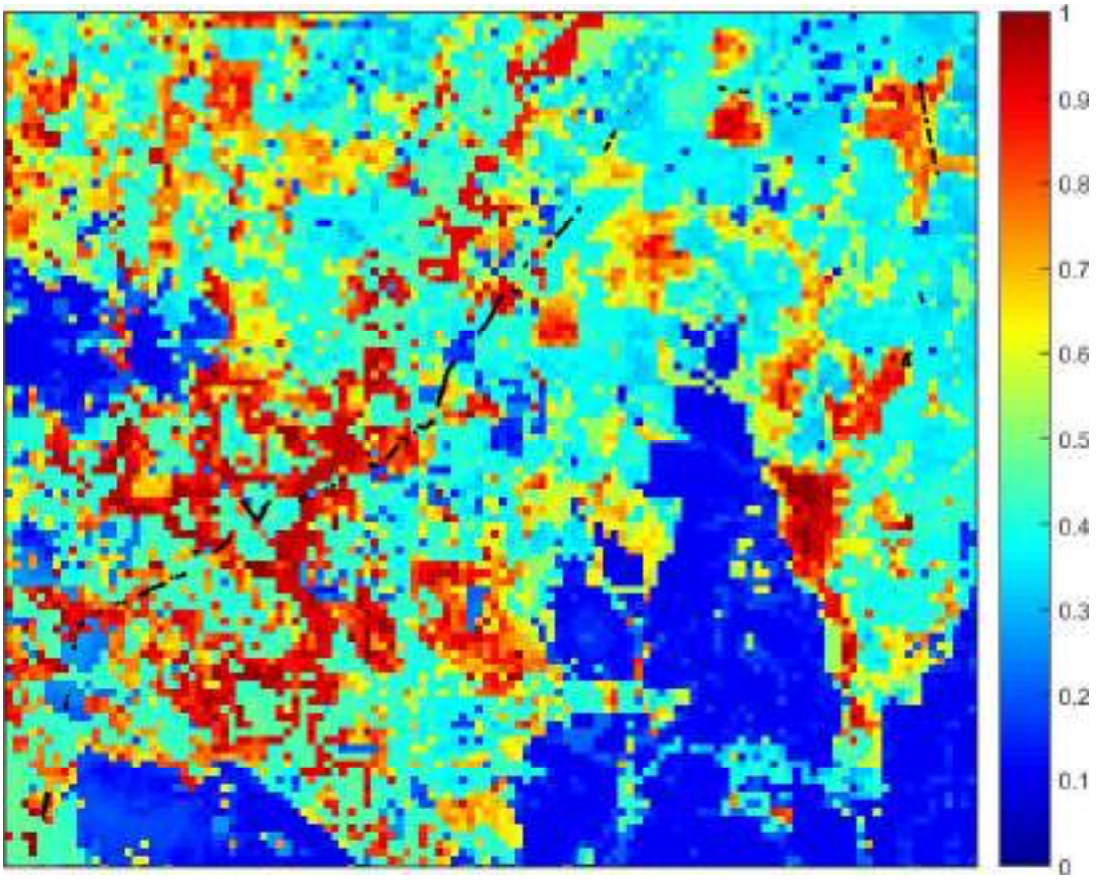
- Highly localised habitat means there is 2000 hectares or less mapped habitat for the species
- Dispersed habitat means there is more than 2000 hectares of mapped habitat for the species

Habitat impacted

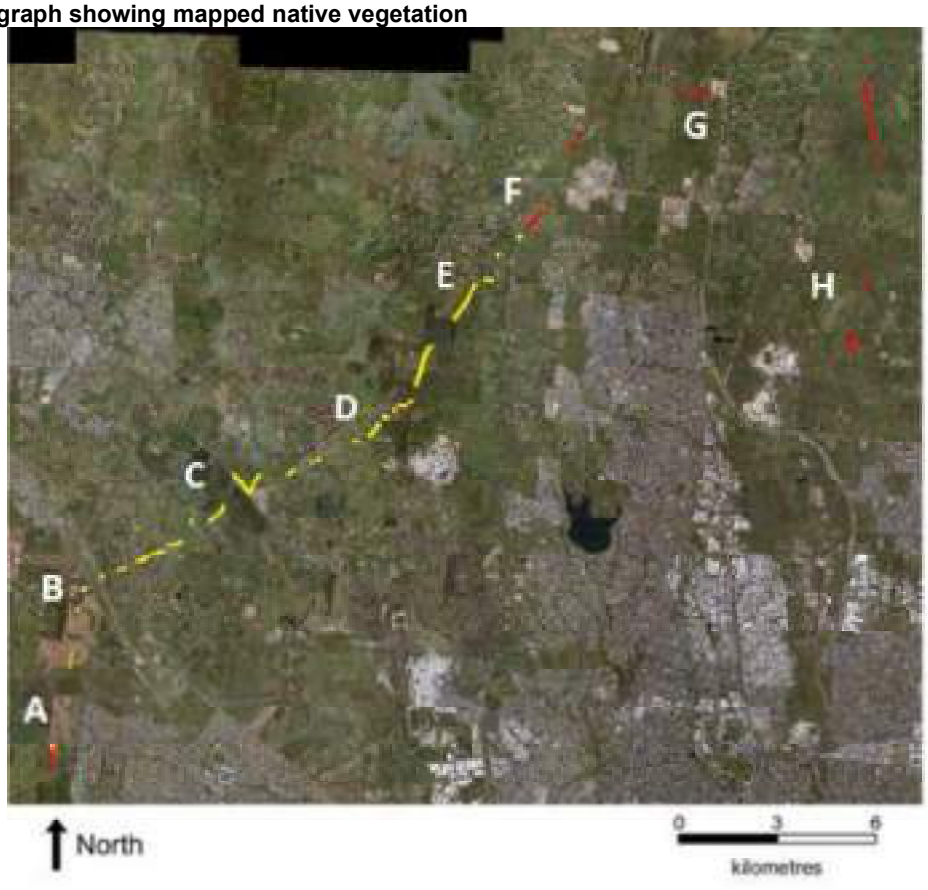
- Habitat importance maps are the maps defined in the Guidelines that include all the mapped habitat for a rare or threatened species
- Top ranking maps are the maps defined in the Guidelines that depict the important areas of a dispersed species habitat, developed from the highest habitat importance scores in dispersed species habitat maps and selected VBA records
- Selected VBA record is an area in Victoria that represents a large population, roosting or breeding site etc.

Appendix 3 – Images of mapped native vegetation

2. Strategic biodiversity values map



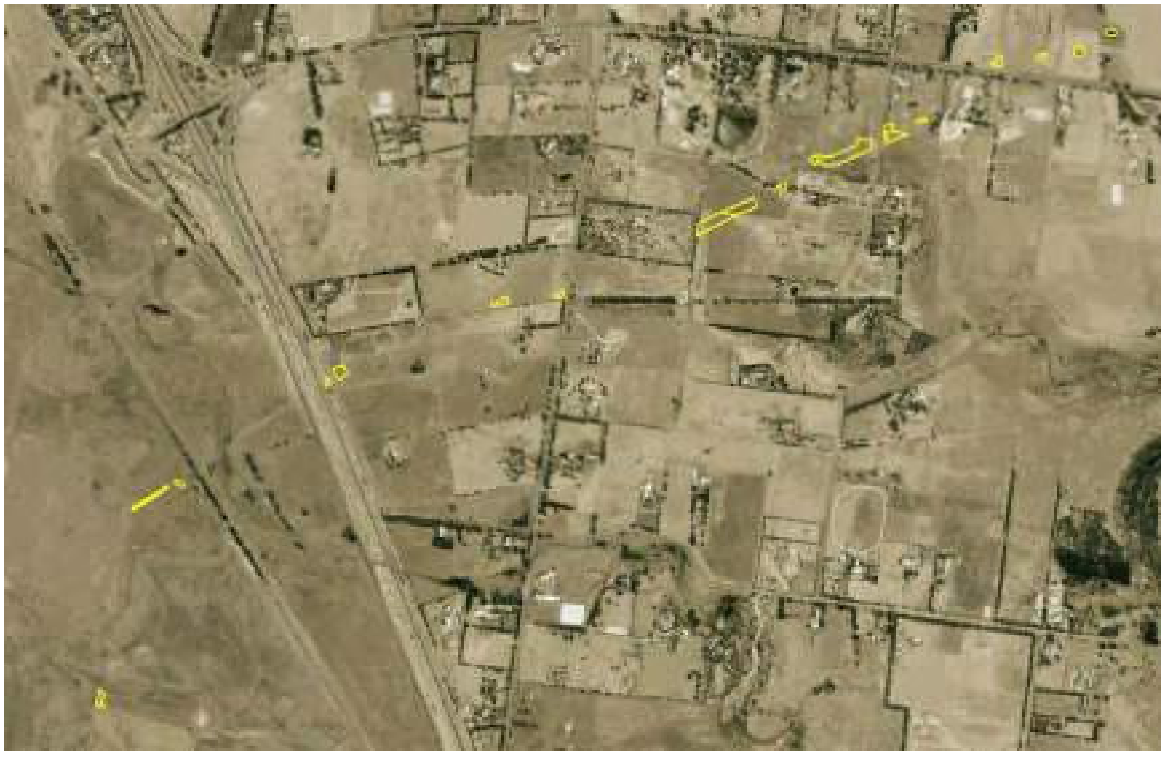
3. Aerial photograph showing mapped native vegetation



A



B



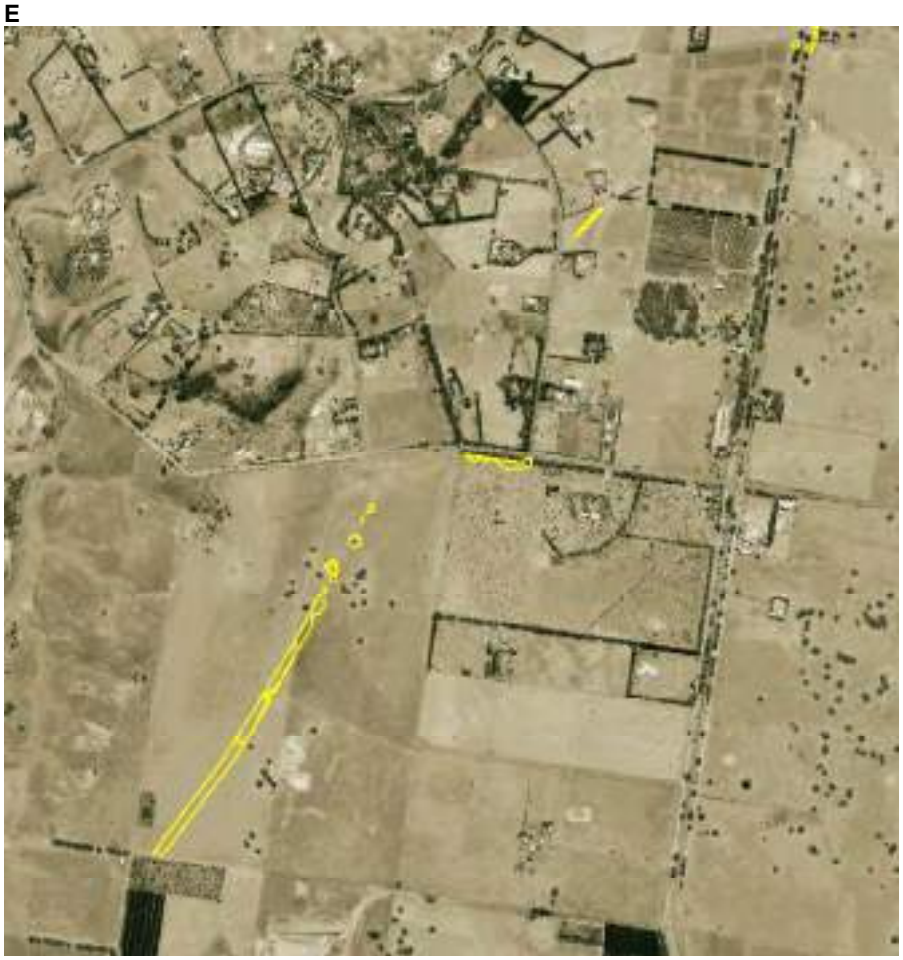
C



D



E



F



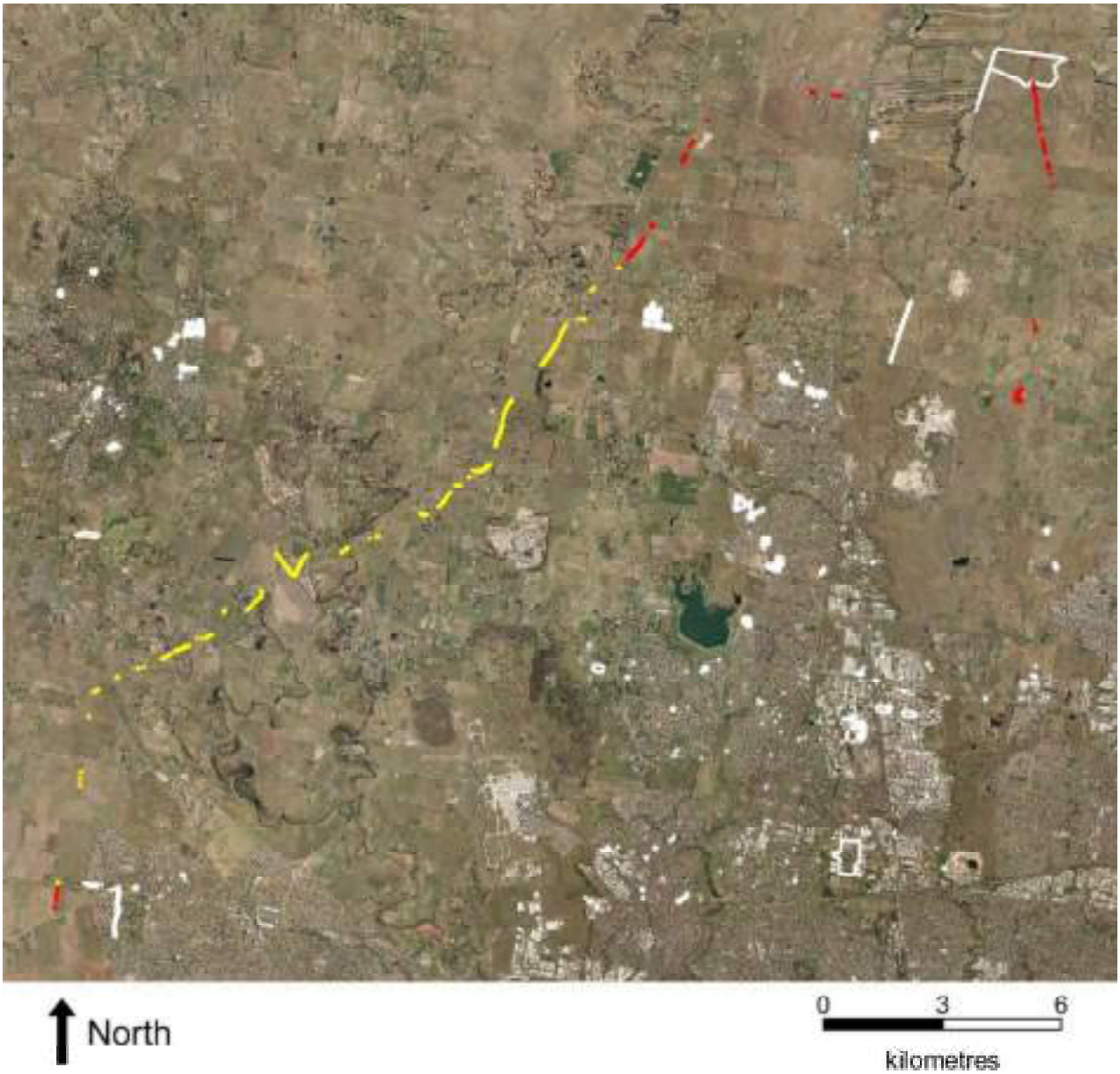
G



H



4. Map of the property in context

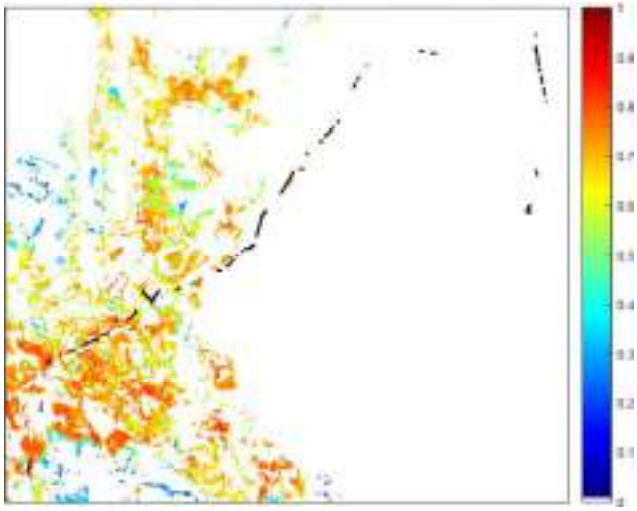


Yellow boundaries denote areas of proposed native vegetation removal assessed under Clause 52.17 of the Victorian Planning Provisions.

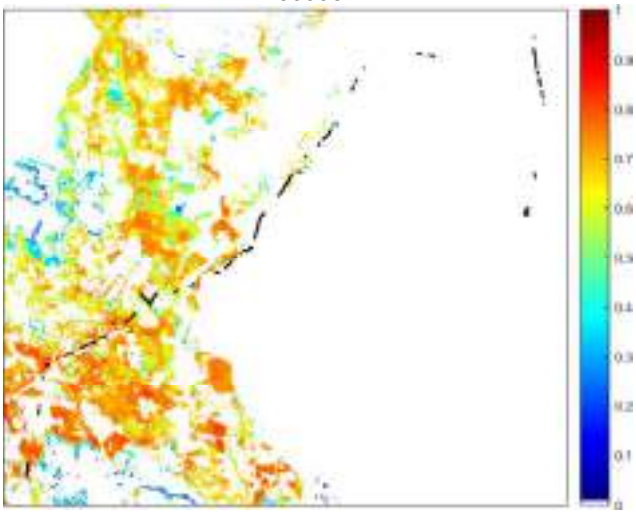
Red boundaries denote areas of proposed native vegetation removal within the Melbourne Strategic Assessment (MSA) Program.

4. Habitat importance maps

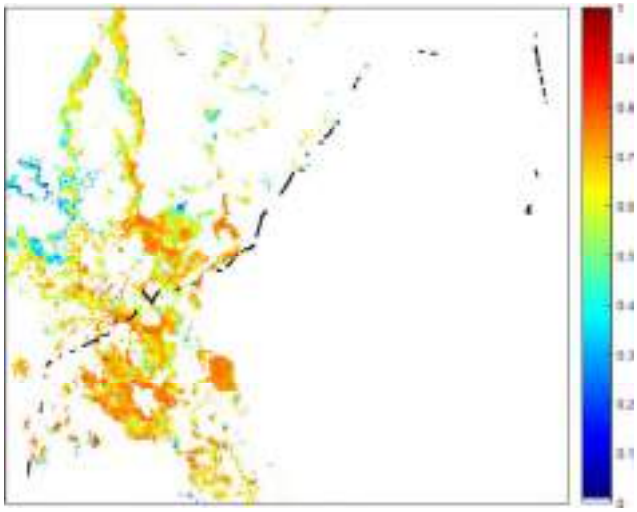
Small Golden Moths
Diuris basaltica
501473



Heath Spear-grass
Austrostipa exilis
503984



Bacchus Marsh Wattle
Acacia rostriformis
505136



Native vegetation removal report

This report provides information to support an application to remove, destroy or lop native vegetation in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation*. The report **is not an assessment by DELWP** of the proposed native vegetation removal. Native vegetation information and offset requirements have been determined using spatial data provided by the applicant or their consultant.

Date of issue: **01/04/2020**
Time of issue: **1:50 pm**

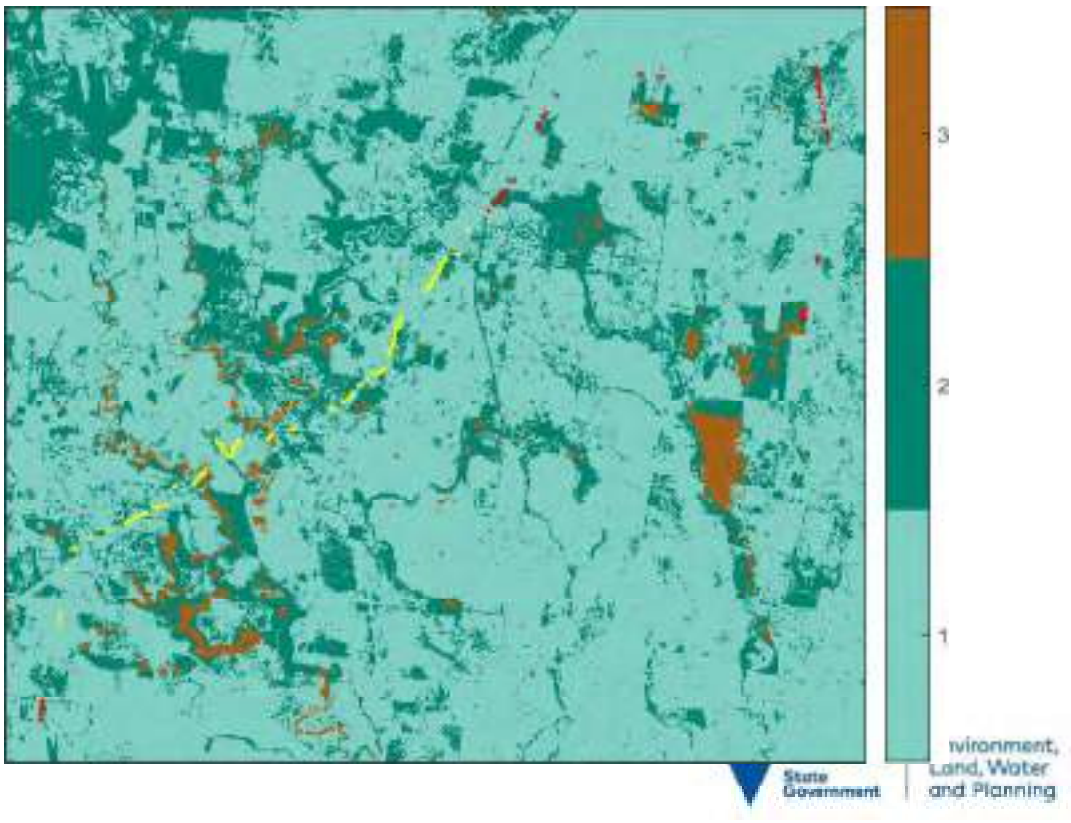
Report ID: BIO_2020_019

Project ID	31496_VegClearing2_MS01_00683B_edit

Assessment pathway

Assessment pathway	**Detailed Assessment Pathway**
Extent including past and proposed	29.604 ha
Extent of past removal where past = areas of native vegetation to be removed within the Melbourne Strategic Assessment (MSA) Program	10.406 ha
Extent of proposed removal	19.199 ha
No. Large trees proposed to be removed	20
Location category of proposed removal	Location 3 The native vegetation is in an area where the removal of less than 0.5 hectares could have a significant impact on habitat for one or more rare or threatened species.The native vegetation is also in an area mapped as an endangered Ecological Vegetation Class (as per the statewide EVC map).

1. Location map



Offset requirements if a permit is granted

Any approval granted will include a condition to obtain an offset that meets the following requirements:

General offset amount[1]	4.385 general habitat units
Vicinity	Port Phillip and Westernport Catchment Management Authority (CMA) or Hume City, Melton City Council
Minimum strategic biodiversity value score[2]	0.450
Large trees*	5 large trees
Species offset amount[3]	8.527 species units of habitat for Small Golden Moths, *Diuris basaltica* 8.655 species units of habitat for Heath Spear-grass, *Austrostipa exilis* 6.701 species units of habitat for Bacchus Marsh Wattle, *Acacia rostriformis*
Large trees*	15 trees
*** The total number of large trees that the offset must protect**	20 large trees to be protected in either the general, species or combination across all habitat units protected

NB: values within tables in this document may not add to the totals shown above due to rounding

Appendix 1 includes information about the native vegetation to be removed

Appendix 2 includes information about the rare or threatened species mapped at the site.

Appendix 3 includes maps showing native vegetation to be removed and extracts of relevant species habitat importance maps

1 The general offset amount required is the sum of all general habitat units in Appendix 1.

2 Minimum strategic biodiversity score is 80 per cent of the weighted average score across habitat zones where a general offset is required

3 The species offset amount(s) required is the sum of all species habitat units in Appendix 1.

Next steps

Any proposal to remove native vegetation must meet the application requirements of the Detailed Assessment Pathway and it will be assessed under the Detailed Assessment Pathway.

If you wish to remove the mapped native vegetation you are required to apply for a permit from your local council. Council will refer your application to DELWP for assessment, as required. **This report is not a referral assessment by DELWP.**

This *Native vegetation removal report* must be submitted with your application for a permit to remove, destroy or lop native vegetation.

Refer to the *Guidelines for the removal, destruction or lopping of native* vegetation (the Guidelines) for a full list of application requirements This report provides information that meets the following application requirements:

- The assessment pathway and reason for the assessment pathway
- A description of the native vegetation to be removed (partly met)
- Maps showing the native vegetation and property (partly met)
- Information about the impacts on rare or threatened species.
- The offset requirements determined in accordance with section 5 of the Guidelines that apply if approval is granted to remove native vegetation.

Additional application requirements must be met including:

- Topographical and land information
- Recent dated photographs
- Details of past native vegetation removal
- An avoid and minimise statement
- A copy of any Property Vegetation Plan that applies
- A defendable space statement as applicable
- A statement about the Native Vegetation Precinct Plan as applicable
- A site assessment report including a habitat hectare assessment of any patches of native vegetation and details of trees
- An offset statement that explains that an offset has been identified and how it will be secured.

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Obtaining this publication does not guarantee that an application will meet the requirements of Clauses 52.16 or 52.17 of the Victoria Planning Provisions and Victorian planning schemes or that a permit to remove native vegetation will be granted.

Notwithstanding anything else contained in this publication, you must ensure that you comply with all relevant laws, legislation, awards or orders and that you obtain and comply with all permits, approvals and the like that affect, are applicable or are necessary to undertake any action to remove, lop or destroy or otherwise deal with any native vegetation or that apply to matters within the scope of Clauses 52.16 or 52.17 of the Victoria Planning Provisions and Victorian planning schemes.

Appendix 1: Description of native vegetation to be removed

The species-general offset test was applied to your proposal. This test determines if the proposed removal of native vegetation has a proportional impact on any rare or threatened species habitats above the species offset threshold. The threshold is set at 0.005 per cent of the mapped habitat value for a species. When the proportional impact is above the species offset threshold a species offset is required. This test is done for all species mapped at the site. Multiple species offsets will be required if the species offset threshold is exceeded for multiple species.

Where a zone requires species offset(s), the species habitat units for each species in that zone is calculated by the following equation in accordance with the Guidelines:

Species habitat units = extent x condition x species landscape factor x 2, where the species landscape factor = 0.5 + (habitat importance score/2)

The species offset amount(s) required is the sum of all species habitat units per zone

Where a zone does not require a species offset, the general habitat units in that zone is calculated by the following equation in accordance with the Guidelines:

General habitat units = extent x condition x general landscape factor x 1.5, where the general landscape factor = 0.5 + (strategic biodiversity value score/2)

The general offset amount required is the sum of all general habitat units per zone.

Native vegetation to be removed

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
3-1	Patch	vvp_0132	Endangered	0	no	0.250	0.032	0.032	0.190		0.007	General
6-2	Patch	vvp_0132	Endangered	0	no	0.240	0.097	0.097	0.270		0.022	General
5-3	Patch	vvp_0132	Endangered	0	no	0.280	0.057	0.057	0.250		0.015	General
4-4	Patch	vvp_0132	Endangered	0	no	0.220	0.055	0.055	0.250		0.011	General
8-5	Patch	vvp_0132	Endangered	0	no	0.190	0.037	0.037	0.920	0.820	0.013	501473 Small Golden Moths *Diuris basaltica*
										0.820	0.013	503984 Heath Spear-grass *Austrostipa exilis*
7-6	Patch	vvp_0132	Endangered	0	no	0.230	0.098	0.098	0.925	0.832	0.041	501473 Small Golden Moths *Diuris basaltica*
										0.832	0.041	503984 Heath Spear-grass *Austrostipa exilis*
										0.218	0.041	505136 Bacchus Marsh Wattle *Acacia rostriformis*
18-7	Patch	vvp_0132	Endangered	0	no	0.230	0.027	0.027	0.740	0.790	0.011	501473 Small Golden Moths *Diuris basaltica*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
										0.790	0.011	503984 Heath Spear-grass *Austrostipa exilis*
15-8	Patch	vvp_0132	Endangered	0	no	0.480	0.523	0.523	0.446	0.729	0.434	501473 Small Golden Moths *Diuris basaltica*
										0.643	0.434	503984 Heath Spear-grass *Austrostipa exilis*
										0.270	0.432	505136 Bacchus Marsh Wattle *Acacia rostriformis*
23-9	Patch	vvp_0132	Endangered	0	no	0.360	0.268	0.268	0.900	0.740	0.168	501473 Small Golden Moths *Diuris basaltica*
										0.736	0.167	503984 Heath Spear-grass *Austrostipa exilis*
										0.736	0.167	505136 Bacchus Marsh Wattle *Acacia rostriformis*
14-10	Patch	vvp_0132	Endangered	0	no	0.230	0.047	0.047	0.450	0.760	0.019	501473 Small Golden Moths *Diuris basaltica*
										0.574	0.019	503984 Heath Spear-grass *Austrostipa exilis*
24-11	Patch	vvp_0132	Endangered	0	no	0.270	0.443	0.443	0.869	0.660	0.198	501473 Small Golden Moths *Diuris basaltica*
										0.708	0.204	503984 Heath Spear-grass *Austrostipa exilis*
										0.708	0.204	505136 Bacchus Marsh Wattle *Acacia rostriformis*
25-12	Patch	vvp_0641	Endangered	3	no	0.430	0.075	0.075	0.880	0.680	0.054	501473 Small Golden Moths *Diuris basaltica*
										0.680	0.054	503984 Heath Spear-grass *Austrostipa exilis*
										0.680	0.054	505136 Bacchus Marsh Wattle *Acacia rostriformis*
16-13	Patch	vvp_0132	Endangered	0	no	0.320	0.123	0.123	0.641	0.746	0.069	501473 Small Golden Moths *Diuris basaltica*
										0.277	0.069	503984 Heath Spear-grass *Austrostipa exilis*
										0.243	0.069	505136 Bacchus Marsh Wattle *Acacia rostriformis*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
10-14	Patch	cvu_0132	Endangered	0	no	0.290	0.079	0.079	0.710	0.420	0.033	501473 Small Golden Moths *Diuris basaltica*
										0.420	0.033	503984 Heath Spear-grass *Austrostipa exilis*
13-15	Patch	cvu_0132	Endangered	0	no	0.320	0.036	0.036	0.580	0.778	0.021	501473 Small Golden Moths *Diuris basaltica*
										0.778	0.021	503984 Heath Spear-grass *Austrostipa exilis*
21-16	Patch	vvp_0653	Endangered	0	no	0.320	0.064	0.064	0.430	0.650	0.034	501473 Small Golden Moths *Diuris basaltica*
										0.650	0.034	503984 Heath Spear-grass *Austrostipa exilis*
19-17	Patch	vvp_0132	Endangered	0	no	0.290	0.063	0.063	0.648	0.744	0.032	501473 Small Golden Moths *Diuris basaltica*
										0.312	0.032	503984 Heath Spear-grass *Austrostipa exilis*
										0.312	0.032	505136 Bacchus Marsh Wattle *Acacia rostriformis*
20-18	Patch	vvp_0132	Endangered	0	no	0.290	0.040	0.040	0.440		0.012	General
12-19	Patch	vvp_0132	Endangered	0	no	0.260	0.272	0.272	0.867	0.811	0.128	501473 Small Golden Moths *Diuris basaltica*
										0.217	0.128	503984 Heath Spear-grass *Austrostipa exilis*
11-20	Patch	cvu_0132	Endangered	0	no	0.290	0.043	0.043	0.756	0.715	0.021	501473 Small Golden Moths *Diuris basaltica*
										0.715	0.021	503984 Heath Spear-grass *Austrostipa exilis*
37-21	Patch	vvp_0055_61	Endangered	4	no	0.290	2.507	2.507	0.562		0.852	General
17-22	Patch	vvp_0132	Endangered	0	no	0.260	0.054	0.054	0.740		0.018	General
9-23	Patch	vvp_0132_61	Endangered	0	no	0.250	0.020	0.020	0.960	0.742	0.009	501473 Small Golden Moths *Diuris basaltica*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.742	0.009	503984 Heath Spear-grass *Austrostipa exilis*
22-24	Patch	vvp_0055_61	Endangered	2	no	0.320	0.077	0.077	0.526	0.734	0.043	501473 Small Golden Moths *Diuris basaltica*
										0.734	0.043	503984 Heath Spear-grass *Austrostipa exilis*
										0.734	0.043	505136 Bacchus Marsh Wattle *Acacia rostriformis*
29-25	Patch	vvp_0132	Endangered	0	no	0.280	0.085	0.085	0.444	0.710	0.041	501473 Small Golden Moths *Diuris basaltica*
										0.631	0.039	503984 Heath Spear-grass *Austrostipa exilis*
										0.631	0.039	505136 Bacchus Marsh Wattle *Acacia rostriformis*
44-26	Patch	vvp_0055_61	Endangered	0	no	0.190	0.030	0.030	0.620		0.007	General
45-27	Patch	vvp_0055_61	Endangered	0	no	0.190	0.031	0.031	0.620		0.007	General
43-28	Patch	vvp_0055_61	Endangered	0	no	0.310	0.027	0.027	0.620		0.010	General
30-29	Patch	vvp_0132	Endangered	0	no	0.410	0.668	0.668	0.627		0.334	General
39-30	Patch	vvp_0132	Endangered	0	no	0.370	0.806	0.806	0.529	0.556	0.464	501473 Small Golden Moths *Diuris basaltica*
										0.275	0.464	503984 Heath Spear-grass *Austrostipa exilis*
1-31	Patch	vvp_0132	Endangered	0	no	0.310	0.117	0.117	0.880	0.814	0.066	501473 Small Golden Moths *Diuris basaltica*
										0.814	0.066	503984 Heath Spear-grass *Austrostipa exilis*
42-32	Patch	vvp_0132	Endangered	0	no	0.180	0.077	0.077	0.460		0.015	General
33-33	Patch	vvp_0132	Endangered	0	no	0.380	0.477	0.477	0.939	0.780	0.323	501473 Small Golden Moths *Diuris basaltica*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.778	0.323	503984 Heath Spear-grass *Austrostipa exilis*
										0.778	0.323	505136 Bacchus Marsh Wattle *Acacia rostriformis*
31-34	Patch	vvp_0132_61	Endangered	0	no	0.280	0.474	0.474	0.811		0.180	General
32-35	Patch	vvp_0132_61	Endangered	0	no	0.360	0.684	0.684	0.813		0.335	General
27-B	Patch	vvp_0132	Endangered	0	no	0.360	0.031	0.031	0.410		0.012	General
40-B	Patch	vvp_0132	Endangered	0	no	0.290	0.042	0.042	0.920	0.655	0.020	503984 Heath Spear-grass *Austrostipa exilis*
40-A	Patch	vvp_0132	Endangered	0	no	0.290	0.007	0.007	0.920	0.650	0.003	501473 Small Golden Moths *Diuris basaltica*
										0.650	0.003	503984 Heath Spear-grass *Austrostipa exilis*
41-36	Patch	vvp_0055_61	Endangered	0	no	0.200	0.313	0.313	0.912	0.681	0.105	503984 Heath Spear-grass *Austrostipa exilis*
38-B	Patch	vvp_0132	Endangered	0	no	0.260	0.526	0.526	0.763	0.651	0.226	501473 Small Golden Moths *Diuris basaltica*
										0.597	0.226	503984 Heath Spear-grass *Austrostipa exilis*
38-A	Patch	vvp_0132	Endangered	0	no	0.260	1.255	1.255	0.367		0.335	General
36-B	Patch	vvp_0132	Endangered	0	no	0.460	1.136	1.136	0.463		0.573	General
36-A	Patch	vvp_0132	Endangered	0	no	0.460	0.362	0.362	0.678		0.210	General
2-A	Patch	vvp_0132	Endangered	0	no	0.260	0.011	0.011	0.880	0.750	0.005	501473 Small Golden Moths *Diuris basaltica*
										0.750	0.005	503984 Heath Spear-grass *Austrostipa exilis*
2-B	Patch	vvp_0132	Endangered	0	no	0.260	0.024	0.024	0.880	0.750	0.011	501473 Small Golden Moths *Diuris basaltica*
										0.750	0.011	503984 Heath Spear-grass *Austrostipa exilis*
26-A	Patch	cvu_0641	Endangered	2	no	0.530	0.112	0.112	0.960	0.500	0.089	501473 Small Golden Moths *Diuris basaltica*
										0.500	0.089	503984 Heath Spear-grass *Austrostipa exilis*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
26-B	Patch	cvu_0641	Endangered	0	no	0.530	0.002	0.002	0.960	0.530	0.002	501473 Small Golden Moths *Diuris basaltica*
										0.530	0.002	503984 Heath Spear-grass *Austrostipa exilis*
										0.530	0.002	505136 Bacchus Marsh Wattle *Acacia rostriformis*
1-ST	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.070	0.430	0.720	0.024	501473 Small Golden Moths *Diuris basaltica*
										0.720	0.024	503984 Heath Spear-grass *Austrostipa exilis*
10-ST	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.070	0.900	0.670	0.023	501473 Small Golden Moths *Diuris basaltica*
										0.670	0.023	503984 Heath Spear-grass *Austrostipa exilis*
8-ST	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.930	0.680	0.011	501473 Small Golden Moths *Diuris basaltica*
										0.680	0.011	503984 Heath Spear-grass *Austrostipa exilis*
9-ST	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.052	0.930	0.680	0.017	501473 Small Golden Moths *Diuris basaltica*
										0.680	0.017	503984 Heath Spear-grass *Austrostipa exilis*
2-ST	Scattered Tree	vvp_0803	Endangered	1	no	0.200	0.070	0.070	0.760	0.750	0.025	501473 Small Golden Moths *Diuris basaltica*
										0.750	0.025	503984 Heath Spear-grass *Austrostipa exilis*
										0.750	0.025	505136 Bacchus Marsh Wattle *Acacia rostriformis*
3-ST	Scattered Tree	vvp_0803	Endangered	0	no	0.200	0.031	0.031	0.900	0.750	0.011	501473 Small Golden Moths *Diuris basaltica*
										0.750	0.011	503984 Heath Spear-grass *Austrostipa exilis*
										0.750	0.011	505136 Bacchus Marsh Wattle *Acacia rostriformis*
6-ST	Scattered Tree	cvu_0055_61	Endangered	1	no	0.200	0.070	0.061	0.960	0.553	0.019	501473 Small Golden Moths *Diuris basaltica*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.553	0.019	503984 Heath Spear-grass *Austrostipa exilis*
										0.553	0.019	505136 Bacchus Marsh Wattle *Acacia rostriformis*
5-ST	Scattered Tree	cvu_0055_61	Endangered	1	no	0.200	0.070	0.062	0.960	0.550	0.019	501473 Small Golden Moths *Diuris basaltica*
										0.550	0.019	503984 Heath Spear-grass *Austrostipa exilis*
										0.550	0.019	505136 Bacchus Marsh Wattle *Acacia rostriformis*
7-ST	Scattered Tree	cvu_0055_61	Endangered	1	no	0.200	0.070	0.070	0.960	0.566	0.022	501473 Small Golden Moths *Diuris basaltica*
										0.566	0.022	503984 Heath Spear-grass *Austrostipa exilis*
										0.566	0.022	505136 Bacchus Marsh Wattle *Acacia rostriformis*
4-ST	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.880	0.680	0.011	501473 Small Golden Moths *Diuris basaltica*
										0.680	0.011	503984 Heath Spear-grass *Austrostipa exilis*
										0.680	0.011	505136 Bacchus Marsh Wattle *Acacia rostriformis*
2-Z	Patch	vvp_0132_61	Endangered	0	no	0.800	0.316	0.316	0.844	0.778	0.450	501473 Small Golden Moths *Diuris basaltica*
										0.778	0.450	503984 Heath Spear-grass *Austrostipa exilis*
4-Z	Patch	vvp_0132_61	Endangered	0	no	0.720	1.626	1.626	0.610		1.413	General
1-Z	Patch	vvp_0132_61	Endangered	0	no	0.750	0.099	0.099	0.936	0.750	0.130	501473 Small Golden Moths *Diuris basaltica*
										0.521	0.130	503984 Heath Spear-grass *Austrostipa exilis*
3-Z	Patch	vvp_0055_61	Endangered	0	no	0.750	4.054	4.054	0.566	0.708	5.192	501473 Small Golden Moths *Diuris basaltica*
										0.413	5.192	503984 Heath Spear-grass *Austrostipa exilis*
										0.404	5.190	505136 Bacchus Marsh Wattle *Acacia rostriformis*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
0-78	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.052	0.930	0.680	0.017	501473 Small Golden Moths *Diuris basaltica*
										0.680	0.017	503984 Heath Spear-grass *Austrostipa exilis*
0-79	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.070	0.430		0.015	General

Appendix 2: Information about impacts to rare or threatened species' habitats on site

This table lists all rare or threatened species' habitats mapped at the site.

Species common name	Species scientific name	Species number	Conservation status	Group	Habitat impacted	% habitat value affected
Bacchus Marsh Wattle	*Acacia rostriformis*	505136	Vulnerable	Dispersed	Habitat importance map	0.0096
Small Golden Moths	*Diuris basaltica*	501473	Endangered	Dispersed	Habitat importance map	0.0063
Heath Spear-grass	*Austrostipa exilis*	503984	Rare	Dispersed	Habitat importance map	0.0060
Fragrant Saltbush	*Rhagodia parabolica*	502929	Rare	Dispersed	Habitat importance map	0.0046
Large-headed Fireweed	*Senecio macrocarpus*	503116	Endangered	Dispersed	Habitat importance map	0.0037
Large-flower Crane's-bill	*Geranium sp. 1*	505342	Endangered	Dispersed	Habitat importance map	0.0035
Plump Swamp Wallaby-grass	*Amphibromus pithogastrus*	503624	Endangered	Dispersed	Habitat importance map	0.0032
Brackish Plains Buttercup	*Ranunculus diminutus*	504314	Rare	Dispersed	Habitat importance map	0.0030
Melbourne Yellow-gum	*Eucalyptus leucoxylon subsp. connata*	504484	Vulnerable	Dispersed	Habitat importance map	0.0028
Werribee Blue-box	*Eucalyptus baueriana subsp. thalassina*	507580	Endangered	Dispersed	Habitat importance map	0.0027
Grassland Earless Dragon	*Tympanocryptis pinguicolla*	12922	Critically endangered	Dispersed	Habitat importance map ; special site	0.0022
Matted Flax-lily	*Dianella amoena*	505084	Endangered	Dispersed	Habitat importance map	0.0018
Tough Scurf-pea	*Cullen tenax*	502776	Endangered	Dispersed	Habitat importance map	0.0018
Pale-flower Crane's-bill	*Geranium sp. 3*	505344	Rare	Dispersed	Habitat importance map	0.0018
Rye Beetle-grass	*Tripogon loliiformis*	503455	Rare	Dispersed	Habitat importance map	0.0015
Small Golden Moths	*Diuris basaltica*	501473	Endangered	Dispersed	Top ranking map	0.0015
Arching Flax-lily	*Dianella sp. aff. longifolia (Benambra)*	505560	Vulnerable	Dispersed	Habitat importance map	0.0014
Heath Spear-grass	*Austrostipa exilis*	503984	Rare	Dispersed	Top ranking map	0.0014

Spiny Rice-flower	*Pimelea spinescens subsp. spinescens*	504823	Endangered	Dispersed	Habitat importance map	0.0014
Small Scurf-pea	*Cullen parvum*	502773	Endangered	Dispersed	Habitat importance map	0.0014
Pale Swamp Everlasting	*Coronidium gunnianum*	504655	Vulnerable	Dispersed	Habitat importance map	0.0013
Austral Tobacco	*Nicotiana suaveolens*	502275	Rare	Dispersed	Habitat importance map	0.0012
Rosemary Grevillea	*Grevillea rosmarinifolia subsp. rosmarinifolia*	504066	Rare	Dispersed	Habitat importance map	0.0012
Curly Sedge	*Carex tasmanica*	500650	Vulnerable	Dispersed	Habitat importance map	0.0011
Golden Sun Moth	*Synemon plana*	15021	Critically endangered	Dispersed	Habitat importance map ; special site	0.0011
Basalt Podolepis	*Podolepis linearifolia*	504658	Endangered	Dispersed	Top ranking map	0.0011
Plains Yam-daisy	*Microseris scapigera s.s.*	504657	Vulnerable	Dispersed	Habitat importance map	0.0011
Velvet Daisy-bush	*Olearia pannosa subsp. cardiophylla*	502317	Vulnerable	Dispersed	Habitat importance map	0.0011
Cane Spear-grass	*Austrostipa breviglumis*	503268	Rare	Dispersed	Habitat importance map	0.0010
Growling Grass Frog	*Litoria raniformis*	13207	Endangered	Dispersed	Habitat importance map	0.0010
Western Golden-tip	*Goodia medicaginea*	501518	Rare	Dispersed	Habitat importance map	0.0010
Fragrant Saltbush	*Rhagodia parabolica*	502929	Rare	Dispersed	Top ranking map	0.0009
Snowy Mint-bush	*Prostanthera nivea var. nivea*	502746	Rare	Dispersed	Habitat importance map	0.0009
Purple Blown-grass	*Lachnagrostis punicea subsp. punicea*	504206	Rare	Dispersed	Habitat importance map	0.0009
Swamp Fireweed	*Senecio psilocarpus*	504659	Vulnerable	Dispersed	Habitat importance map	0.0008
Basalt Podolepis	*Podolepis linearifolia*	504658	Endangered	Dispersed	Habitat importance map	0.0008
Button Wrinklewort	*Rutidosis leptorhynchoides*	502982	Endangered	Dispersed	Habitat importance map	0.0008
Button Wrinklewort	*Rutidosis leptorhynchoides*	502982	Endangered	Dispersed	Top ranking map	0.0008
Small Milkwort	*Comesperma polygaloides*	500798	Vulnerable	Dispersed	Habitat importance map	0.0007
Austral Crane's-bill	*Geranium solanderi var. solanderi s.s.*	505337	Vulnerable	Dispersed	Habitat importance map	0.0007

Dark Wire-grass	*Aristida calycina var. calycina*	503630	Rare	Dispersed	Habitat importance map	0.0006
Swamp Everlasting	*Xerochrysum palustre*	503763	Vulnerable	Dispersed	Habitat importance map	0.0006
Brittle Greenhood	*Pterostylis truncata*	502821	Endangered	Dispersed	Habitat importance map	0.0006
Clover Glycine	*Glycine latrobeana*	501456	Vulnerable	Dispersed	Habitat importance map	0.0005
Large-headed Fireweed	*Senecio macrocarpus*	503116	Endangered	Dispersed	Top ranking map	0.0005
Melbourne Yellow-gum	*Eucalyptus leucoxylon subsp. connata*	504484	Vulnerable	Dispersed	Top ranking map	0.0004
Late-flower Flax-lily	*Dianella tarda*	505085	Vulnerable	Dispersed	Habitat importance map	0.0004
Branching Groundsel	*Senecio cunninghamii var. cunninghamii*	503104	Rare	Dispersed	Habitat importance map	0.0003
Bearded Dragon	*Pogona barbata*	12177	Vulnerable	Dispersed	Habitat importance map	0.0003
Striped Legless Lizard	*Delma impar*	12159	Endangered	Dispersed	Habitat importance map	0.0003
Hairy Tails	*Ptilotus erubescens*	502825	Vulnerable	Dispersed	Habitat importance map	0.0003
Waterbush	*Myoporum montanum*	502240	Rare	Dispersed	Habitat importance map	0.0003
Black Falcon	*Falco subniger*	10238	Vulnerable	Dispersed	Habitat importance map ; special site	0.0003
Shiny Leionema	*Leionema lamprophyllum subsp. obovatum*	505478	Rare	Dispersed	Habitat importance map	0.0002
Purple Diuris	*Diuris punctata*	501084	Vulnerable	Dispersed	Habitat importance map	0.0002
Clumping Golden Moths	*Diuris gregaria*	504887	Endangered	Dispersed	Habitat importance map	0.0002
Buloke	*Allocasuarina luehmannii*	500678	Endangered	Dispersed	Habitat importance map	0.0002
Dwarf Brooklime	*Gratiola pumilo*	503753	Rare	Dispersed	Habitat importance map	0.0001
Golden Cowslips	*Diuris behrii*	501061	Vulnerable	Dispersed	Habitat importance map	0.0001
Port Lincoln Snake	*Parasuta spectabilis*	12813	Vulnerable	Dispersed	Habitat importance map	0.0001
Lewin's Rail	*Lewinia pectoralis pectoralis*	10045	Vulnerable	Dispersed	Habitat importance map	0.0001
Yellow Burr-daisy	*Calotis lappulacea*	500598	Rare	Dispersed	Habitat importance map	0.0001
Silky Kidney-weed	*Dichondra sp. 1*	505786	Rare	Dispersed	Habitat importance map	0.0001

Australian Painted Snipe	*Rostratula australis*	10170	Critically endangered	Dispersed	Habitat importance map	0.0000
Brown Toadlet	*Pseudophryne bibronii*	13117	Endangered	Dispersed	Habitat importance map	0.0000
Australian Little Bittern	*Ixobrychus dubius*	10195	Endangered	Dispersed	Habitat importance map	0.0000
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	10226	Vulnerable	Dispersed	Habitat importance map	0.0000
Floodplain Fireweed	*Senecio campylocarpus*	507136	Rare	Dispersed	Habitat importance map	0.0000
Buloke Mistletoe	*Amyema linophylla subsp. orientalis*	500217	Vulnerable	Dispersed	Habitat importance map	0.0000
Musk Duck	*Biziura lobata*	10217	Vulnerable	Dispersed	Habitat importance map	0.0000
Hardhead	*Aythya australis*	10215	Vulnerable	Dispersed	Habitat importance map	0.0000
Painted Honeyeater	*Grantiella picta*	10598	Vulnerable	Dispersed	Habitat importance map	0.0000
Baillon's Crake	*Porzana pusilla palustris*	10050	Vulnerable	Dispersed	Habitat importance map	0.0000
Australasian Shoveler	*Anas rhynchotis*	10212	Vulnerable	Dispersed	Habitat importance map	0.0000
Little Egret	*Egretta garzetta nigripes*	10185	Endangered	Dispersed	Habitat importance map	0.0000
Australasian Bittern	*Botaurus poiciloptilus*	10197	Endangered	Dispersed	Habitat importance map	0.0000
Blue-billed Duck	*Oxyura australis*	10216	Endangered	Dispersed	Habitat importance map	0.0000
Freckled Duck	*Stictonetta naevosa*	10214	Endangered	Dispersed	Habitat importance map	0.0000
Swift Parrot	*Lathamus discolor*	10309	Endangered	Dispersed	Habitat importance map	0.0000
Brolga	*Grus rubicunda*	10177	Vulnerable	Dispersed	Habitat importance map	0.0000
Eastern Great Egret	*Ardea modesta*	10187	Vulnerable	Dispersed	Habitat importance map	0.0000
Intermediate Egret	*Ardea intermedia*	10186	Endangered	Dispersed	Habitat importance map	0.0000
Barking Owl	*Ninox connivens connivens*	10246	Endangered	Dispersed	Habitat importance map	0.0000
Slender Mint-bush	*Prostanthera saxicola var. bracteolata*	502750	Rare	Dispersed	Habitat importance map	0.0000
Grey Goshawk	*Accipiter novaehollandiae novaehollandiae*	10220	Vulnerable	Dispersed	Habitat importance map	0.0000
Speckled Warbler	*Chthonicola sagittatus*	10504	Vulnerable	Dispersed	Habitat importance map	0.0000

White-throated Needletail	*Hirundapus caudacutus*	10334	Vulnerable	Dispersed	Habitat importance map	0.0000

Habitat group

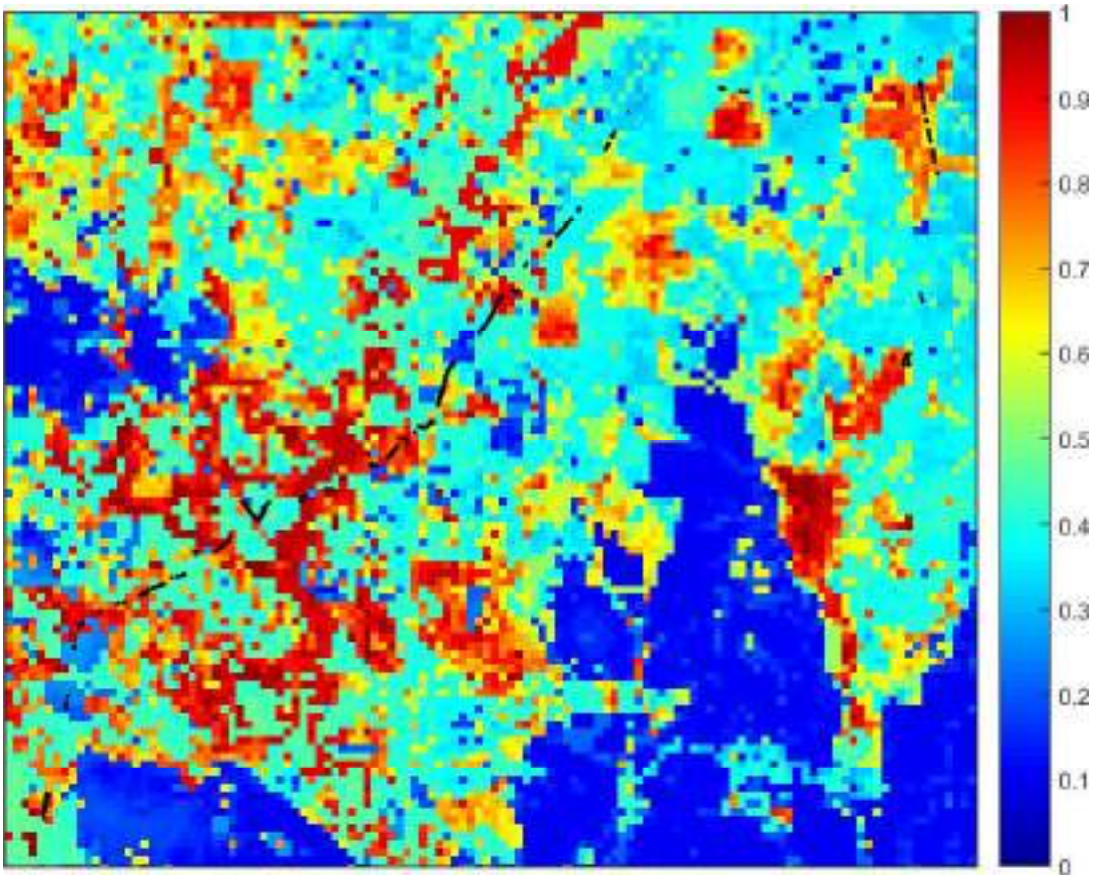
- Highly localised habitat means there is 2000 hectares or less mapped habitat for the species
- Dispersed habitat means there is more than 2000 hectares of mapped habitat for the species

Habitat impacted

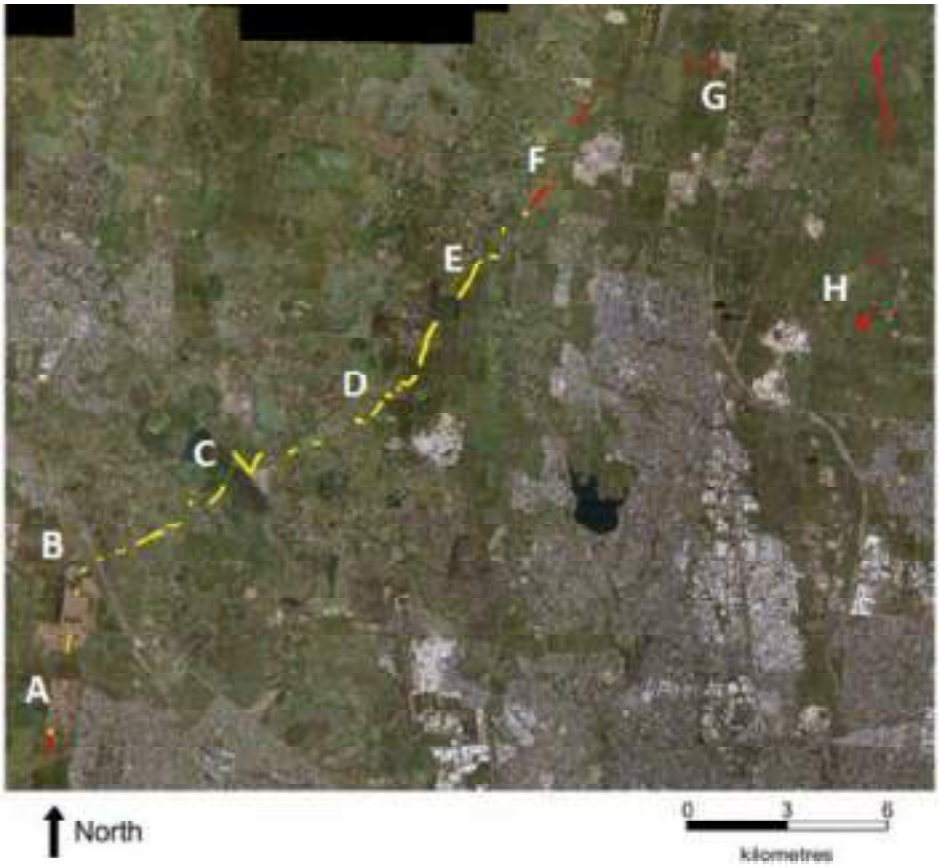
- Habitat importance maps are the maps defined in the Guidelines that include all the mapped habitat for a rare or threatened species
- Top ranking maps are the maps defined in the Guidelines that depict the important areas of a dispersed species habitat, developed from the highest habitat importance scores in dispersed species habitat maps and selected VBA records
- Selected VBA record is an area in Victoria that represents a large population, roosting or breeding site etc.

Appendix 3 – Images of mapped native vegetation

2. Strategic biodiversity values map



3. Aerial photograph showing mapped native vegetation



A



B



C



D



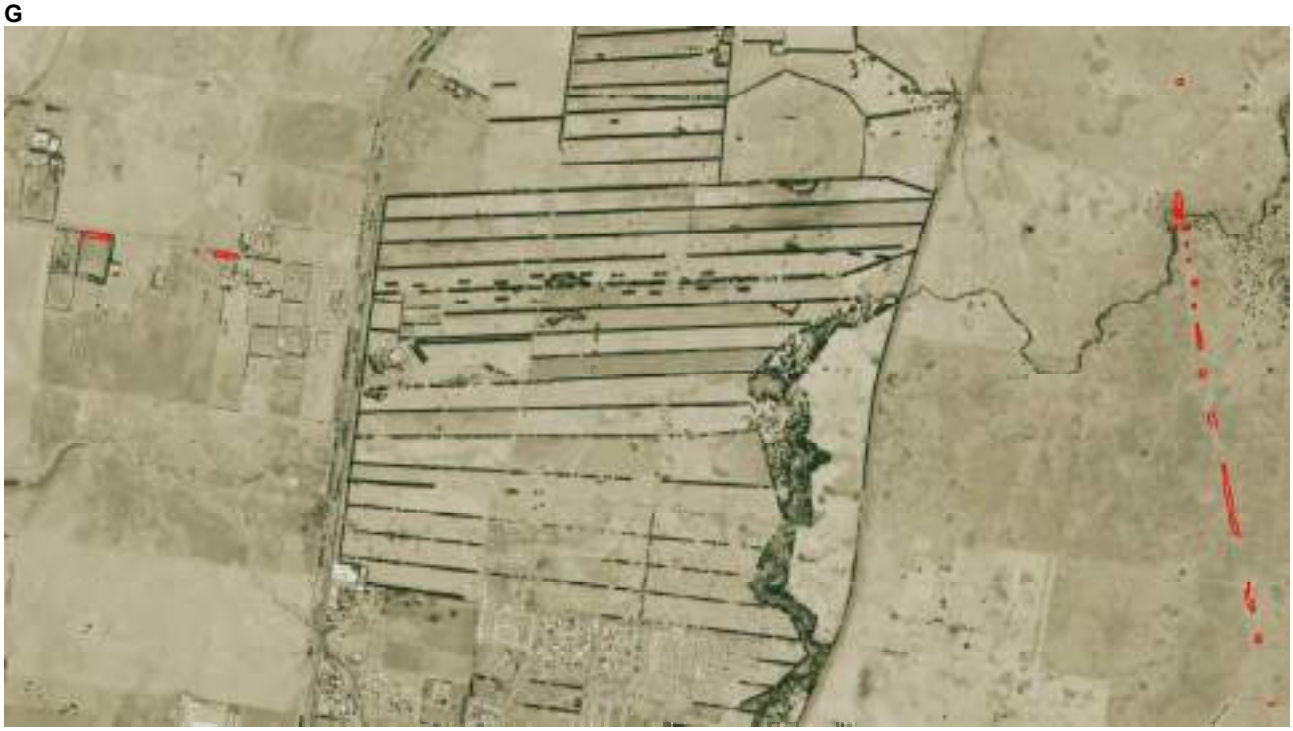
E



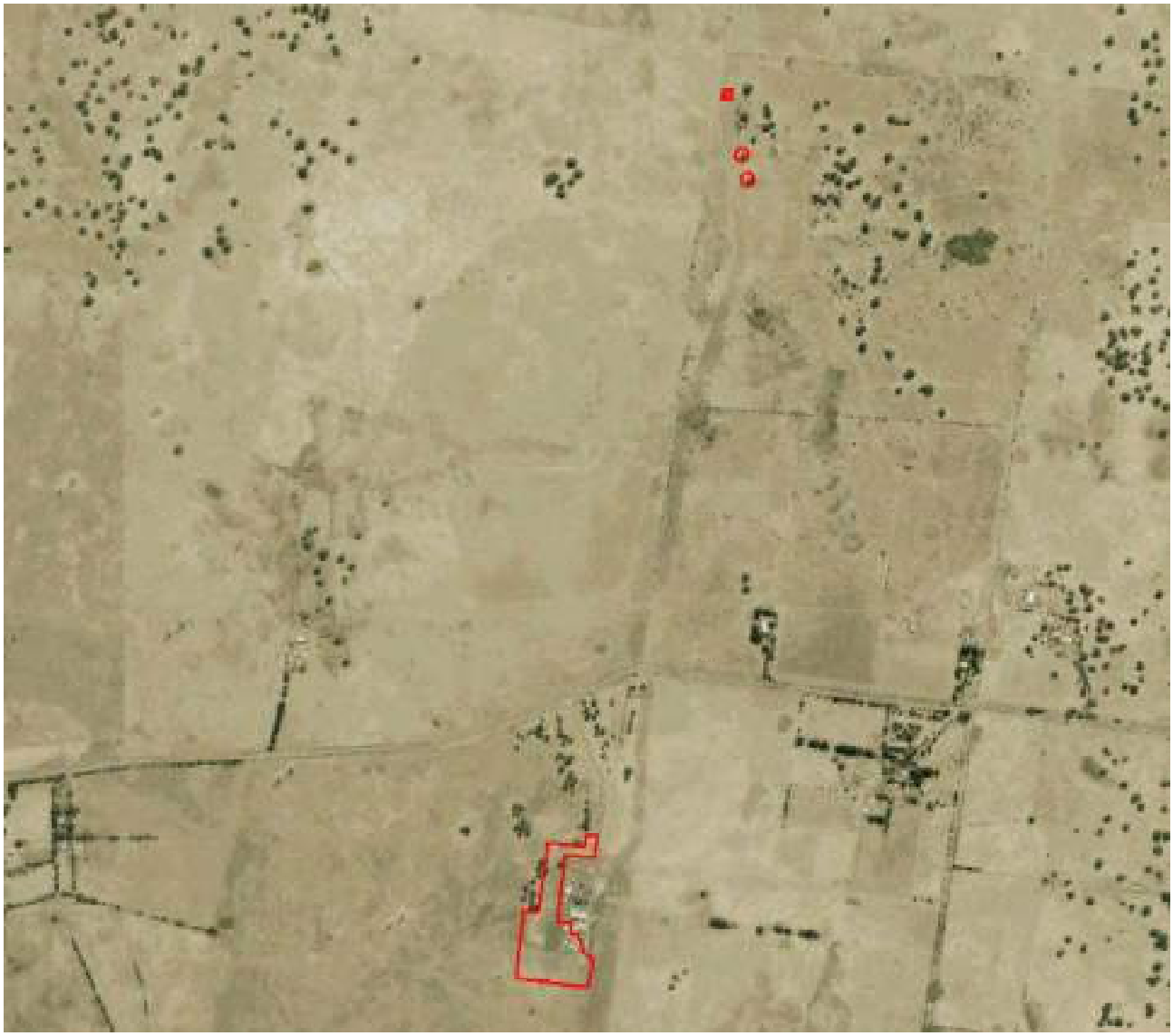
F



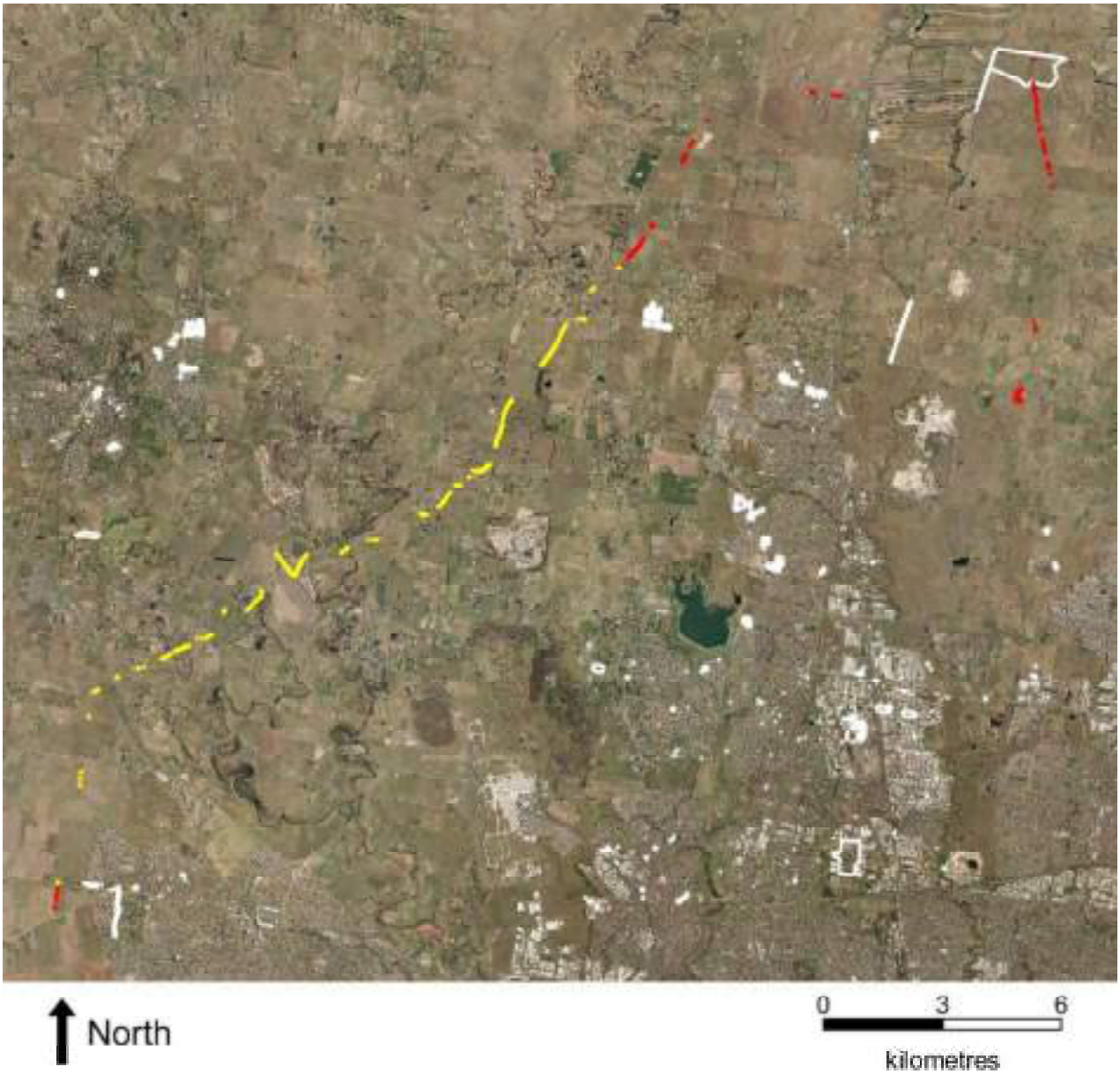
G



H



4. Map of the property in context

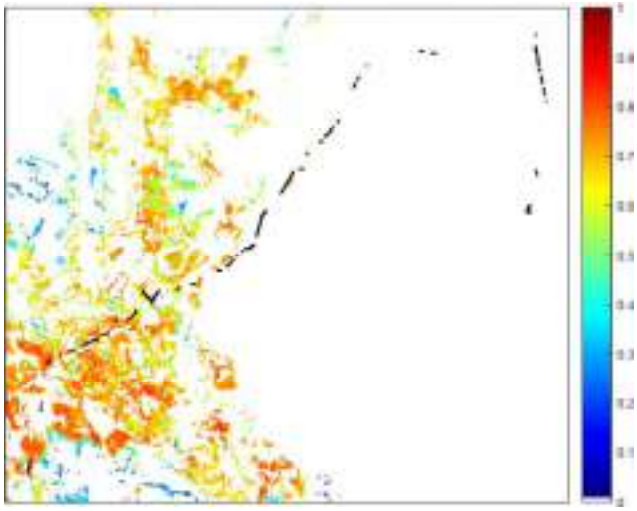


Yellow boundaries denote areas of proposed native vegetation removal assessed under Clause 52.17 of the Victorian Planning Provisions.

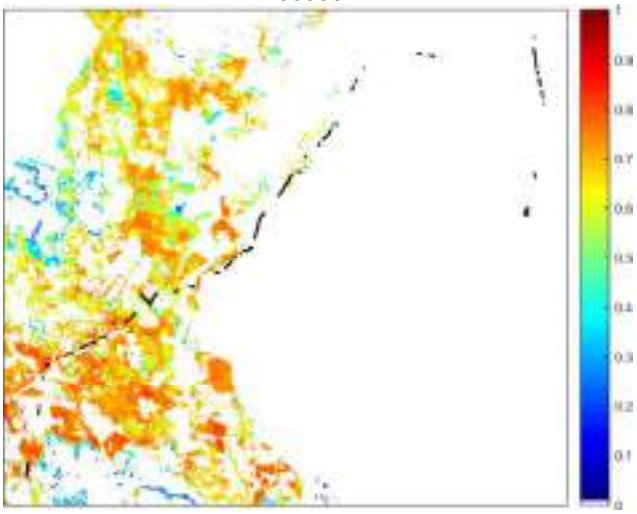
Red boundaries denote areas of proposed native vegetation removal within the Melbourne Strategic Assessment (MSA) Program.

4. Habitat importance maps

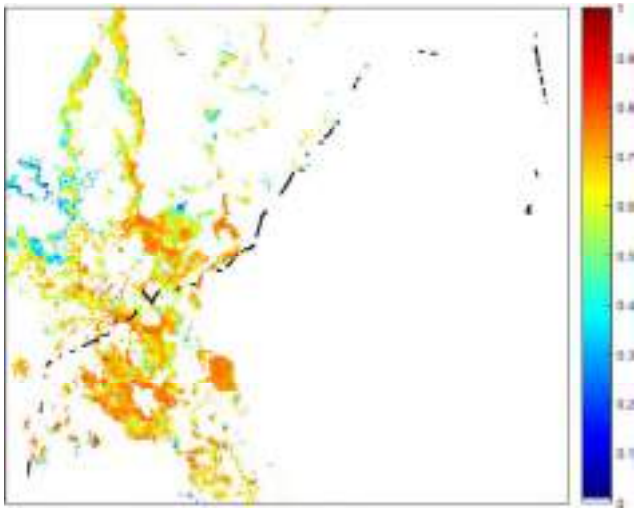
Small Golden Moths
Diuris basaltica
501473



Heath Spear-grass
Austrostipa exilis
503984



Bacchus Marsh Wattle
Acacia rostriformis
505136



Appendix 7 Habitat compensation obligations statement

Habitat Compensation Obligations Statement

Statement of obligations under the Melbourne Strategic Assessment

Date of issue: 19 March 2020

The Victorian Department of Environment, Land, Water and Planning (DELWP) administers the Melbourne Strategic Assessment (MSA) program under Part 10 approvals of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). The MSA program has effect until 31 December 2060 and is subject to conditions specified in Annexure 2 for the 2010 approval, and Annexure 1 for the 2013 and 2014 approvals.

This HCO Statement summarises the habitat compensation obligations for the specified infrastructure that are to be met prior to commencement of construction.

Project Details	
Project Name	MS01-HC-00683 Western Outer Ring Main (WORM) Project
Project Location	<table><tr><th>Section Ref</th><th>KP (Kilometre Point)</th><th>Description</th></tr><tr><td>1</td><td>KP 0 – 3.2</td><td>The pipeline alignment follows APA's existing Sunbury pipeline easement and is wholly located within the Plumpton PSP and urban growth boundary.</td></tr><tr><td>2</td><td>KP 3.2 – 28</td><td>The pipeline alignment is located outside of the urban growth boundary.</td></tr><tr><td>3</td><td>KP 28 – 28.2</td><td>The pipeline alignment enters the urban growth boundary and traverses through the Lindum Vale (Mt Ridley West) PSP (EPBC Ref: 2015/7516). The PSP was approved in July 2019.</td></tr><tr><td>4</td><td>KP 28.2 – 33.2</td><td>The pipeline alignment continues inside the urban growth boundary and runs inside the eastern edge of the Outer Metropolitan Ring Transport Corridor (OMR) adjoining the Merrifield West PSP.</td></tr><tr><td>5</td><td>KP 33.2 – 36.8</td><td>The pipeline alignment enters the Merrifield North Employment PSP, outside of the OMR before running along the southern side of Gunns Gully Road between KP 34 – 36.8.</td></tr><tr><td>6</td><td>KP 36.8 – 41.7</td><td>The pipeline alignment crosses the Hume Freeway and OMR at KP 36.8 before joining the western edge of the Lockerbie PSP. The pipeline alignment runs inside the southern edge of the OMR before crossing the Shepparton railway</td></tr></table>
Data Source	Data submitted to DELWP on 10 March 2020 by Sera Cutler, Biosis
Local Government Areas	Melton, Hume, Mitchell, and Whittlesea

Proponent Details	
Organisation	APA Group
Contact	Sera Cutler (Senior Botanist), Biosis
Email	scutler@biosis.com.au
Address	38 Bertie St, Port Melbourne VIC 3207

Habitat Compensation Obligations

Summary of habitat compensation obligations and status

Habitat Type	Obligation	Status
Native vegetation	4.348 ha	Obligations not met
Spiny Rice-flower	1.065 ha	Obligations not met
Matted Flax-lily	3.282 ha	Obligations not met
Golden Sun Moth	32.042 ha	Obligations not met
Growling Grass Frog	9.510 ha	Obligations not met

Conservation Area Habitat Compensation Obligations

Summary of Conservation Area habitat compensation obligations and status

Conservation Area Numbers	Conservation Area Types	Habitat Type	Obligation	Status
28B and 34A	Nature Conservation and open space (28B) Growling Grass Frog conservation, floodplain and open space (34A)	Native Vegetation	0.150 ha	Obligations not met
		Matted Flax-lily	0.150 ha	Obligations not met
		Golden Sun Moth	0.376 ha	Obligations not met
		Growling Grass Frog	0.377 ha	Obligations not met

To determine the habitat compensation fees, multiply the habitat compensation obligation shown for each fee type by its unit cost listed at https://www.msa.vic.gov.au/regulatory-requirements/habitat-compensation. Note, GST is applicable. Please only request invoices to meet the habitat compensation obligations when you are certain that this will be paid.

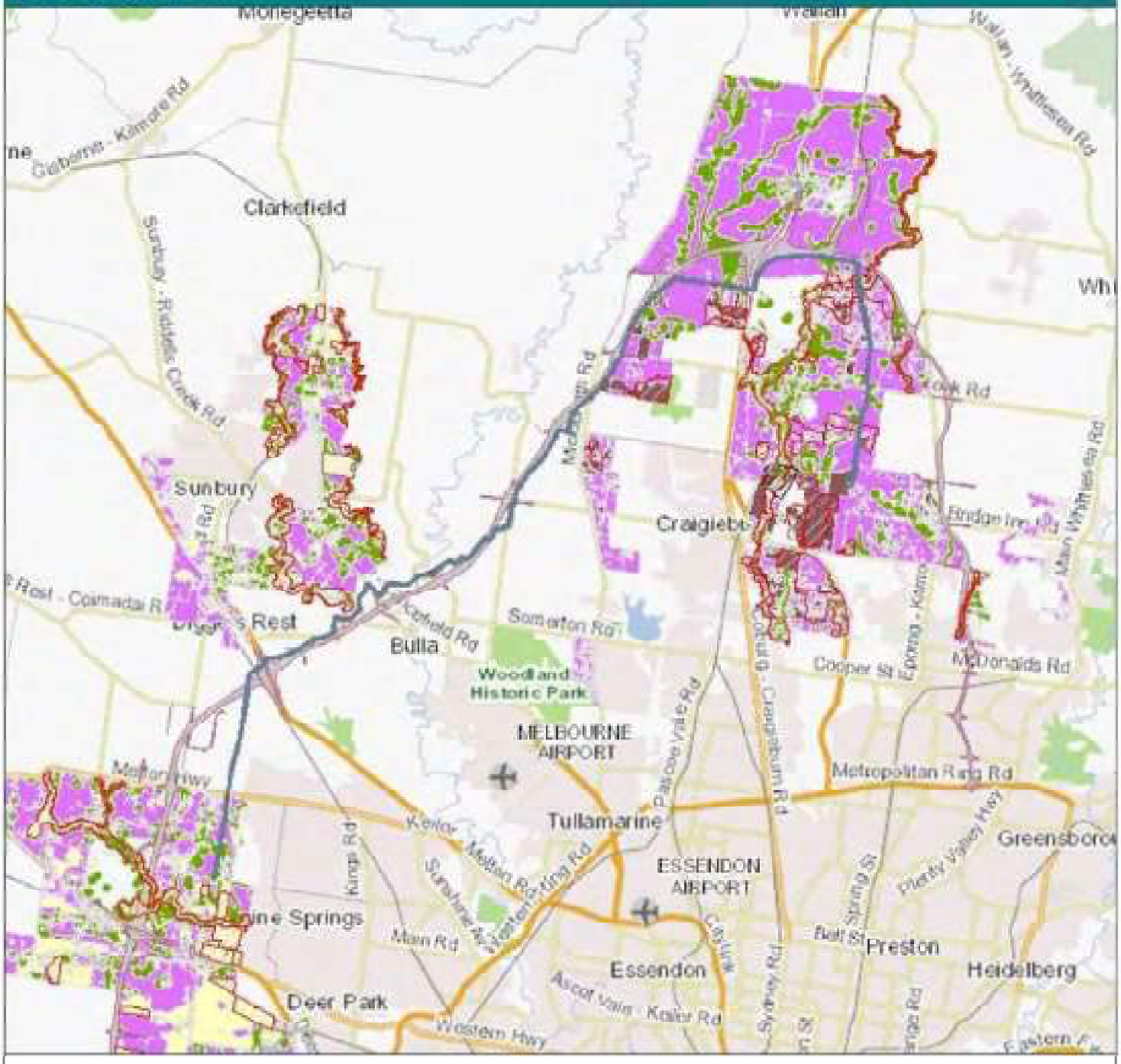
The MSA program wishes to advise that the proponent is responsible for ensuring that any other applicable Commonwealth, State and Local government legislation, regulation and operational policy is satisfied prior to subdivision, building and/or works commencing.

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MS01-HC-00683 Western Outer Ring Main (WORM) Project

Melbourne Strategic Assessment



Legend

Habitat area

- Growling Grass Frog habitat area
- Growling Grass Frog and Southern Brown Bandicoot habitat area
- Golden Sun Moth habitat area
- Native vegetation area
- Native vegetation area and Matted Flax-lily habitat area
- Native vegetation area and Southern Brown Bandicoot habitat area
- Native vegetation area and Spiny Rice-flower habitat area
- Southern Brown Bandicoot habitat area

Scattered tree location

- Not retained
- Retained
- Conservation areas
- Outer Metropolitan Ring transport corridor/E6 road reservation
- Regional Rail link
- Parcel boundaries

0 2,800 5,600 8,400

Meters

Produced by Biodiversity Division, DELWP on **19 March 2020**

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Figures

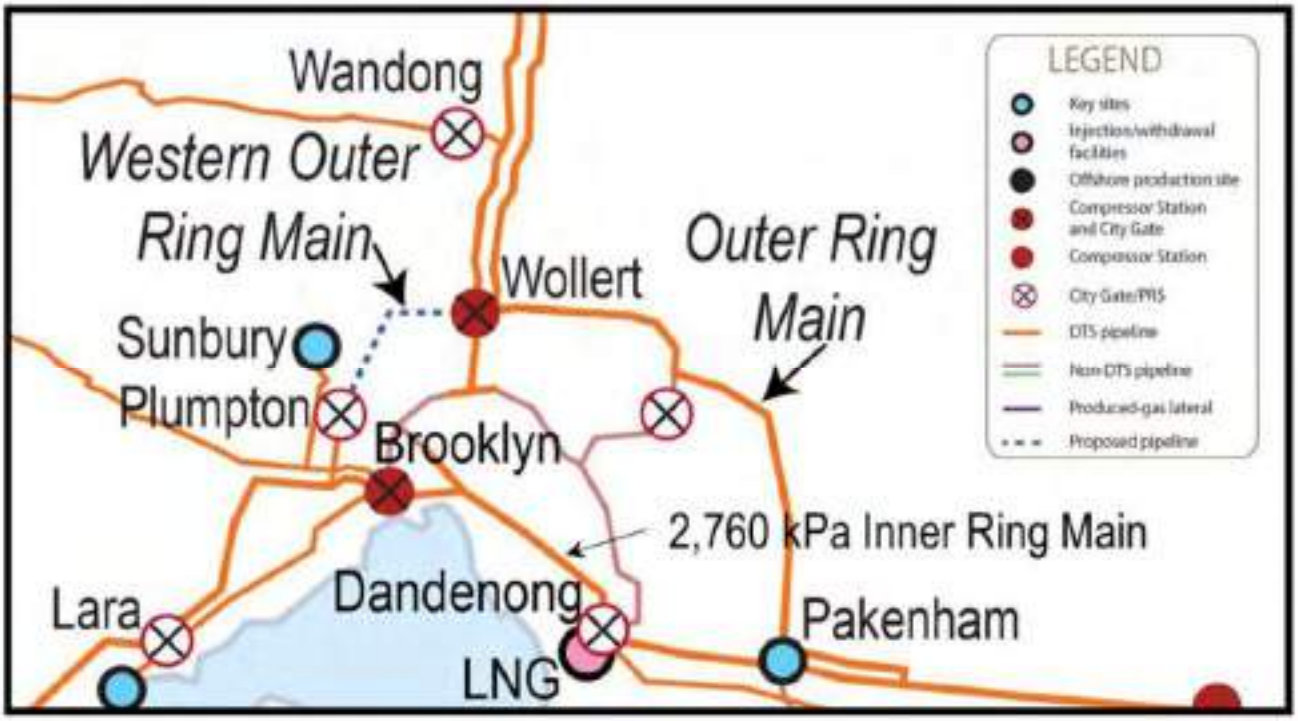


Figure 1 Western Outer Ring Main (WORM)

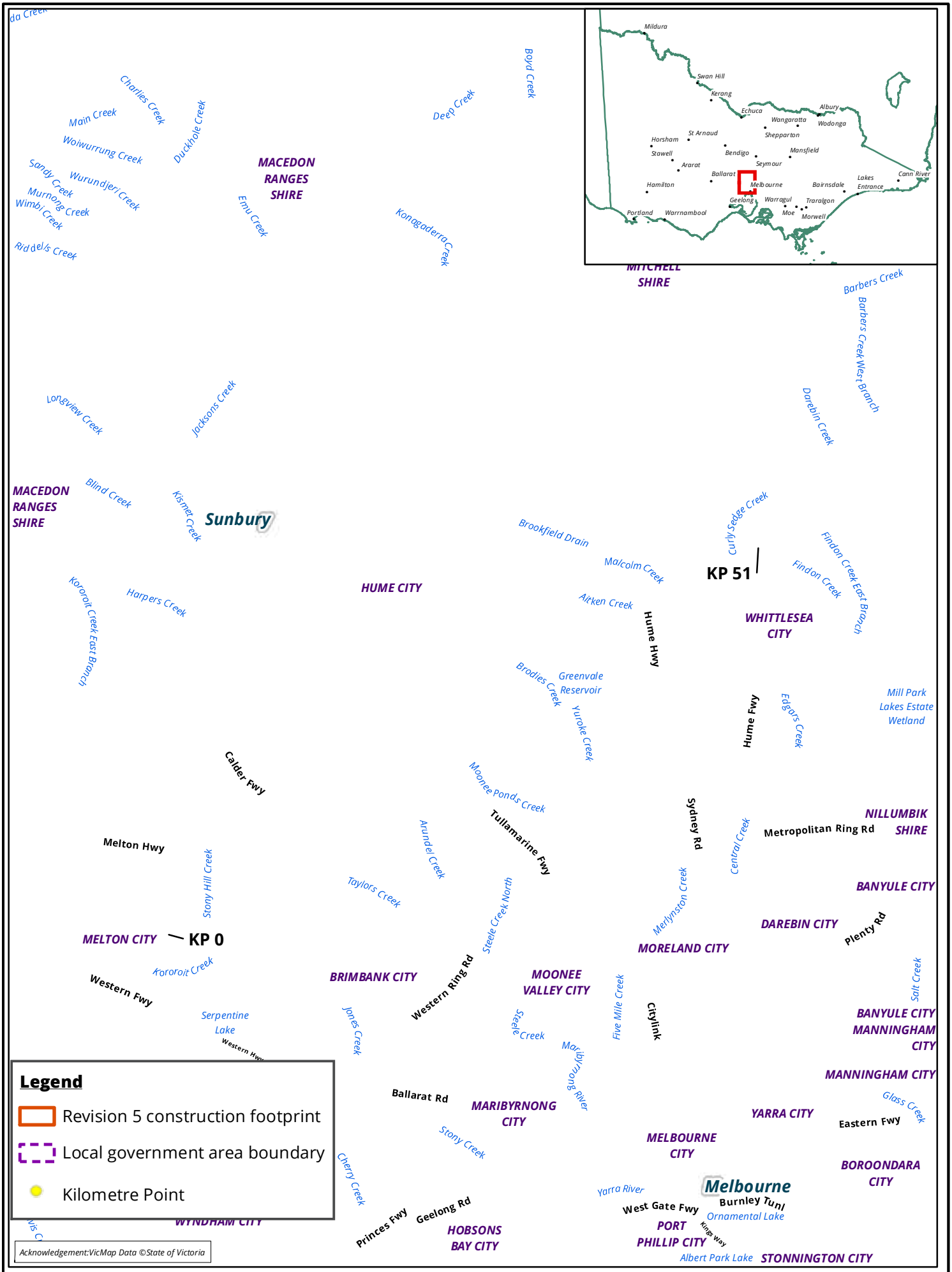
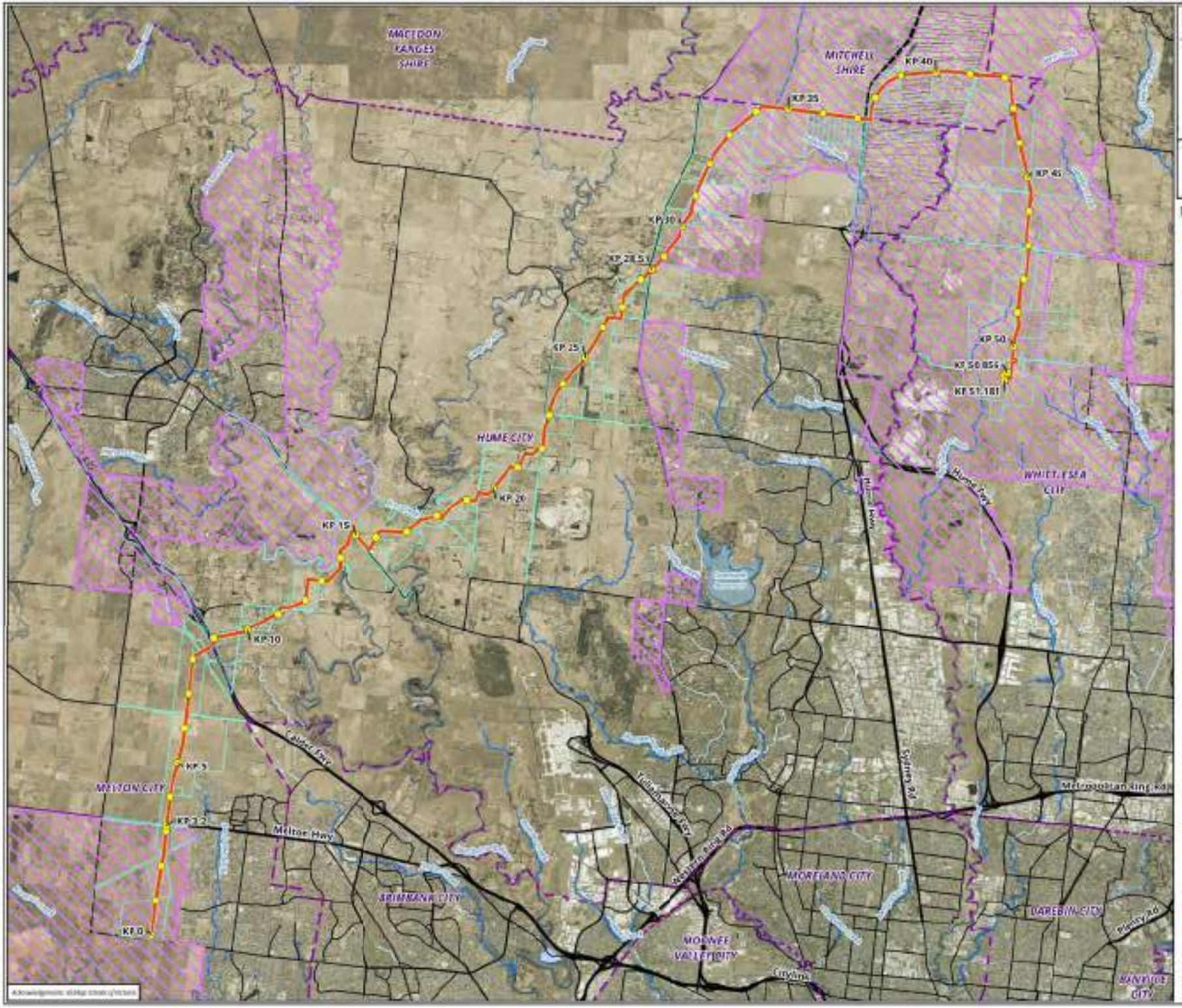


Figure 2 Location of the Project

Matter: 31496,
Date: 27 March 2020,
Checked by: JMU, Drawn by: JPT, Last edited by: jturner
Location:\\bio-data-01\matters$\31400s\31496\Mapping\31496_F2_Locality.mxd


MACEDON RANGES SHIRE
MITCHELL SHIRE
KP 40
KP 35
KP 45
KP 30
KP 28.5
KP 25
KP 50
KP 50.856
KP 51.181
HUME CITY
KP 20
KP 15
WHITTLESEA CITY
KP 10
KP 5
KP 2.2
KP 0
MELTON CITY
Calder Fwy
Melton Hwy
Sydney Rd
Metropolitan Ring Rd
Tullamarine Fwy
Western Ring Rd
BRIMBANK CITY
MORELAND CITY
DAREBIN CITY
MOONEE VALLEY CITY
Plenty Rd
Epping
Legend
Construction footprint
MSA Approved area
Local government area boundary
Affected parcels
Kilometre Point
Figure 3 WORM Revision 5 construction footprint
0 1 2 3 4 5
Kilometres
Scale: 1:100,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55
N
biosis

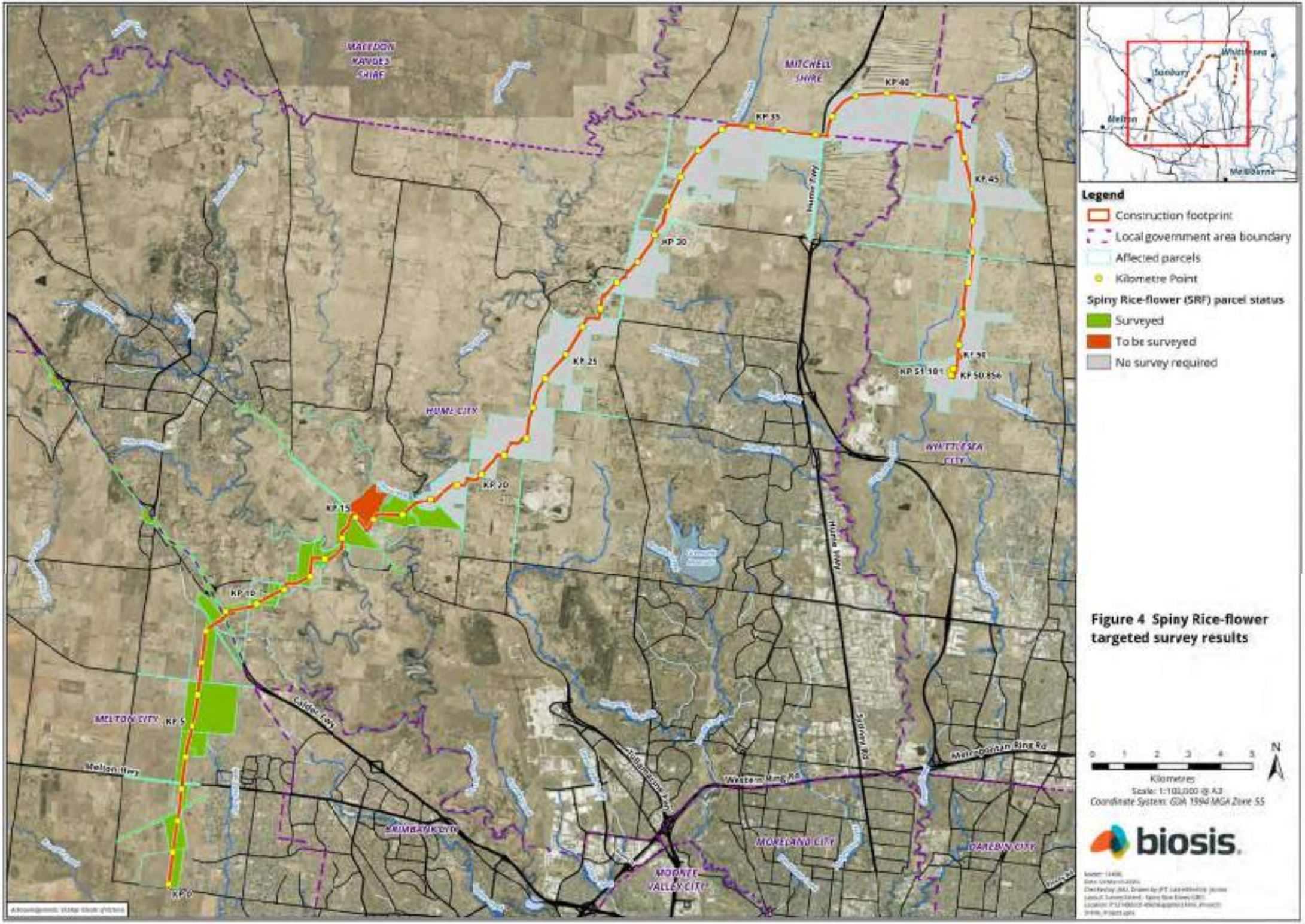


Figure 4 Spiny Rice-flower targeted survey results

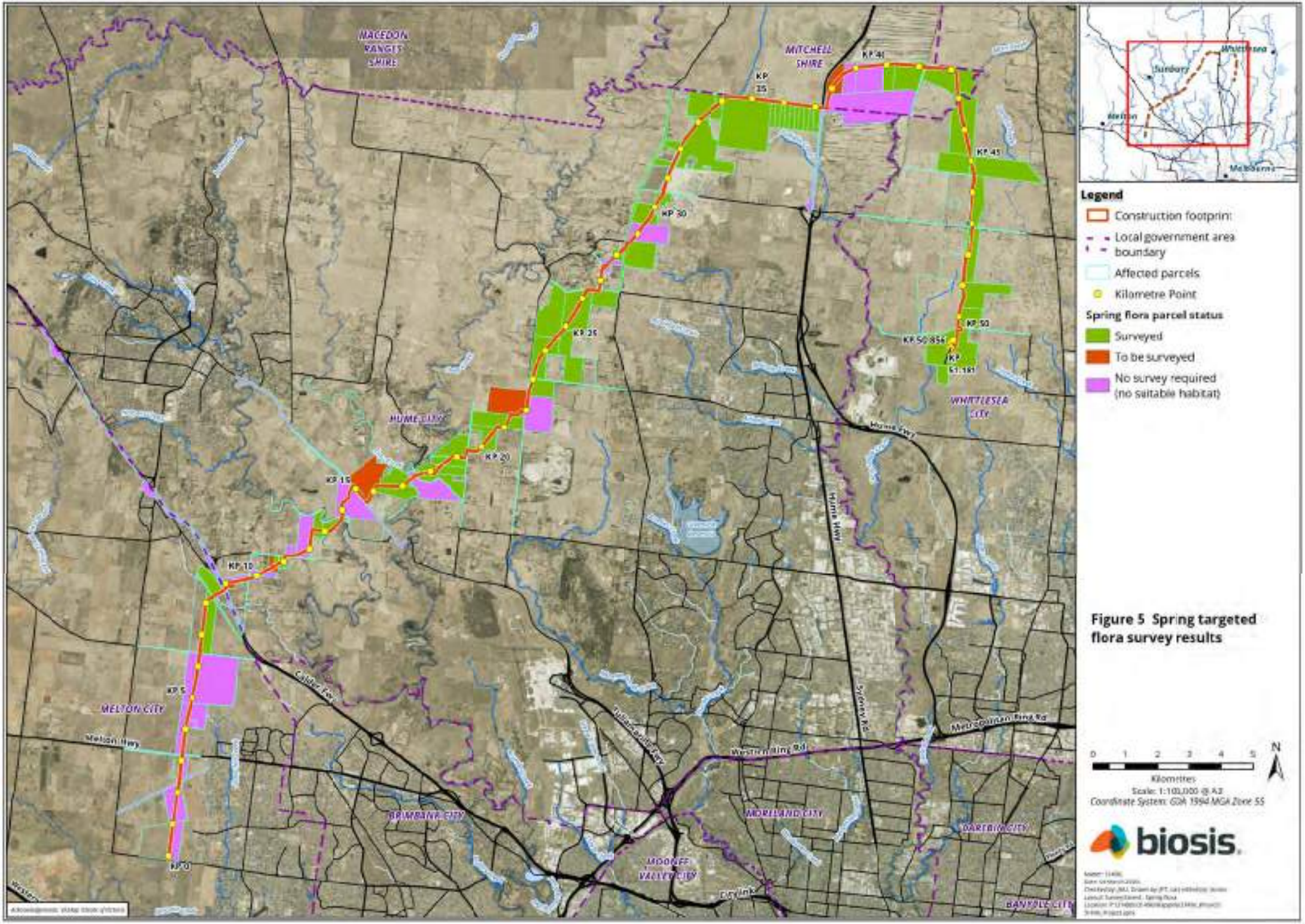


Figure 5 Spring targeted flora survey results

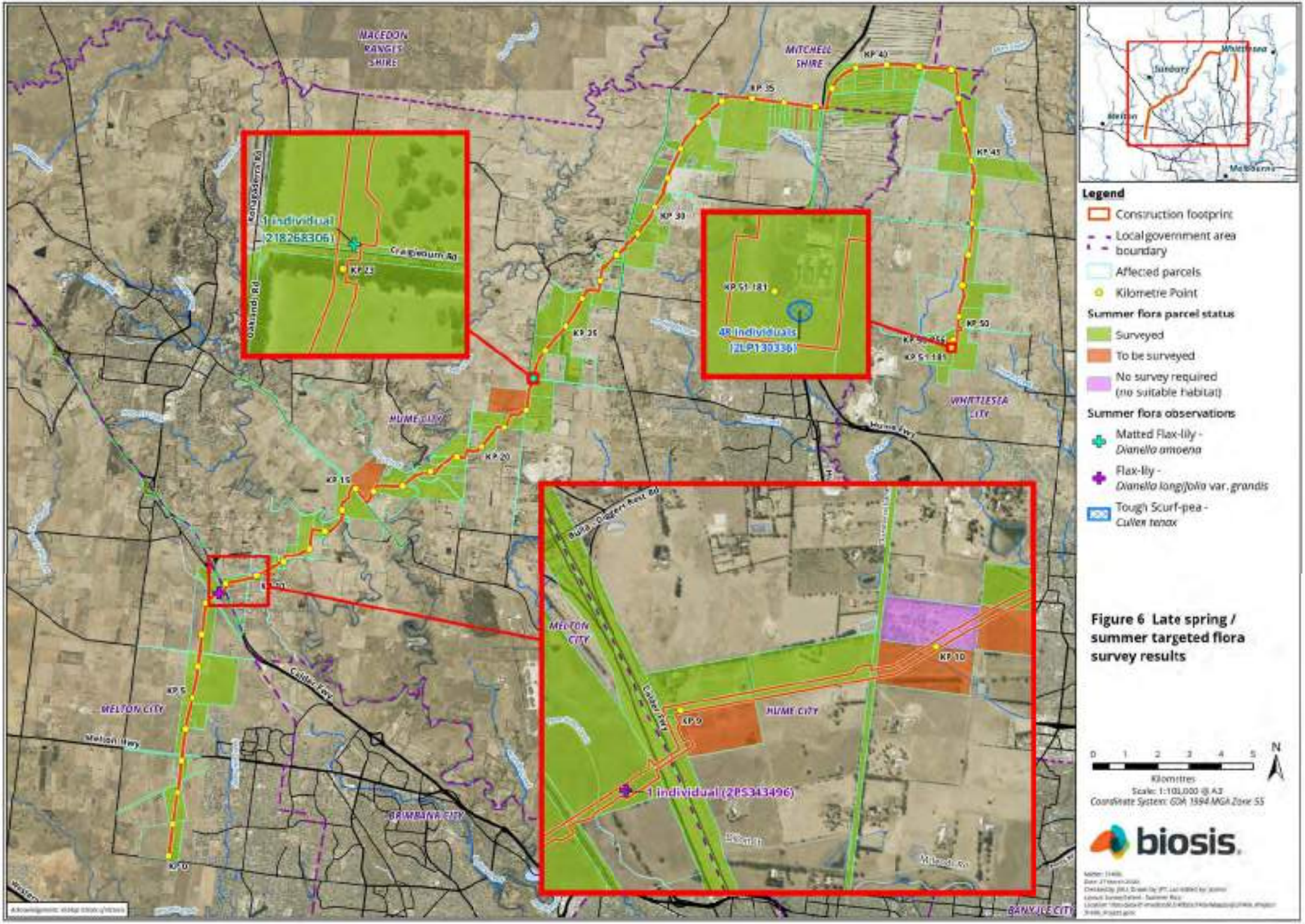


Figure 6 Late spring / summer targeted flora survey results



Figure 7.1 Native vegetation mapped within the construction footprint

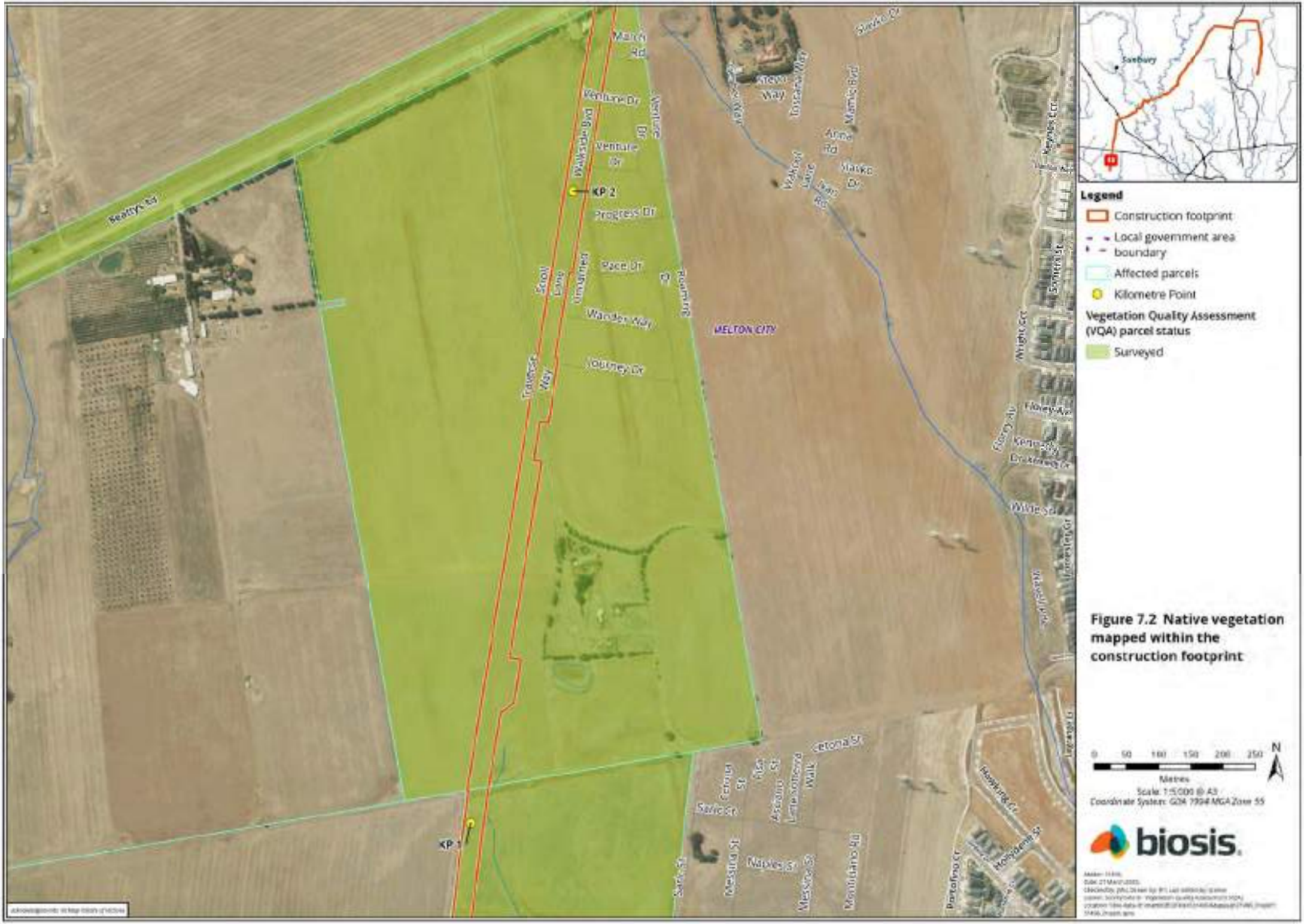


Figure 7.2 Native vegetation mapped within the construction footprint



Figure 7.3 Native vegetation mapped within the construction footprint



Figure 7.4 Native vegetation mapped within the construction footprint





Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point

Vegetation Quality Assessment (VQA) parcel status

- Surveyed

Ecological Vegetation Class (EVC)

- EVC 132 Plains Grassland

Figure 7.5 Native vegetation mapped within the construction footprint

0 50 100 150 200 250

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 2020 MGA Zone 55

N

biosis





Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point

Vegetation Quality Assessment (VQA) parcel status

- Surveyed

Ecological Vegetation Class (EVC)

- EVC 132 Plains Grassland

Figure 7.6 Native vegetation mapped within the construction footprint

0 50 100 150 200 250 N

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

biosis



Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point

Vegetation Quality Assessment (VQA) parcel status

- Surveyed
- To be surveyed

Ecological Vegetation Class (EVC)

- EVC 132 Plains Grassland

Figure 7.7 Native vegetation mapped within the construction footprint

0 50 100 150 200 250

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 2020 MGA Zone 55

N

biosis





Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point

Vegetation Quality Assessment (VQA) parcel status

- Surveyed
- To be surveyed

Ecological Vegetation Class (EVC)

- EVC 132 Plains Grassland

Figure 7.8 Native vegetation mapped within the construction footprint

0 50 100 150 200 250

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

biosis



Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point
- Patch tree
- Scattered tree

Vegetation Quality Assessment (VQA) parcel status

- Surveyed

Ecological Vegetation Class (EVC)

- EVC 55 Plains Grassy Woodland
- EVC 132 Plains Grassland
- EVC 641 Riparian Woodland
- EVC 653 Aquatic Herbland

Figure 7.9 Native vegetation mapped within the construction footprint

0 50 100 150 200 250

Metres

Scale: 1:5,000 @ A3

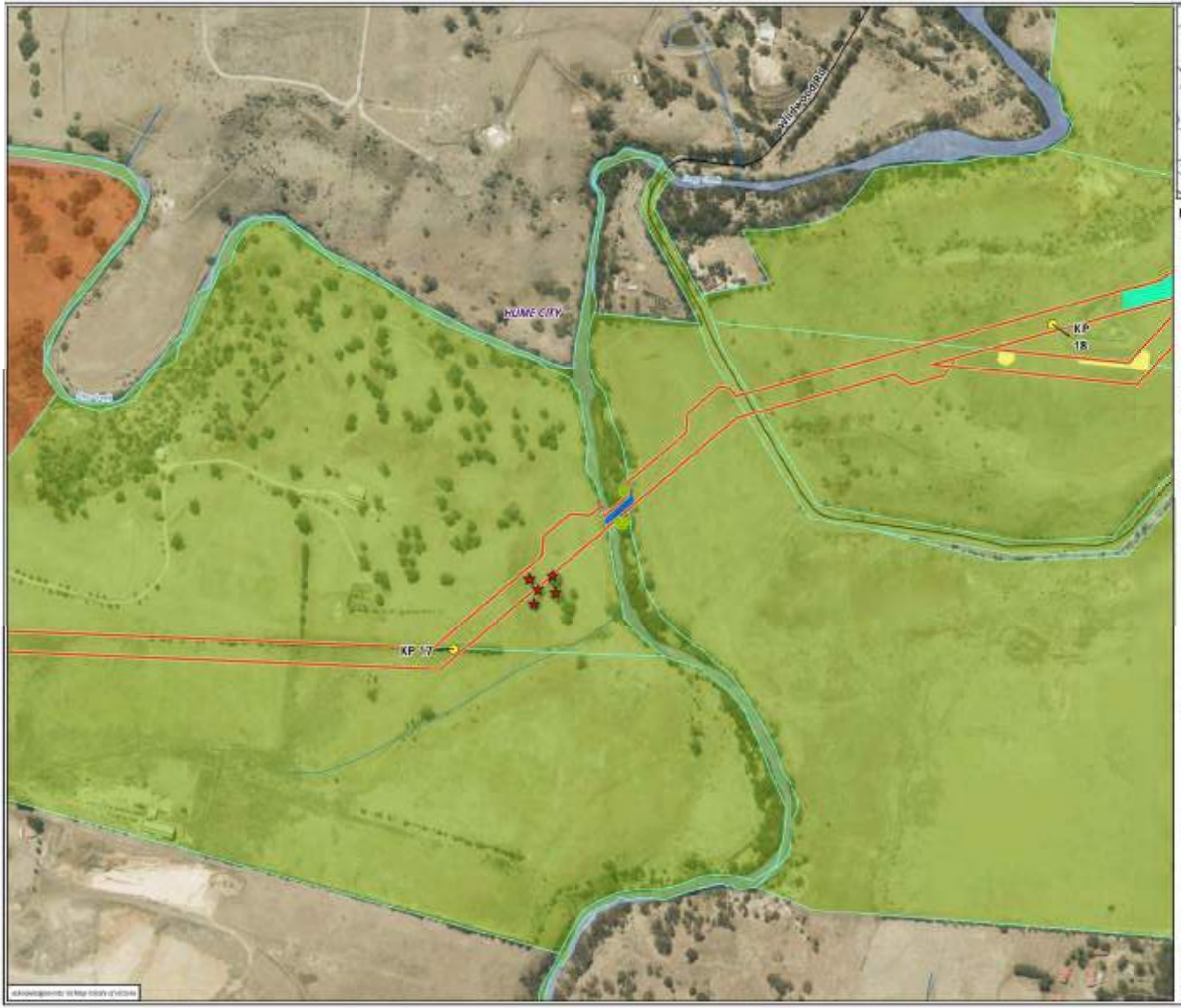
Coordinate System: GDA 1994 MGA Zone 55

N

biosis



Figure 7.10 Native vegetation mapped within the construction footprint





Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point
- Patch tree
- Scattered tree

Vegetation Quality Assessment (VQA) parcel status

- Surveyed
- To be surveyed

Ecological Vegetation Class (EVC)

- EVC 125 Plains Grassy Wetland
- EVC 132 Plains Grassland
- EVC 641 Riparian Woodland

Figure 7.11 Native vegetation mapped within the construction footprint

0 50 100 150 200 250

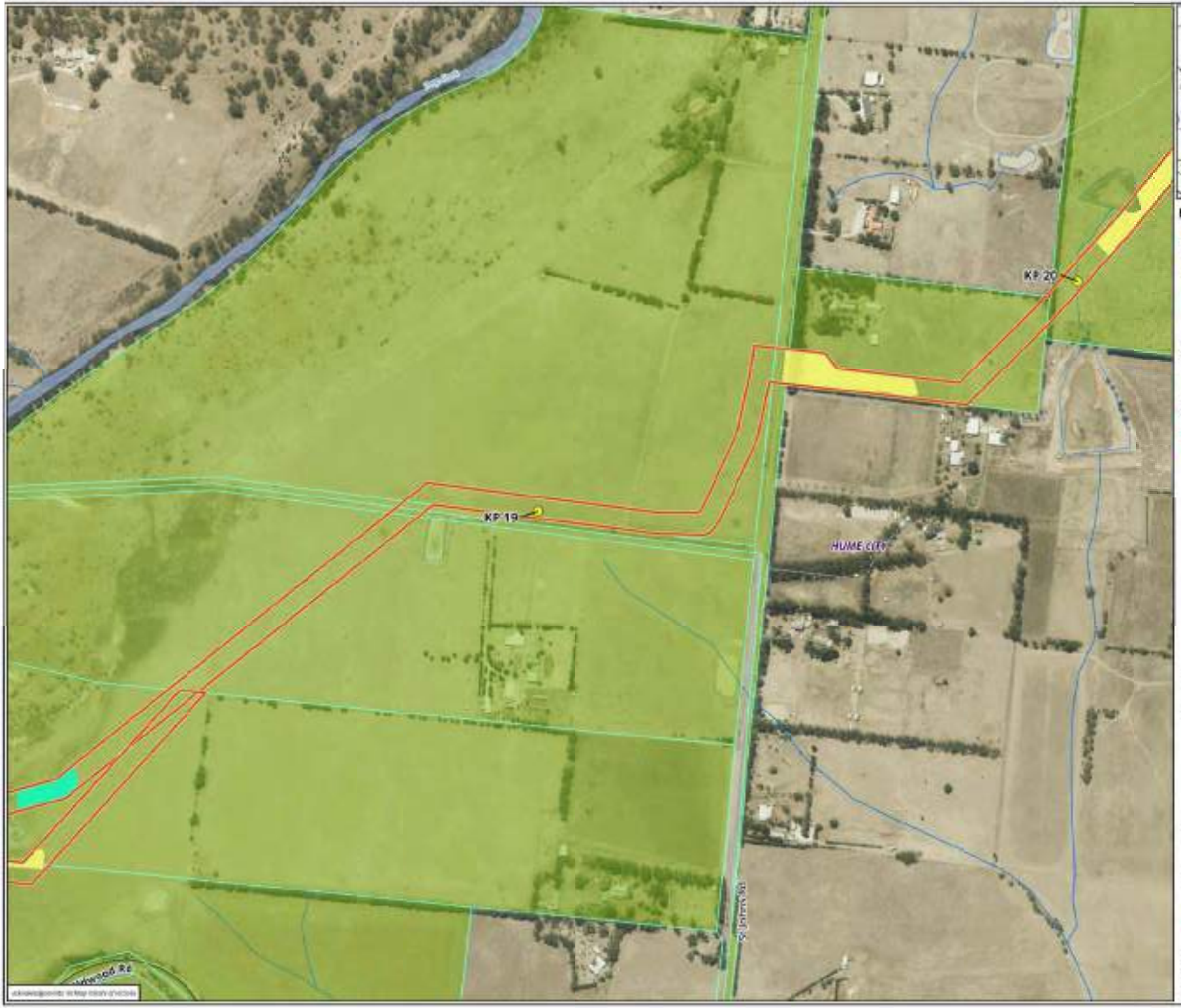
Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

biosis



Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point

Vegetation Quality Assessment (VQA) parcel status

- Surveyed

Ecological Vegetation Class (EVC)

- EVC 125 Plains Grassy Wetland
- EVC 132 Plains Grassland

Figure 7.12 Native vegetation mapped within the construction footprint

0 50 100 150 200 250

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

biosis



Figure 7.13 Native vegetation mapped within the construction footprint





Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point
- Patch tree

Vegetation Quality Assessment (VQA) parcel status

- Surveyed
- To be surveyed

Ecological Vegetation Class (EVC)

- EVC 55 Plains Grassy Woodland
- EVC 132 Plains Grassland

Figure 7.14 Native vegetation mapped within the construction footprint

0 50 100 150 200 250

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

biosis



Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point
- Patch tree

Vegetation Quality Assessment (VQA) parcel status

- Surveyed

Ecological Vegetation Class (EVC)

- EVC 55 Plains Grassy Woodland
- EVC 132 Plains Grassland

Figure 7.15 Native vegetation mapped within the construction footprint

0 50 100 150 200 250

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

biosis





Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point
- Scattered tree

Vegetation Quality Assessment (VQA) parcel status

- Surveyed

Ecological Vegetation Class (EVC)

- EVC 55 Plains Grassy Woodland
- EVC 132 Plains Grassland

Figure 7.16 Native vegetation mapped within the construction footprint

0 50 100 150 200 250

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

biosis



Figure 7.17 Native vegetation mapped within the construction footprint



Figure 7.18 Native vegetation mapped within the construction footprint



Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point

Vegetation Quality Assessment (VQA) parcel status

- Surveyed

Ecological Vegetation Class (EVC)

- EVC 55 Plains Grassy Woodland
- EVC 132 Plains Grassland

Figure 7.19 Native vegetation mapped within the construction footprint

0 50 100 150 200 250 N

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

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Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point

Vegetation Quality Assessment (VQA) parcel status

- Surveyed

Ecological Vegetation Class (EVC)

- EVC 132 Plains Grassland

Figure 7.20 Native vegetation mapped within the construction footprint

0 50 100 150 200 250

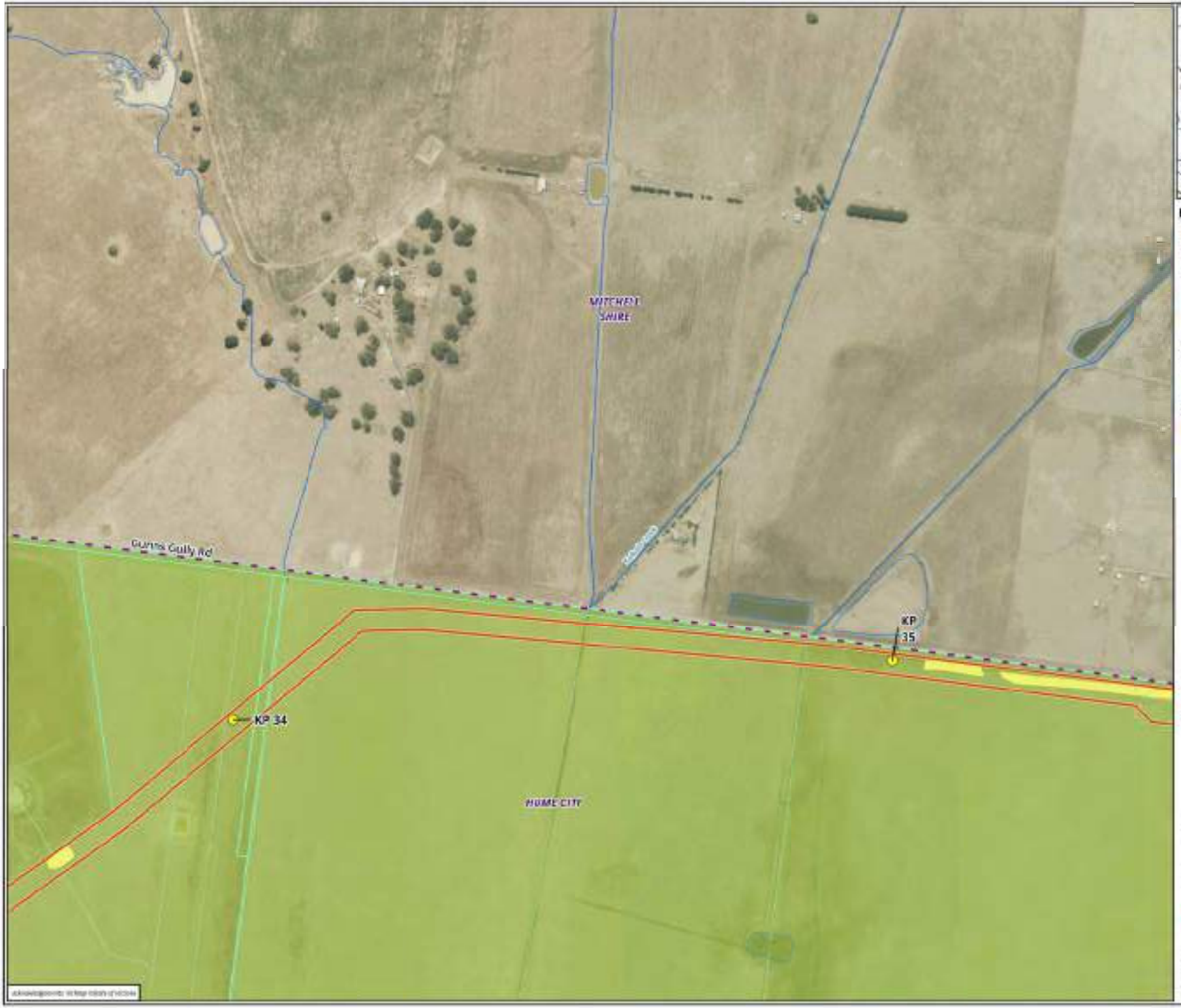
Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

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Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point

Vegetation Quality Assessment (VQA) parcel status

- Surveyed

Ecological Vegetation Class (EVC)

- EVC 132 Plains Grassland

Figure 7.21 Native vegetation mapped within the construction footprint

0 50 100 150 200 250

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

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Figure 7.22 Native vegetation mapped within the construction footprint



Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point

Vegetation Quality Assessment (VQA) parcel status

- Surveyed
- To be surveyed

Figure 7.23 Native vegetation mapped within the construction footprint

0 50 100 150 200 250

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

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Figure 7.24 Native vegetation mapped within the construction footprint





Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point

Vegetation Quality Assessment (VQA) parcel status

- Surveyed

Ecological Vegetation Class (EVC)

- EVC 132 Plains Grassland
- EVC 649 Stony Knoll Shrubland

Figure 7.25 Native vegetation mapped within the construction footprint

0 50 100 150 200 250

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 2020 MGA Zone 55

N

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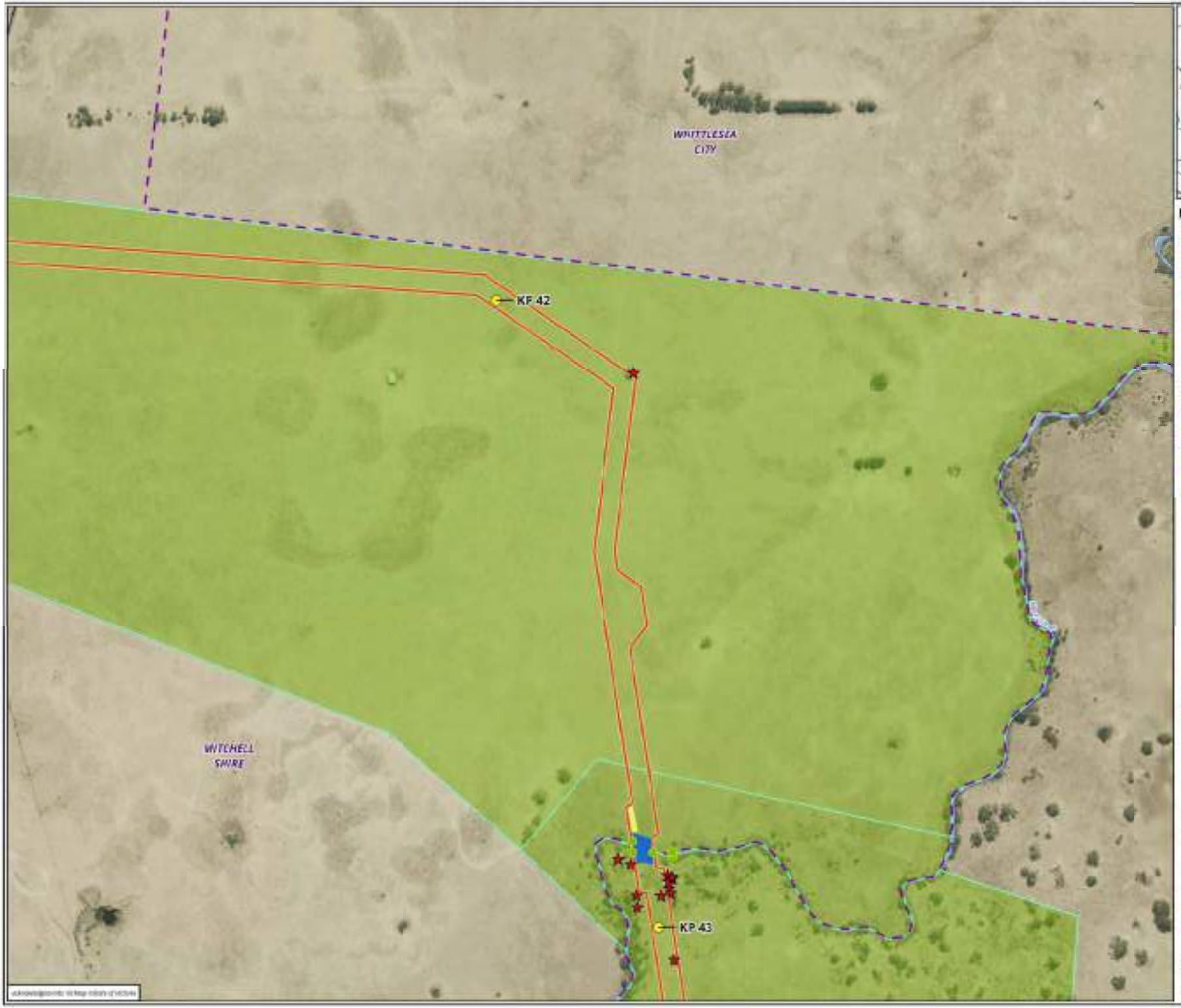
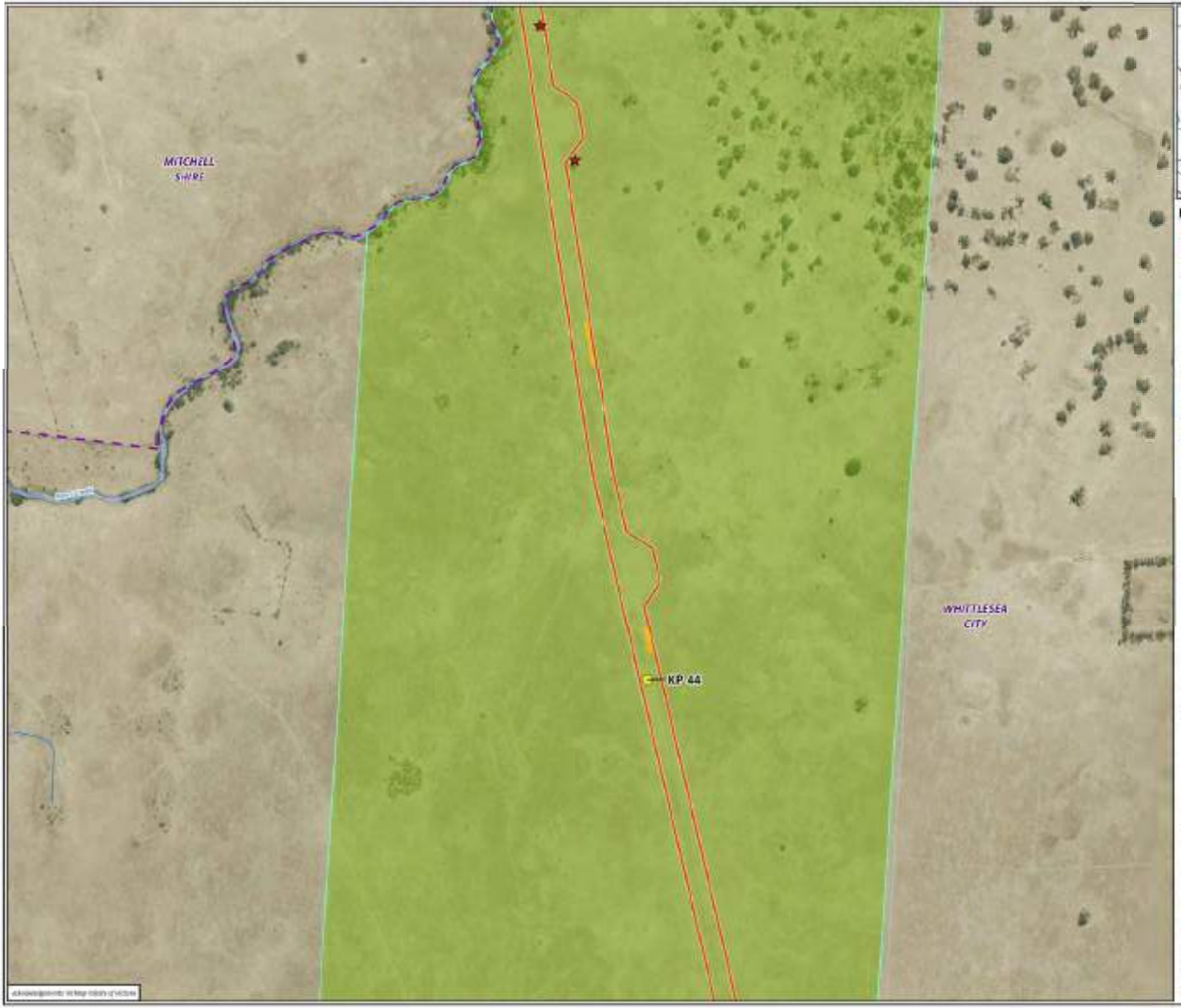


Figure 7.26 Native vegetation mapped within the construction footprint



Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point
- Scattered tree

Vegetation Quality Assessment (VQA) parcel status

- Surveyed

Ecological Vegetation Class (EVC)

- EVC 649 Stony Knoll Shrubland

Figure 7.27 Native vegetation mapped within the construction footprint

0 50 100 150 200 250 N

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 2020 MGA Zone 55

biosis





Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point

Vegetation Quality Assessment (VQA) parcel status

- Surveyed

Figure 7.28 Native vegetation mapped within the construction footprint

0 50 100 150 200 250

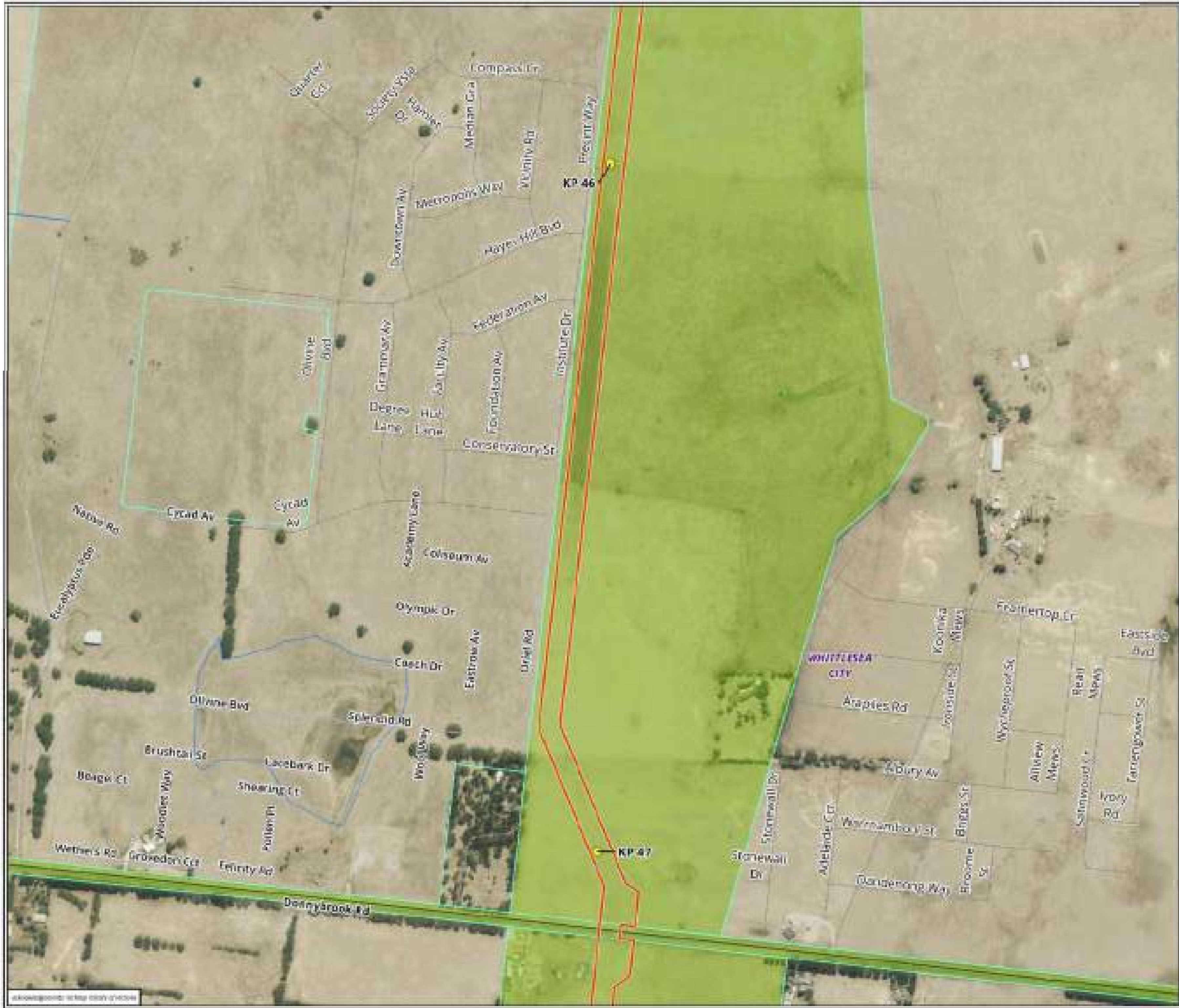
Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

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Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point

Vegetation Quality Assessment (VQA) parcel status

- Surveyed

Figure 7.29 Native vegetation mapped within the construction footprint

0 50 100 150 200 250

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

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Figure 7.30 Native vegetation mapped within the construction footprint





Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point
- Scattered tree

Vegetation Quality Assessment (VQA) parcel status

- Surveyed

Figure 7.31 Native vegetation mapped within the construction footprint

0 50 100 150 200 250

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 2020 MGA Zone 55

N

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Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point
- Patch tree
- Scattered tree

Vegetation Quality Assessment (VQA) parcel status

- Surveyed

Ecological Vegetation Class (EVC)

- EVC 55 Plains Grassy Woodland
- EVC 649 Stony Knoll Shrubland

Figure 7.32 Native vegetation mapped within the construction footprint

0 50 100 150 200 250 N

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

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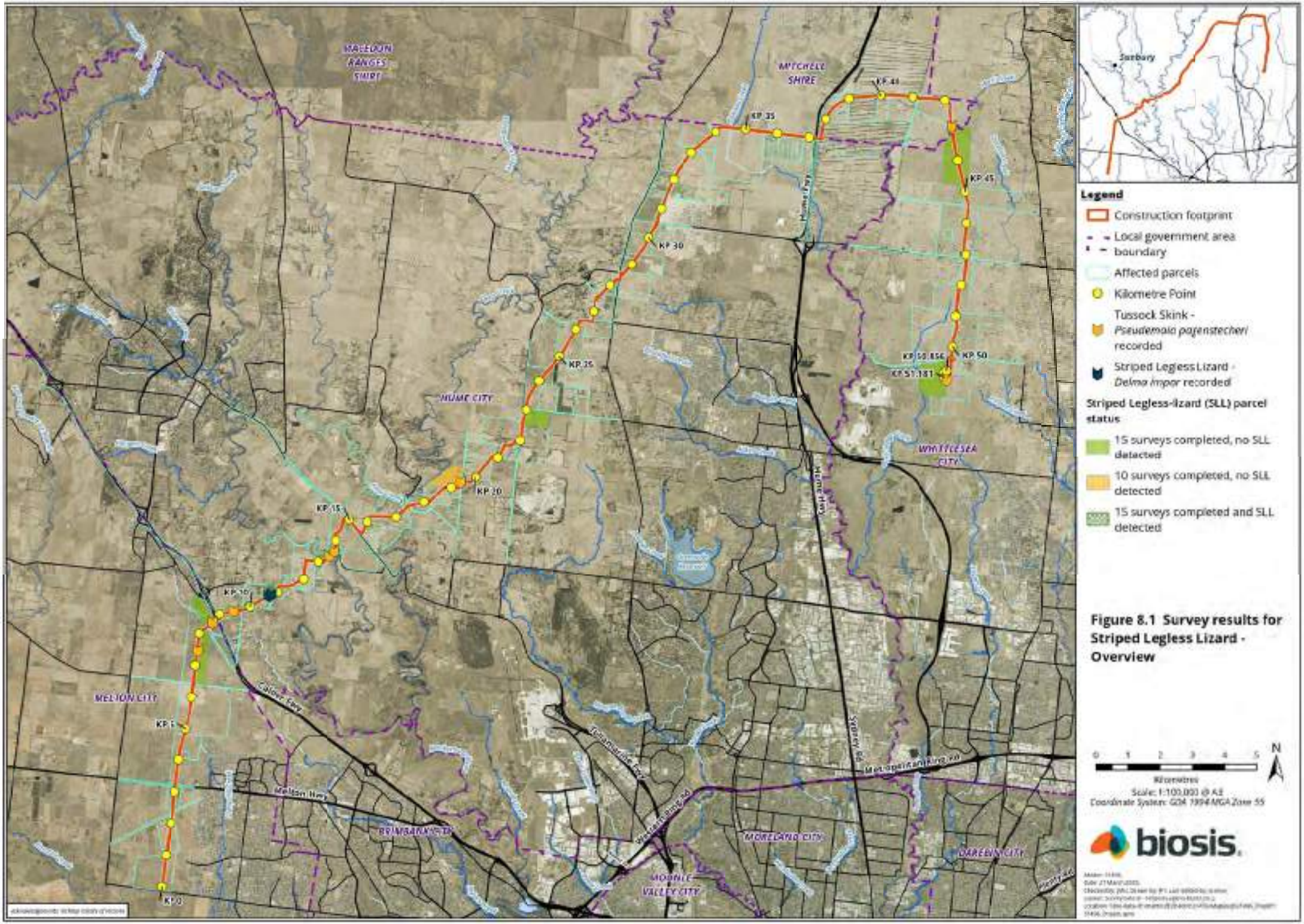


Figure 8.1 Survey results for Striped Legless Lizard - Overview



Figure 8.2 Survey results for Striped Legless Lizard



Figure 8.3 Survey results for Striped Legless Lizard





Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point
- SLL tile grid
- Tussock Skink - *Pseudemoia pagenstecheri* recorded

Striped Legless-lizard (SLL) parcel status

- 15 surveys completed, no SLL detected

Figure 8.4 Survey results for Striped Legless Lizard

0 50 100
Metres
Scale: 1:2,500 @ A3
Coordinate System: GDA 2020 MGA Zone 55

N

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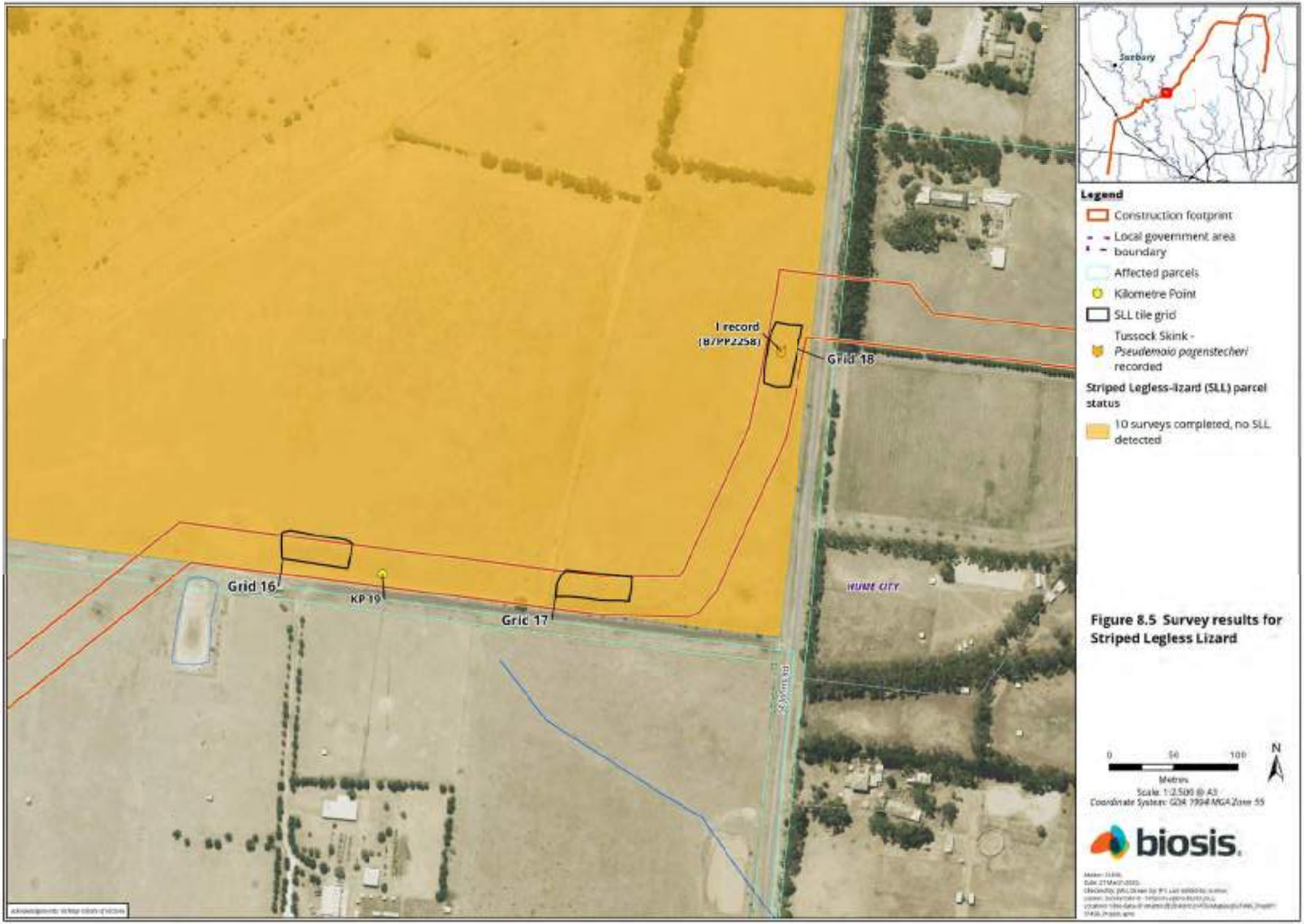


Figure 8.5 Survey results for Striped Legless Lizard





Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point
- SLL tile grid

Striped Legless-lizard (SLL) parcel status

- 15 surveys completed, no SLL detected

Figure 8.6 Survey results for Striped Legless Lizard

0 50 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA 2020 MGA Zone 55

N

biosis

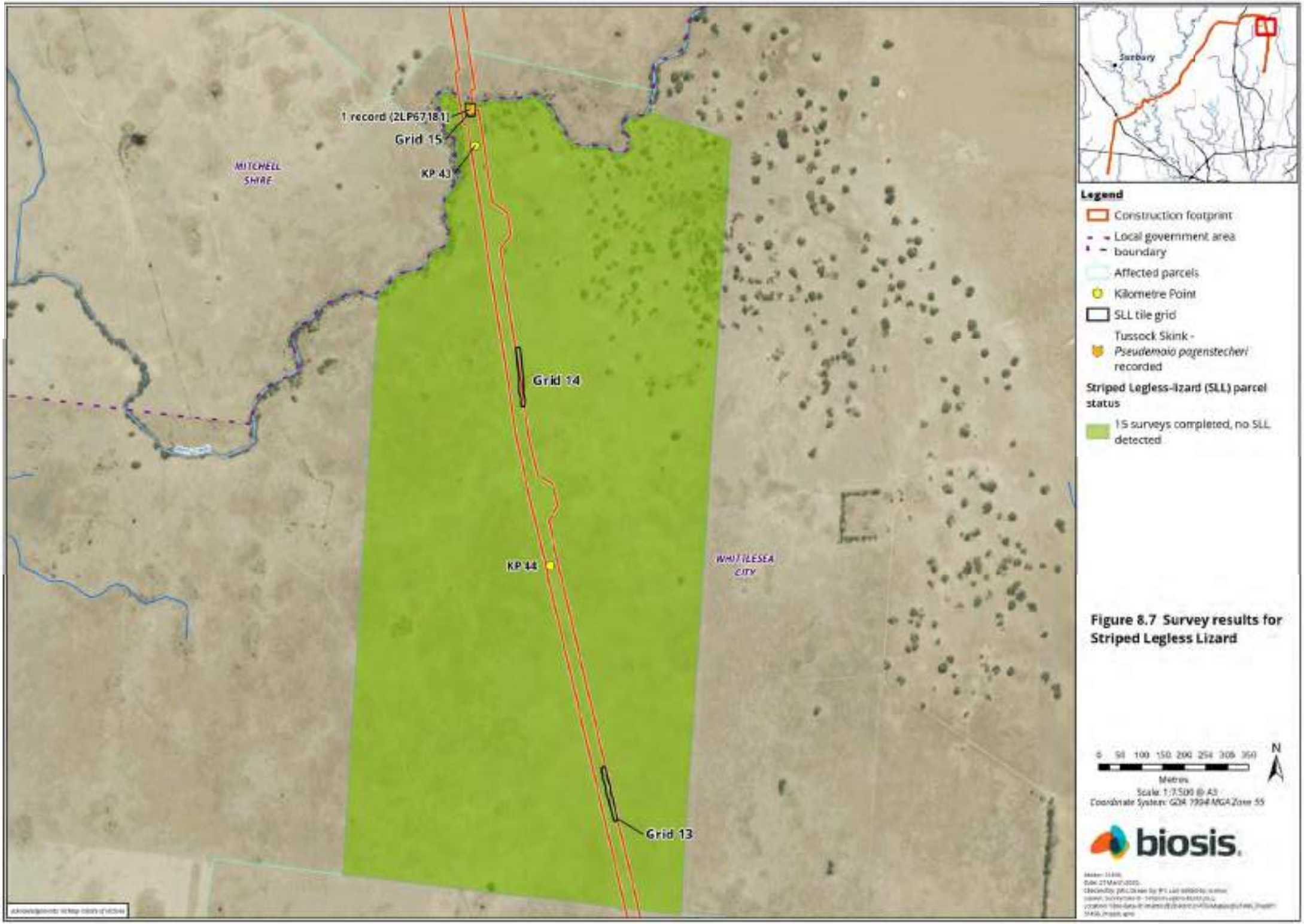


Figure 8.7 Survey results for Striped Legless Lizard





Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Kilometre Point
- SLL tile grid
- Tussock Skink - *Pseudemoia pagenstecheri* recorded

Striped Legless-lizard (SLL) parcel status

- 15 surveys completed, no SLL detected

Figure 8.8 Survey results for Striped Legless Lizard

0 50 100
Metres
Scale: 1:2,500 @ A3
Coordinate System: GDA 2020 MGA Zone 55

N

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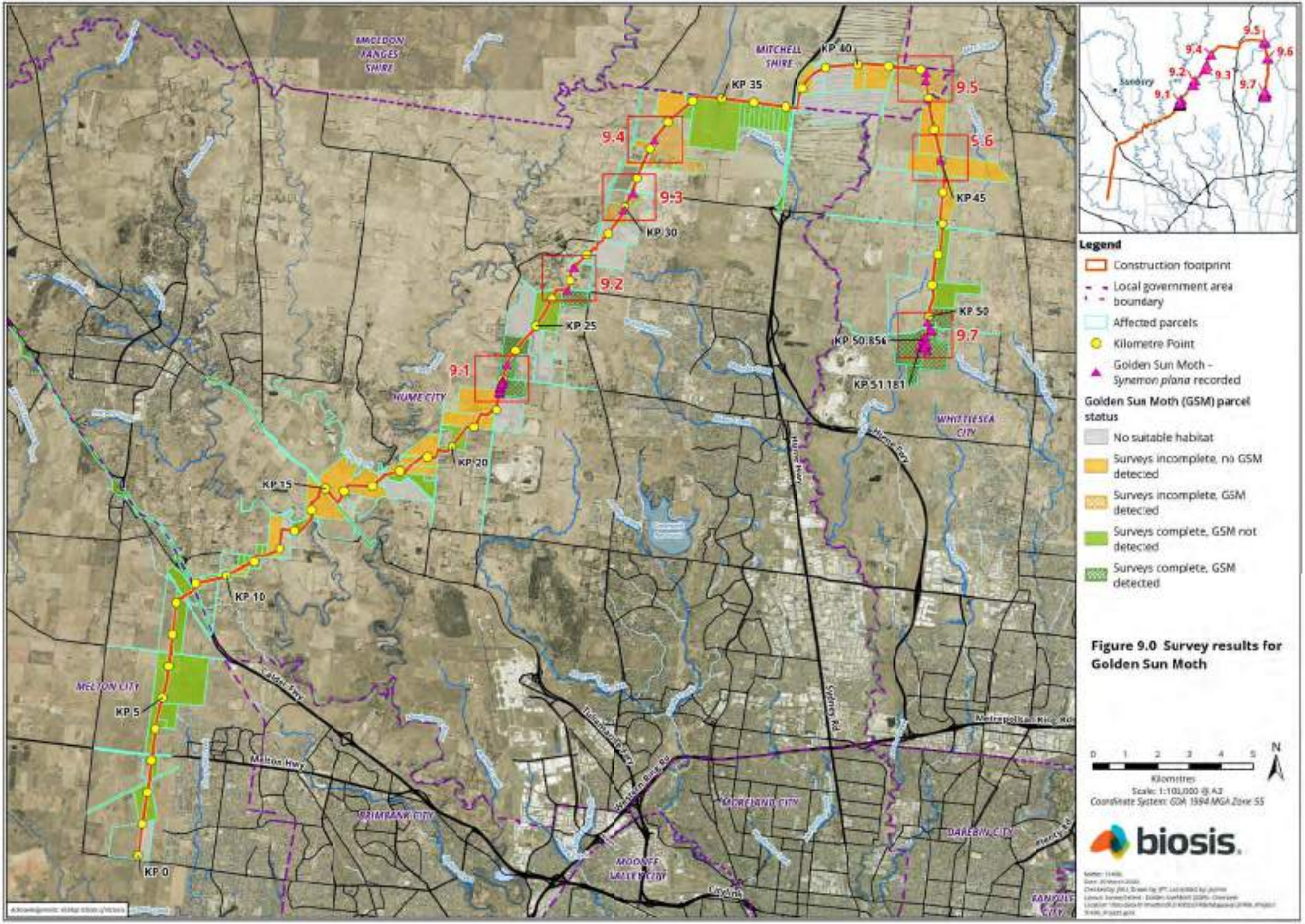


Figure 9.0 Survey results for Golden Sun Moth





Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Affected parcels with GSM records
- Kilometre Point
- Golden Sun Moth - *Synemon plana* recorded

Golden Sun Moth (GSM) parcel status

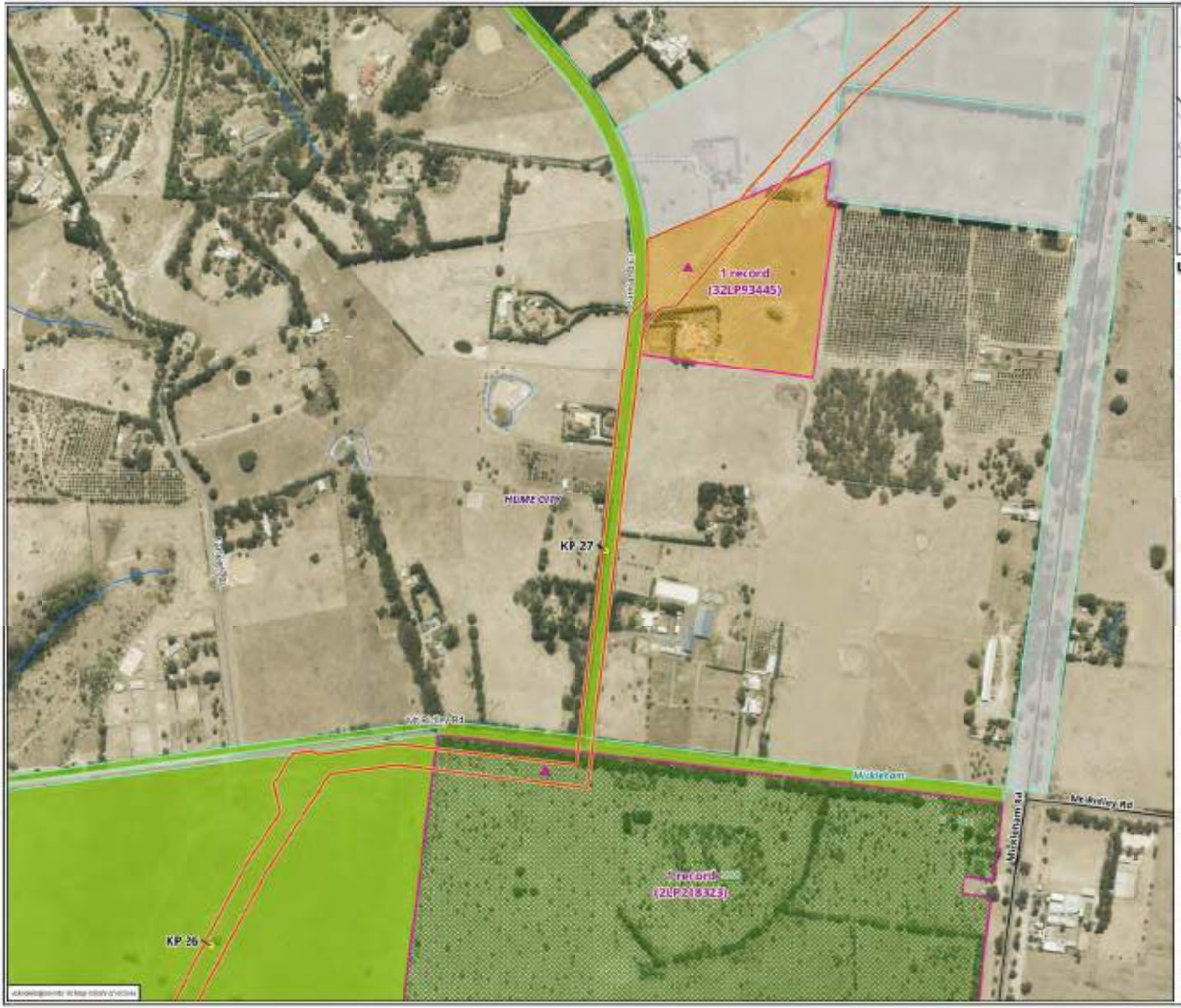
- No suitable habitat
- Surveys incomplete, no GSM detected
- Surveys complete, GSM not detected
- Surveys complete, GSM detected

Figure 9.1 Survey results for Golden Sun Moth

0 50 100 150 200 250
Metres
N

Scale: 1:5,000 @ A3
Coordinate System: GDA 2020 MGA Zone 55

biosis





Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Affected parcels with GSM records
- Kilometre Point
- Golden Sun Moth - *Synemon plana* recorded

Golden Sun Moth (GSM) parcel status

- No suitable habitat
- Surveys incomplete, GSM detected
- Surveys complete, GSM not detected
- Surveys complete, GSM detected

Figure 9.2 Survey results for Golden Sun Moth

0 50 100 150 200 250

Metres

Scale: 1:5,000 @ A3
Coordinate System: GDA 2020 MGA Zone 55

N

biosis

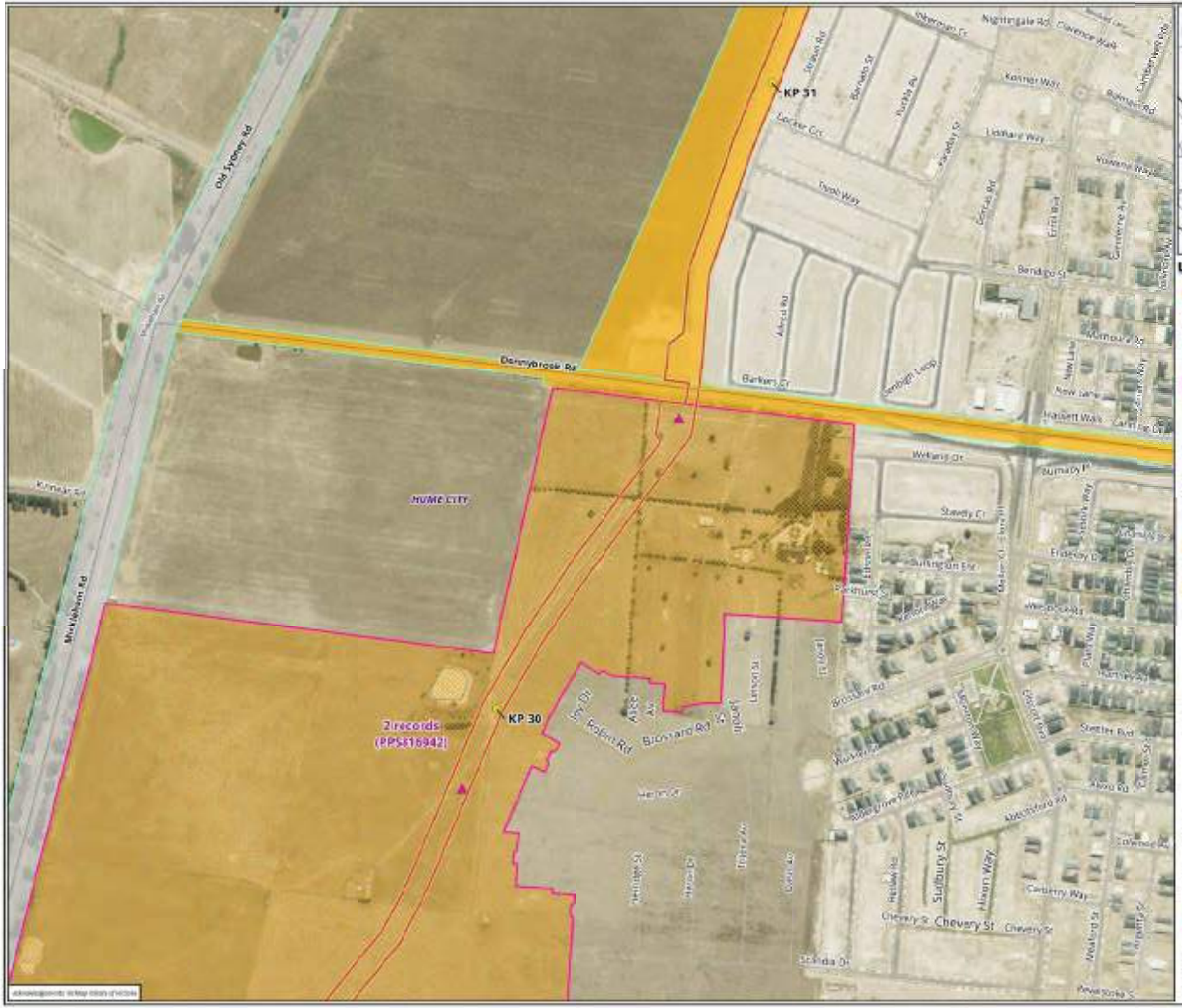
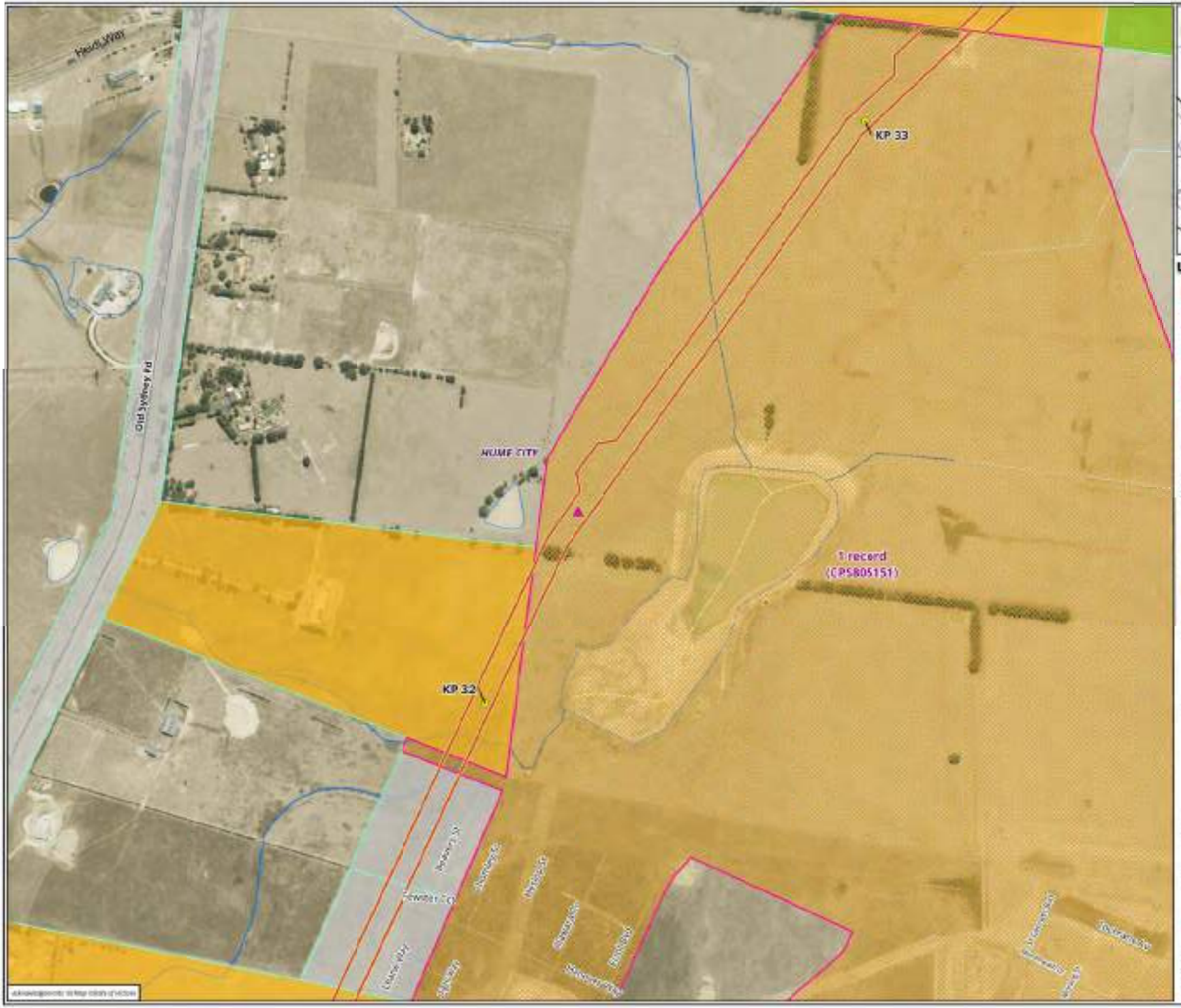


Figure 9.3 Survey results for Golden Sun Moth





Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Affected parcels with GSM records
- Kilometre Point
- Golden Sun Moth - *Synemon plana* recorded

Golden Sun Moth (GSM) parcel status

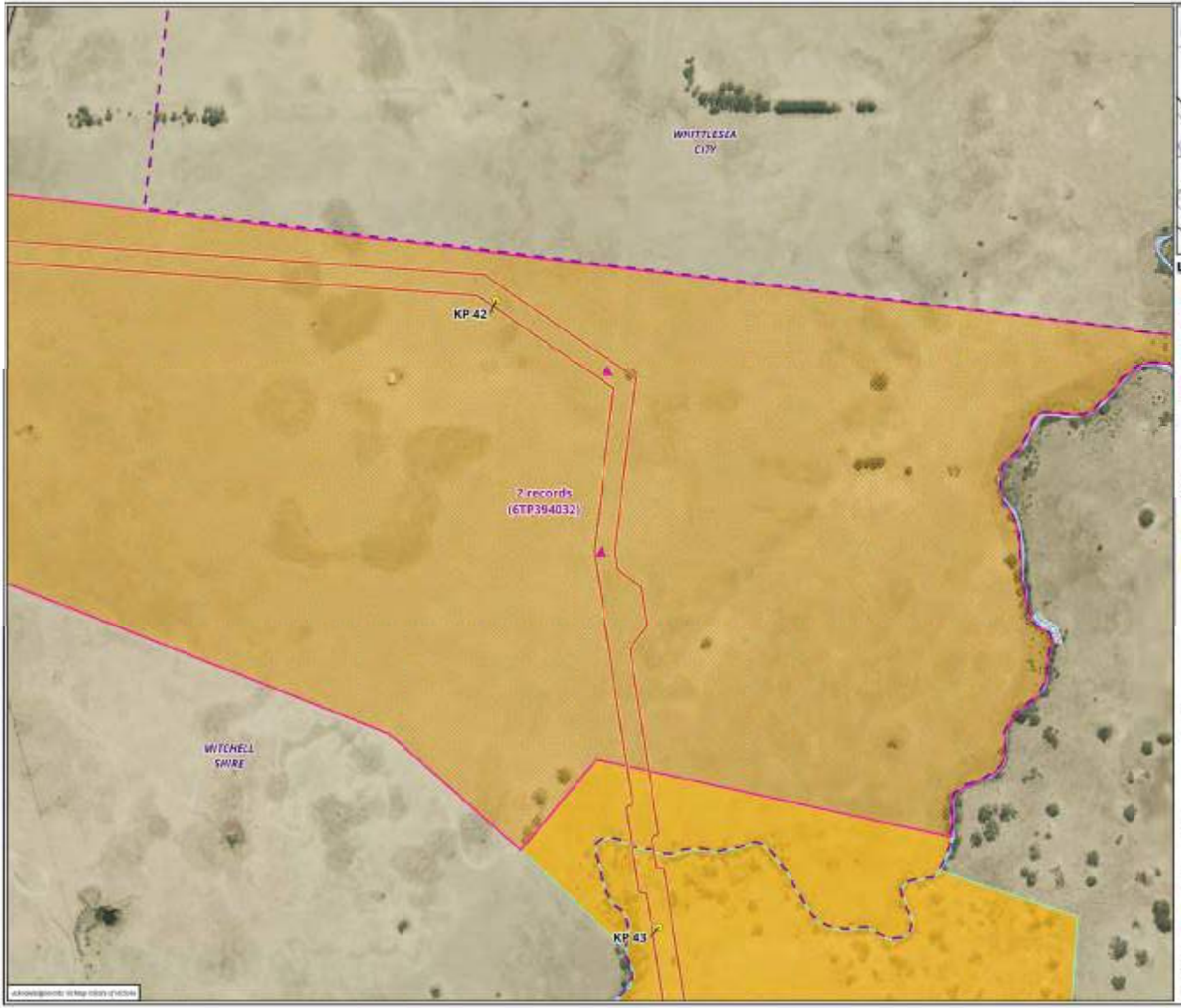
- No suitable habitat
- Surveys incomplete, no GSM detected
- Surveys incomplete, GSM detected
- Surveys complete, GSM not detected

Figure 9.4 Survey results for Golden Sun Moth

0 50 100 150 200 250
Metres
Scale: 1:5,000 @ A3
Coordinate System: GDA 2020 MGA Zone 55

N

biosis





Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Affected parcels with GSM records
- Kilometre Point
- Golden Sun Moth - *Synemon plana* recorded

Golden Sun Moth (GSM) parcel status

- Surveys incomplete, no GSM detected
- Surveys incomplete, GSM detected

Figure 9.5 Survey results for Golden Sun Moth

0 50 100 150 200 250
Metres
N

Scale: 1:5,000 @ A3
Coordinate System: GDA 2020 MGA Zone 55

biosis





Legend

- Construction footprint
- Local government area boundary
- Affected parcels
- Affected parcels with GSM records
- Kilometre Point
- Golden Sun Moth - *Synemon plana* recorded

Golden Sun Moth (GSM) parcel status

- Surveys incomplete, no GSM detected
- Surveys incomplete, GSM detected

Figure 9.6 Survey results for Golden Sun Moth

0 50 100 150 200 250
Metres
Scale: 1:5,000 @ A3
Coordinate System: GDA 2020 MGA Zone 55

N

biosis



Figure 9.7 Survey results for Golden Sun Moth

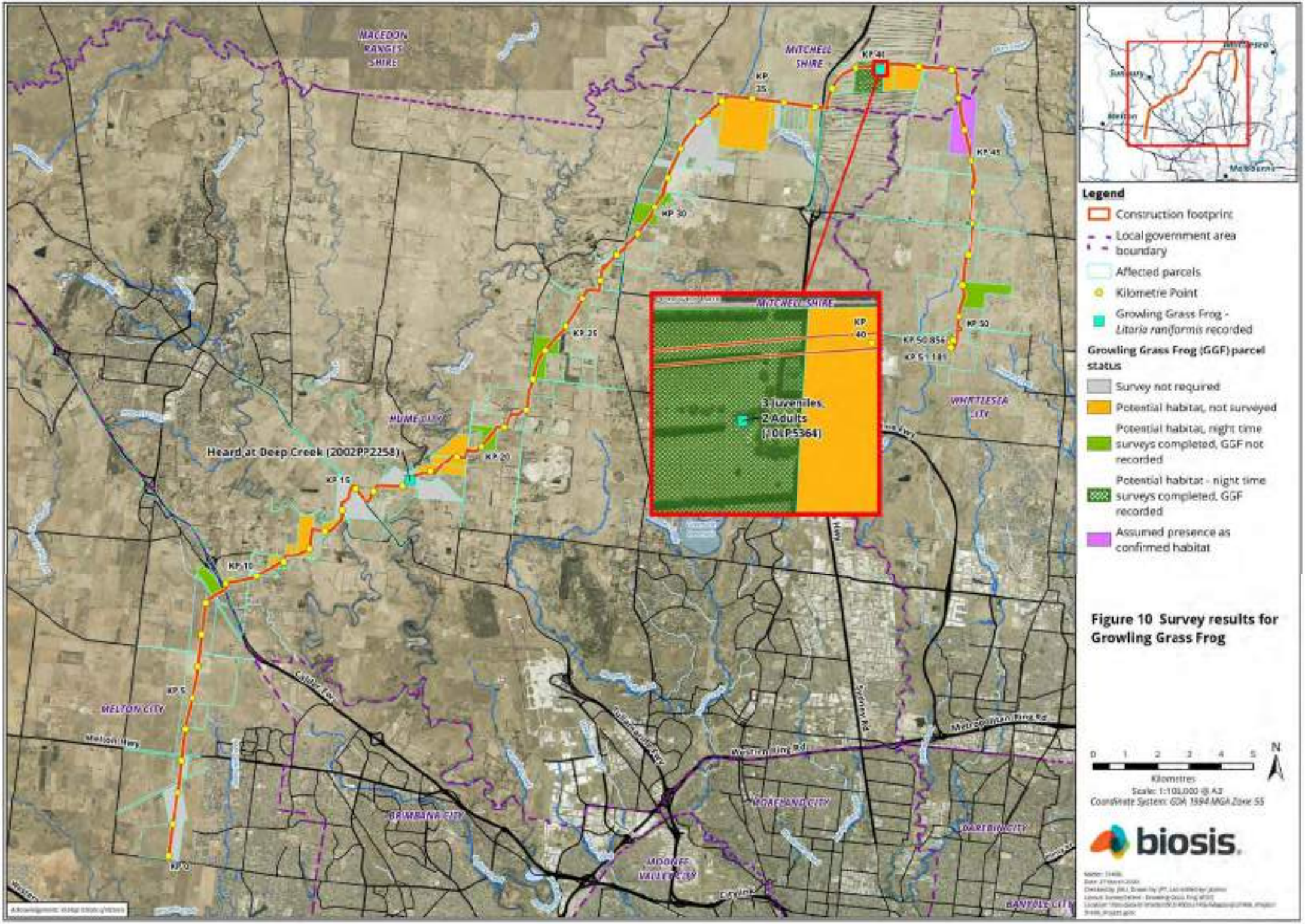


Figure 10 Survey results for Growling Grass Frog

Appendix DD – Mitigation Measures and Constraints for all native vegetation patches

** see map below to reference ID numbers for patches

ID_Map	HH_EVC	EPBC	FFG	KP_IN	GISLink	Parcel ID	Details of mitigation method implemented and /or constraints constraints preventing further mitigation for each impacted area of native vegetation
1	VVP_0132	NTGVVP	FFG	2.37	10LP116565, 425711870,	425711870 (Melton Hwy road reserve)	HDD proposed to minimise impacts to NV
2	VVP_0132		FFG	3.178	218160972	218160972 (Melton Hwy road reserve)	HDD proposed to minimise impacts to NV
3	VVP_0132		FFG	4.812	1TP901066	1TP901066	Construction corridor narrowed to avoid impacts to NV in area
4	VVP_0132	NTGVVP	FFG	4.812	1TP901066		NV patch located within centre of proposed corridor. Area required to faciliate safe construction when working near existing APA gas pipeline in existing easement.
5	VVP_0132	NTGVVP	FFG	4.812	1TP901066	1TP901066	Construction corridor narrowed to avoid impacts to NV in area
6	VVP_0132	NTGVVP	FFG	6.425	2LP119116	2LP119116	Construction corridor narrowed to minimise impacts to NV in area
7	VVP_0132	NTGVVP	FFG	6.425	2LP119116	2LP119116	Construction corridor narrowed to minimise impacts to NV in area
8	VVP_0132	NTGVVP	FFG	6.425	2LP119116		Area required to faciliate set up of HDD required under Rail crossing.
9	VVP_0132_61		FFG	8.744	218257150	218257150	HDD proposed to minimise impacts to NV

ID_Map	HH_EVC	EPBC	FFG	KP_IN	GISLink	Parcel ID	Details of mitigation method implemented and /or constraints constraints preventing further mitigation for each impacted area of native vegetation
10	VVP_0132		FFG	8.325	2PS343496	1TP946706 Victorian Rail Track - Bendigo Line	HB
11	CVU_0132	NTGVVP		9.158	2LP90878		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction.
12	CVU_0132	NTGVVP		9.158	2LP90878, 218268838, 2015PP2761	2015PP2761	Area required to facilitate set up of HB required for road crossing
13	VVP_0132		FFG	9.617	5LP92520		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction.
14	VVP_0132		FFG	9.617	5LP92520, 6LP92520,		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction.
15	VVP_0132		FFG	9.617	5LP92520, 6LP92520,		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction.
16	VVP_0132	NTGVVP	FFG	10.255	11LP215406	11LP215406	Construction corridor narrowed to minimise impacts to NV in area

ID_Map	HH_EVC	EPBC	FFG	KP_IN	GISLink	Parcel ID	Details of mitigation method implemented and /or constraints constraints preventing further mitigation for each impacted area of native vegetation
17	CVU_0132			10.255	11LP215406		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction/access in low lying gully area.
18	VVP_0132	NTGVVP	FFG	10.539	11LP92520, 12LP92520,	12LP92520	Construction corridor narrowed to minimise impacts to NV in area. Alignment constraints on southern boundary with location of OMR. Sufficient access is required at the bend to utilise the construction corridor for turning of plant/equipment and to facilitate installation of pipeline (each pipe segment is 18m long).
18	VVP_0132	NTGVVP	FFG	10.539	11LP92520, 12LP92520,	12LP92520	Construction corridor narrowed to minimise impacts to NV in area. Alignment constraints on southern boundary with location of OMR.
19	VVP_0132	NTGVVP	FFG	10.586	12LP92520		Area avoided, no impacts to NV, Bore construction under road area has been reduced within property to minimise impacts to SLL.

ID_Map	HH_EVC	EPBC	FFG	KP_IN	GISLink	Parcel ID	Details of mitigation method implemented and /or constraints constraints preventing further mitigation for each impacted area of native vegetation
20	VVP_0132	NTGVVP	FFG	10.586	12LP92520		Area avoided, no impacts to NV, Bore construction under road area has been reduced within property to minimise impacts to SLL.
21	VVP_0132	NTGVVP	FFG	10.586	12LP92520		Area avoided, no impacts to NV, Bore construction under road area has been reduced within property to minimise impacts to SLL.
22	VVP_0132	NTGVVP	FFG	10.586	12LP92520		Construction corridor area narrowed to avoid impacts to NV. Area required to facilitate Bore construction under road has been reduced within property to minimise impacts to NV patch and SLL.
23	VVP_0132	NTGVVP	FFG	10.798	13LP92520		Area required to faciliate set up of Bore required under Road crossing. Area after Bore has been further reduced to avoid NV.
23	VVP_0132	NTGVVP	FFG	10.798	13LP92520		Area required to faciliate set up of Bore required under Road crossing. Area after Bore has been further reduced to avoid NV.
24	VVP_0132		FFG	10.798	13LP92520	13LP92520	Construction corridor narrowed to minimise impacts to NV in area

ID_Map	HH_EVC	EPBC	FFG	KP_IN	GISLink	Parcel ID	Details of mitigation method implemented and /or constraints constraints preventing further mitigation for each impacted area of native vegetation
25	VVP_0132		FFG	11.166	2LP137651, 1LP137651,		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction near dam.
26	VVP_0132		FFG	11.326	1LP137651		Dam to be filled in. Area narrowed to minimise impacts to NV along northern boundary near dam.
27	VVP_0653			11.506	D16PP2761		Works requried to fill in Dam. NV located in centre of construction corridor, unavoidable to maintain safe construction access.
28	VVP_0055_61		FFG	11.506	D16PP2761		Realignment undertaken to avoid NV. No impact to NV patch.
29	VVP_0132	NTGVVP	FFG	12.871	1TP333383		Realignment undertaken to avoid removal of trees along boundary to minimise impacts. NV (grasses) centrally located within construction corridor will be impacted to facilitate construction of pipeline near bend and maintain safe access.

ID_Map	HH_EVC	EPBC	FFG	KP_IN	GISLink	Parcel ID	Details of mitigation method implemented and /or constraints constraints preventing further mitigation for each impacted area of native vegetation
30	VVP_0132	NTGVVP	FFG	11.141	218260126, 1TP333383,		Realignment undertaken to avoid removal of trees along boundary to minimise impacts. NV (grasses) centrally located within construction corridor will be impacted to facilitate construction and maintain spoil stockpiles away from Jackson creek.
31	VVP_0641			12.871	1TP333383, 2029PP2761, 2010PP2258		Jacksons creek alignment selected based on site visit to assess existing conditions and maintain minimal tree removal in creek. Narrow construction corridor proposed within Creek to minmise impacts during construction.
32	VVP_0055_61		FFG	14.831	1LP200366		2nd alignment option removed, NV not impacted in this area.
33	VVP_0055_61		FFG	14.831	1LP200366		2nd alignment option removed, NV not impacted in this area.
34	VVP_0055_61		FFG	14.799	218261878, 1LP200366,	21861530	Area required to facilitate Horizontal bore across road
35	VVP_0055_61		FFG	14.831	1LP200366	1LP200366	Construction corridor narrowed to minimise impacts to NV in area
36	VVP_0055_61		FFG	14.831	1LP200366, 4LP200366,	1LP200366	Construction corridor narrowed to minimise impacts to NV in area

ID_Map	HH_EVC	EPBC	FFG	KP_IN	GISLink	Parcel ID	Details of mitigation method implemented and /or constraints constraints preventing further mitigation for each impacted area of native vegetation
37	VVP_0055_61		FFG	16.411	4LP200366		Proposed access track no longer required for construction to avoid impacts to NV. Revised access track used to avoid removal of nv. No impact
38	VVP_0055_61		FFG	16.411	4LP200366		Proposed access track no longer required for construction to avoid impacts to NV. Revised access track used to avoid removal of nv. No impact
39	CVU_0641			16.411	4LP200366, 2002PP2258, 1TP424528	2002PP2258	HDD proposed in Deep Creek. No Impacts to NV
40	VVP_0132	NTGVVP	FFG	16.97	1TP107502, 2LP130112,		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction at property with rising gradient/slope.
41	VVP_0132	NTGVVP	FFG	16.97	1TP107502, 2LP130112,	2LP130112	Narrowed construction corridor in immediate area to minimise impacts.
42	VVP_0125			17.554	2LP130112		Realignment of pipeline undertaken to avoid impacts to Dam area. No current impact.
43	VVP_0132	NTGVVP	FFG	18.963	218264222, 5LP88261,	218264222, 5LP88261	Hbore proposed, area with NV narrowed to minmise impacts.

ID_Map	HH_EVC	EPBC	FFG	KP_IN	GISLink	Parcel ID	Details of mitigation method implemented and /or constraints constraints preventing further mitigation for each impacted area of native vegetation
44	VVP_0132_61		FFG	19.421	10LP110642		NV located in centre of construction corridor around existing dam, impacts unavoidable to maintain safe construction access.
45	VVP_0132_61	NTGVVP	FFG	19.421	10LP110642		No impact
46	VVP_0132		FFG	19.421	10LP110642		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction
47	VVP_0132		FFG	19.421	10LP110642		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction
48	VVP_0132		FFG	19.421	10LP110642		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction
49	VVP_0132		FFG	19.421	10LP110642		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction
50	VVP_0132		FFG	19.421	10LP110642		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction
51	VVP_0132		FFG	19.421	10LP110642		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction

ID_Map	HH_EVC	EPBC	FFG	KP_IN	GISLink	Parcel ID	Details of mitigation method implemented and /or constraints constraints preventing further mitigation for each impacted area of native vegetation
52	VVP_0132		FFG	19.421	10LP110642, 2LP218160,		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction
53	VVP_0132	NTGVVP	FFG	20.19	2LP218160		Alignment revised to avoid impacts to NV
54	VVP_0132		FFG	20.19	2LP218160		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction
55	VVP_0132		FFG	20.19	2LP218160, 1TP212870,		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction
56	CVU_0132	NTGVVP		20.19	2LP218160, 1TP212870,		Alignment revised to avoid impacts to NV
57	CVU_0132	NTGVVP		21.354	1TP212870		Alignment revised to avoid impacts to NV
58	VVP_0055_61		FFG	21.354	1TP212870, 1TP104933, 218271946	218271946	HB proposed, area required to facilitate safe access and set up of bore. Area narrowed.
59	VVP_0055_61	GEWVVP	FFG	21.613	2LP68808, 1PS733043, 218266378		Corridor narrowed to minmise impacts to NV
60	VVP_0055_61	GEWVVP	FFG	21.613	2LP68808, 1PS733043,		Area avoided. No direct impact to NV
61	VVP_0055_61		FFG	22.093	1PS733043		Existing access track used to minimise overall impacts, required for construction access. Use of track will avoid removal of native trees along property boundary for direct access to Craigieburn Road.

ID_Map	HH_EVC	EPBC	FFG	KP_IN	GISLink	Parcel ID	Details of mitigation method implemented and /or constraints constraints preventing further mitigation for each impacted area of native vegetation
62	VVP_0055_61	GEWVVP	FFG	22.093	1PS733043, 218266378,		Existing access track used to minimise overall impacts, required for construction access. Use of track will avoid removal of native trees along property boundary for direct access to Craigieburn Road.
63	VVP_0055_61		FFG	22.093	1PS733043		Existing access track used to minimise overall impacts, required for construction access. Use of track will avoid removal of native trees along property boundary for direct access to Craigieburn Road.
64	VVP_0055_61	GEWVVP	FFG	22.093	1PS733043, 218266378,		Existing access track used to minimise overall impacts, required for construction access. Use of track will avoid removal of native trees along property boundary for direct access to Craigieburn Road.
65	VVP_0055_61		FFG	22.657	218268306, 1PS733045,	218268306, 1PS733045	Realignment undertaken to avoid NV and reduce impacts.
66	VVP_0055_61		FFG	22.657	218268306, 1PS733045,	218268306, 1PS733045	Realignment undertaken to avoid NV and reduce impacts.
67	VVP_0055_61	GEWVVP	FFG	22.657	218268306, 1PS733045,	218268306, 1PS733045	Realignment undertaken to minimise impacts to NV. HDD proposed across road. Area requried for HDD

ID_Map	HH_EVC	EPBC	FFG	KP_IN	GISLink	Parcel ID	Details of mitigation method implemented and /or constraints constraints preventing further mitigation for each impacted area of native vegetation
68	VVP_0055_61	GEWVVP	FFG	22.665	1PS733045	1PS733045	Realignment undertaken to minimise impacts to NV
69	VVP_0055_61	GEWVVP	FFG	22.665	1PS733045	1PS733045	Realignment undertaken to minimise impacts to NV
70	VVP_0055_61		FFG	22.665	1PS733045	1PS733045	Realignment undertaken to avoid impacts to NV
71	VVP_0055_61	GEWVVP	FFG	22.665	1PS733045	1PS733045	Realignment undertaken to avoid impacts to NV
72	VVP_0055_61		FFG	22.665	1PS733045	1PS733045	Realignment undertaken to avoid impacts to NV
73	VVP_0125			22.665	1PS733045	1PS733045	Realignment undertaken to avoid impacts to NV
74	VVP_0055_61		FFG	22.665	1PS733045	1PS733045	Realignment undertaken to avoid impacts to NV
75	VVP_0132		FFG	24.387	3PS503800, 1PS503800,	1PS503800	Construction corridor narrowed to minimise impacts to NV
76	VVP_0132	NTGVVP	FFG	24.533	1PS503800	1PS503800	Construction corridor narrowed to minimise impacts to NV
77	VVP_0132		FFG	24.533	1PS503800		Impacts minmised in area, partial removal of NV required to facilitate construction of pipeline.
78	VVP_0055_61		FFG	26.13	2LP218323		Alignment takes into consideration trees along property boundary to minimise impacts. Remaining area required to facilitate safe construction.

ID_Map	HH_EVC	EPBC	FFG	KP_IN	GISLink	Parcel ID	Details of mitigation method implemented and /or constraints constraints preventing further mitigation for each impacted area of native vegetation
78	VVP_0055_61		FFG	26.13	2LP218323		Alignment takes into consideration trees along property boundary to minimise impacts. Remaining area required to facilitate safe construction.
79	VVP_0132		FFG	27.007	32LP93445		Area required to store plant/materials to ensure additional area not required within Parkland Cresent road reserve.
81	VVP_0055_61		FFG	27.703	1TP108439, 218271310,	218271310	Impacts avoided to NV from propsed HB
82	VVP_0055_61		FFG	27.997	218271310, 1TP947284,	218271310	Impacts avoided to NV from propsed HB
83	VVP_0055_61		FFG	27.997	218271310, 1TP947284,	218271310	Corridor narrowed to minmise impacts to NV
84	VVP_0132		FFG	28.398	GPS819168, GPS806997,		Realginment undertaken to avoid interfacing issues between pipeline and OMR. Impacts to NV avoided in area.
85	VVP_0132		FFG	29.137	GPS806997		Realginment undertaken to avoid interfacing issues between pipeline and OMR. Impacts to NV avoided in area.
86	VVP_0132	NTGVVP	FFG	29.137	GPS806997		Realginment undertaken to avoid interfacing issues between pipeline and OMR. Impacts to NV avoided in area.

ID_Map	HH_EVC	EPBC	FFG	KP_IN	GISLink	Parcel ID	Details of mitigation method implemented and /or constraints constraints preventing further mitigation for each impacted area of native vegetation
87	VVP_0055_61		FFG	30.219	426092500		Realginment undertaken to avoid interfacing issues between pipeline and OMR. Impacts to NV avoided in area.
88	VVP_0132		FFG	31.505	1PS714688, 2PS714701, 4LP126752		Realginment undertaken to avoid interfacing issues pipeline and OMR. Pipeline moved from eastern boundary of OMR to western boundary to work in with DOT requirements. Construction corridor required in area to facilitate construction near drainage lines.
89	VVP_0132		FFG	32	MPS814703, 4LP126752, PPS814703		Realginment undertaken to avoid interfacing issues between pipeline and OMR. Impacts to NV avoided in area.
90	VVP_0132		FFG	32	MPS814703, PPS814703,		Potential area required for hydrostatic testing of pipeline.
91	VVP_0132		FFG	33.121	2TP215633, 1TP201330,		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction
92	VVP_0132	NTGVVP	FFG	33.993	29PP3100		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction

ID_Map	HH_EVC	EPBC	FFG	KP_IN	GISLink	Parcel ID	Details of mitigation method implemented and /or constraints constraints preventing further mitigation for each impacted area of native vegetation
93	VVP_0132		FFG	33.993	29PP3100		NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction
94	VVP_0132	NTGVVP	FFG	36.583	8LP136262		Area required to faciliate HDD stringing for Hume Fwy construction.
95	VVP_0132		FFG	38.512	2LP221466		Corridor narrowed to minmise impacts to NV
96	VVP_0649			40.167	2LP113763		HB proposed, area required to facilitate safe access and set up of bore.
97	VVP_0055_61		FFG	41.125	6TP394032	1TP332315 (Victorian Rail Track - North Eastern Line	HB proposed, area required to facilitate safe access and set up of bore.
98	VVP_0055_61		FFG	42.687	1TP709372	1TP709372	Construction corridor narrowed to avoid impacts to NV in area
99	VVP_0641			42.687	1TP709372, 2006PP3093, 2LP67181	1TP709372, 2006PP3093, 2LP67181	Construction corridor narrowed to minimise impacts to NV in area
100	VVP_0649			42.809	2LP67181		Minimum area required when working in close proximity to existing gas pipeline infrastructure. Existing APA easement utilised to faciliate construction in area.

ID_Map	HH_EVC	EPBC	FFG	KP_IN	GISLink	Parcel ID	Details of mitigation method implemented and /or constraints constraints preventing further mitigation for each impacted area of native vegetation
101	VVP_0649			42.809	2LP67181		Minimum area required when working in close proximity to existing gas pipeline infrastructure. Existing APA easement utilised to faciliate construction in area.
102	VVP_0132	NTGVVP	FFG	47.045	1LP38239		Minimum area required when working in close proximity to existing gas pipeline infrastructure. Existing APA easement utilised to faciliate construction in area.
103	VVP_0055_61	GEWVVP	FFG	50.716	2LP130336	2LP130336	Construction corridor reduced to minimise impacts to NV
104	VVP_0649			50.384	1TP710356		Construction corridor removed in area to avoid impacts to NV
105	VVP_0132	NTGVVP	FFG	8.325	2PS343496	2PS343496	NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction
106	VVP_0125			8.325	2PS343496	2PS343496	NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction
107	VVP_0132		FFG	8.325	2PS343496	2PS343496	NV patch located centrally in proposed corridor. Minimum corridor required for safe pipeline construction



Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
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N

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Western Outer Ring Main Gas Project

Native vegetation mapped with patch ID

Project No. 12529997
Revision No. C
Date 05/03/2021

FIGURE 0.1

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Native vegetation mapped with patch ID

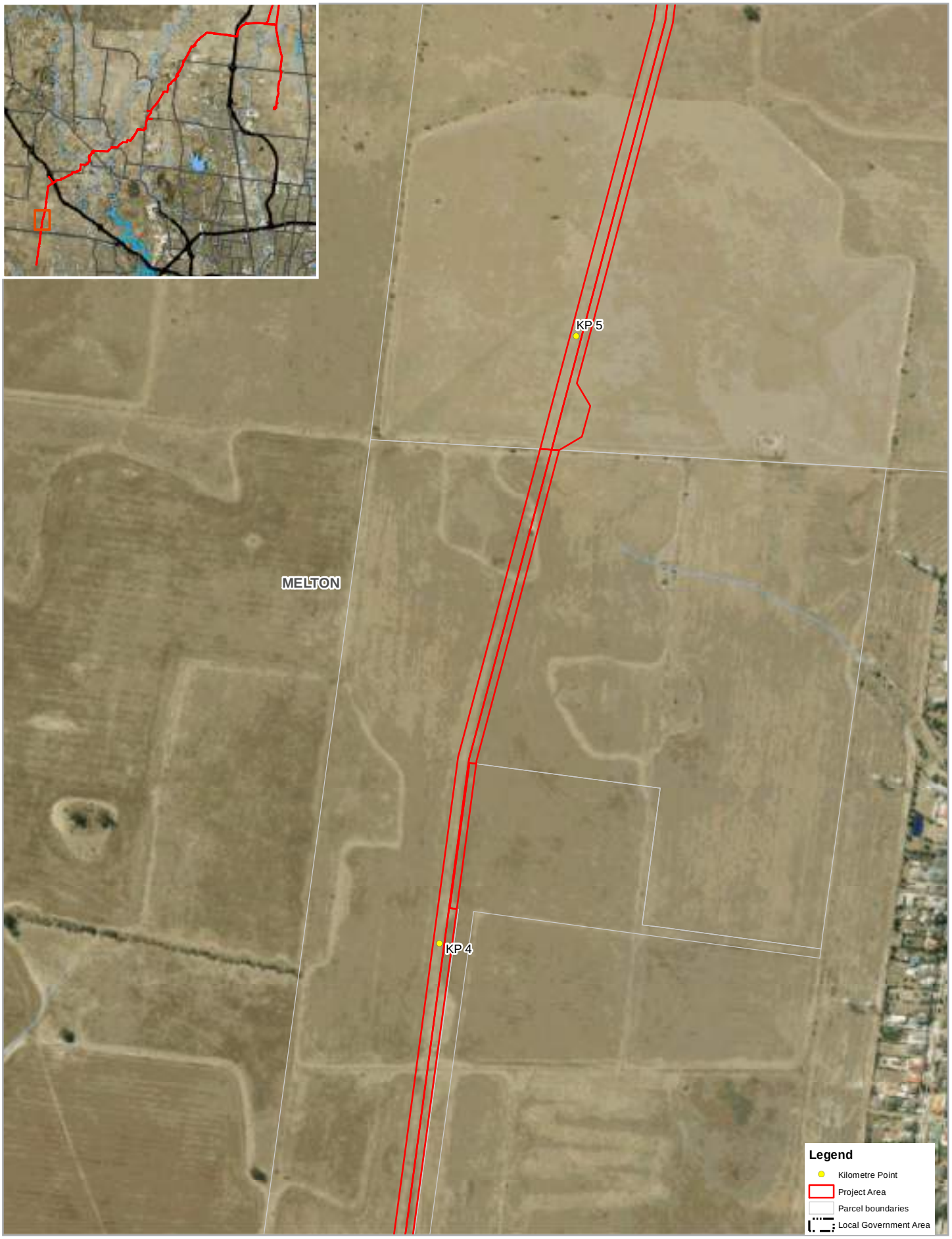
Project No. 12529997
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FIGURE 0.2

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FIGURE 0.3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Native vegetation mapped with patch ID

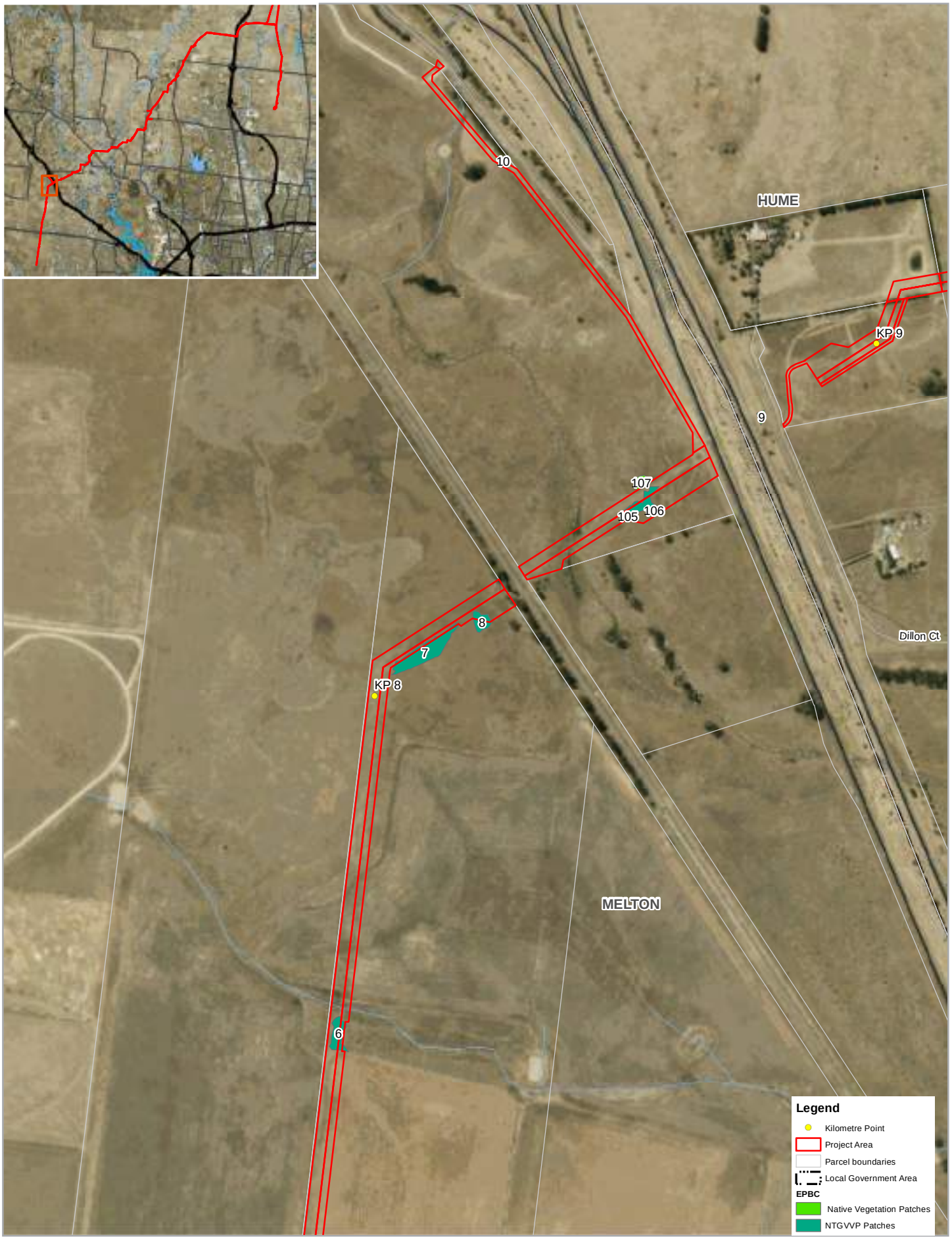
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FIGURE 0.4

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Native vegetation mapped with patch ID

Project No. 12529997
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FIGURE 0.5

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FIGURE 0.6

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Meters

Map Projection: Transverse Mercator
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Native vegetation mapped with patch ID

Project No. 12529997
Revision No. C
Date 05/03/2021

FIGURE 0.7

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Grid: GDA 1994 MGA Zone 55

N

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Native vegetation mapped with patch ID

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FIGURE 0.8

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Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Native vegetation mapped with patch ID

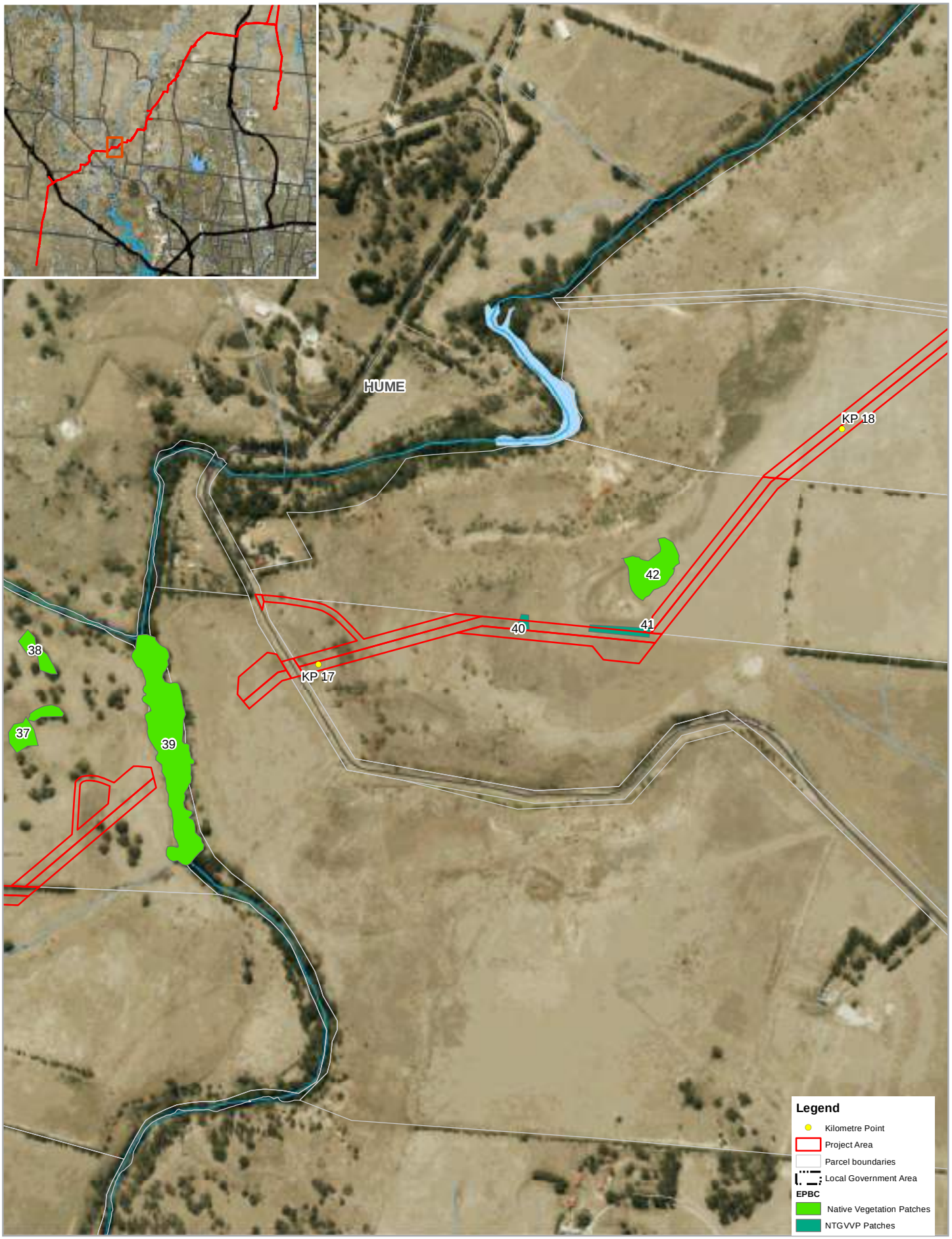
Project No.	12529997
Revision No.	C
Date	05/03/2021

FIGURE 0.9

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N

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Western Outer Ring Main Gas Project

Native vegetation mapped with patch ID

Project No. 12529997
Revision No. C
Date 05/03/2021

FIGURE 0.10

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Native vegetation mapped with patch ID

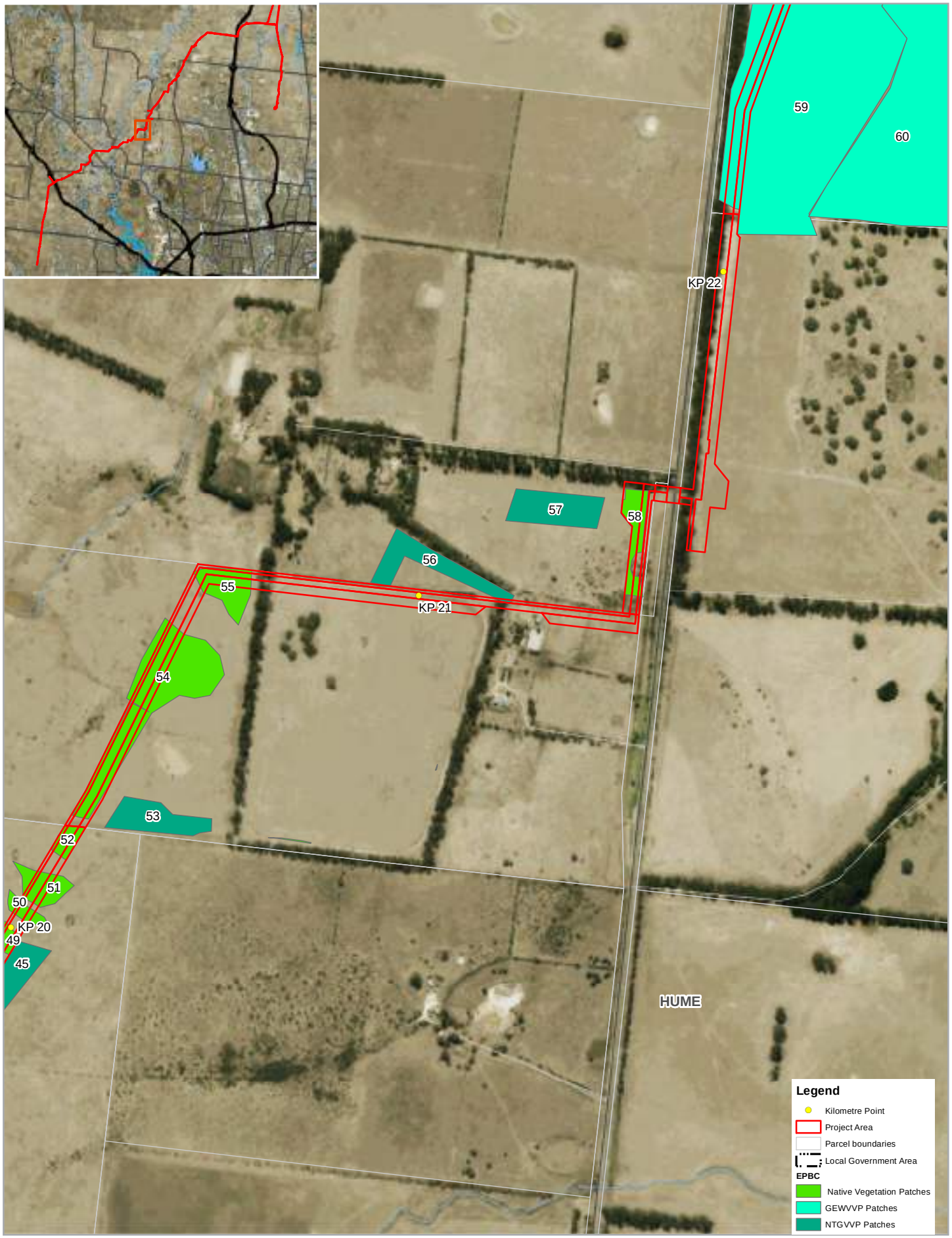
Project No. 12529997
Revision No. C
Date 05/03/2021

FIGURE 0.11

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Western Outer Ring Main Gas Project

Native vegetation mapped with patch ID

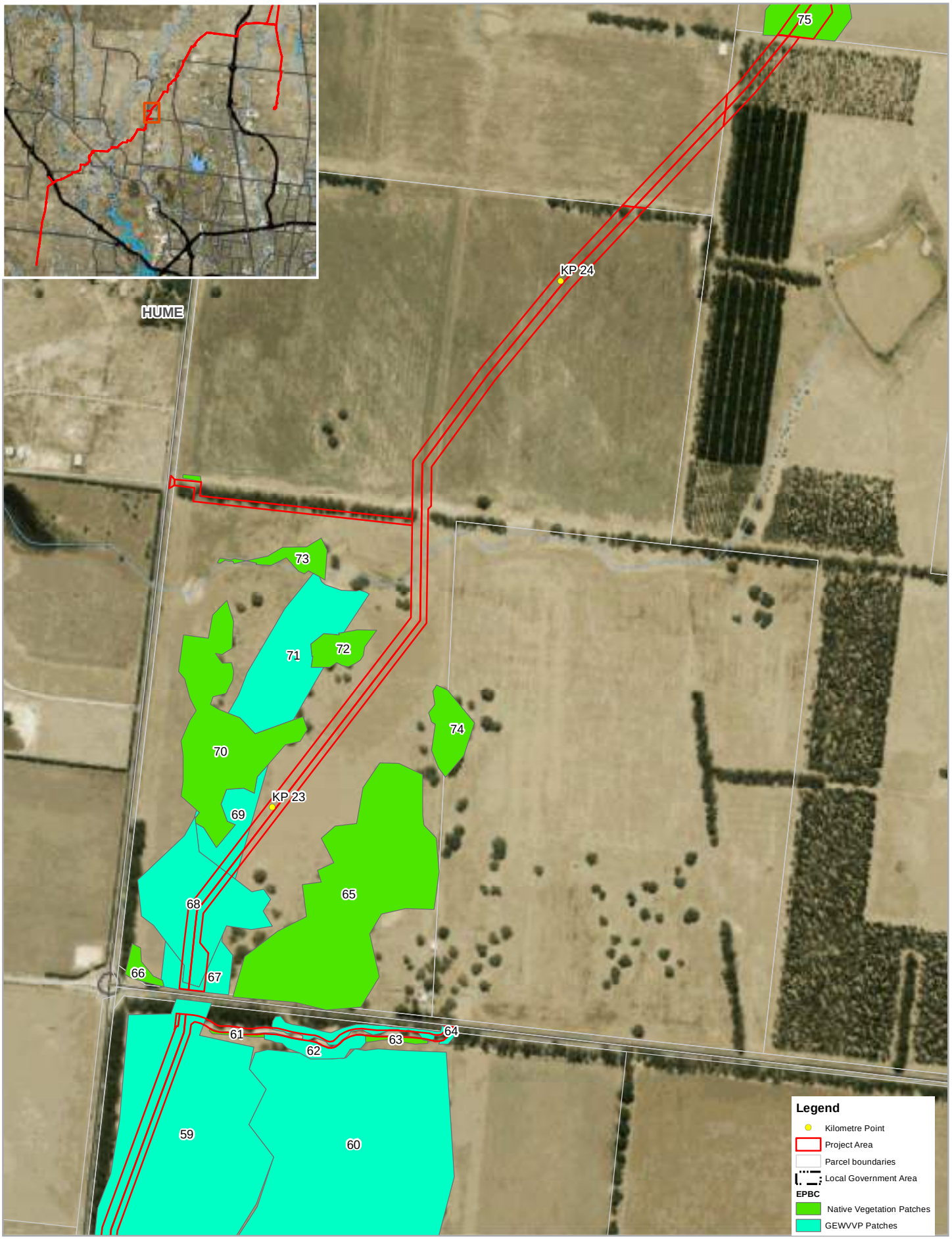
Project No. 12529997
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FIGURE 0.12

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Native vegetation mapped with patch ID

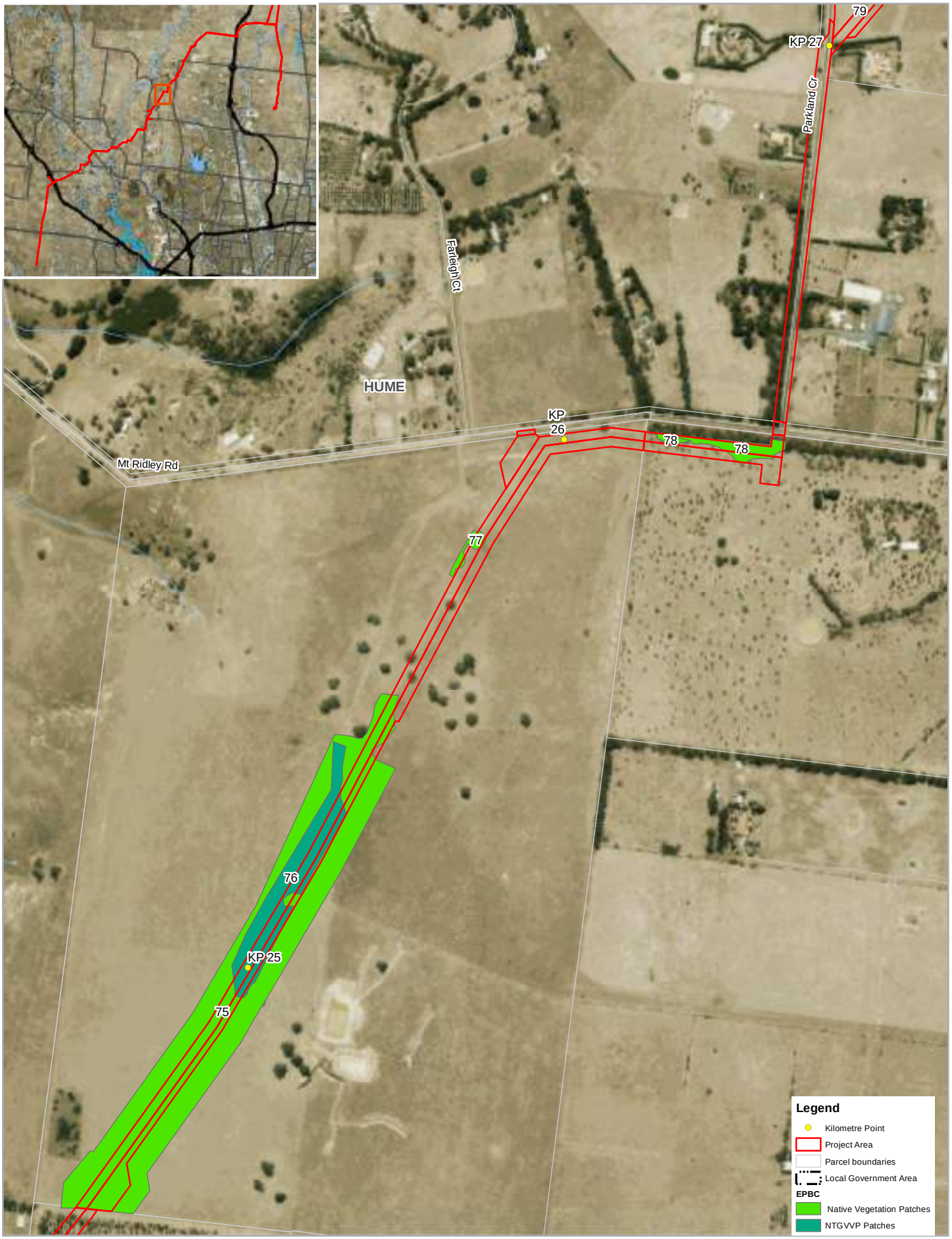
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FIGURE 0.13

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Meters

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Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Native vegetation mapped with patch ID

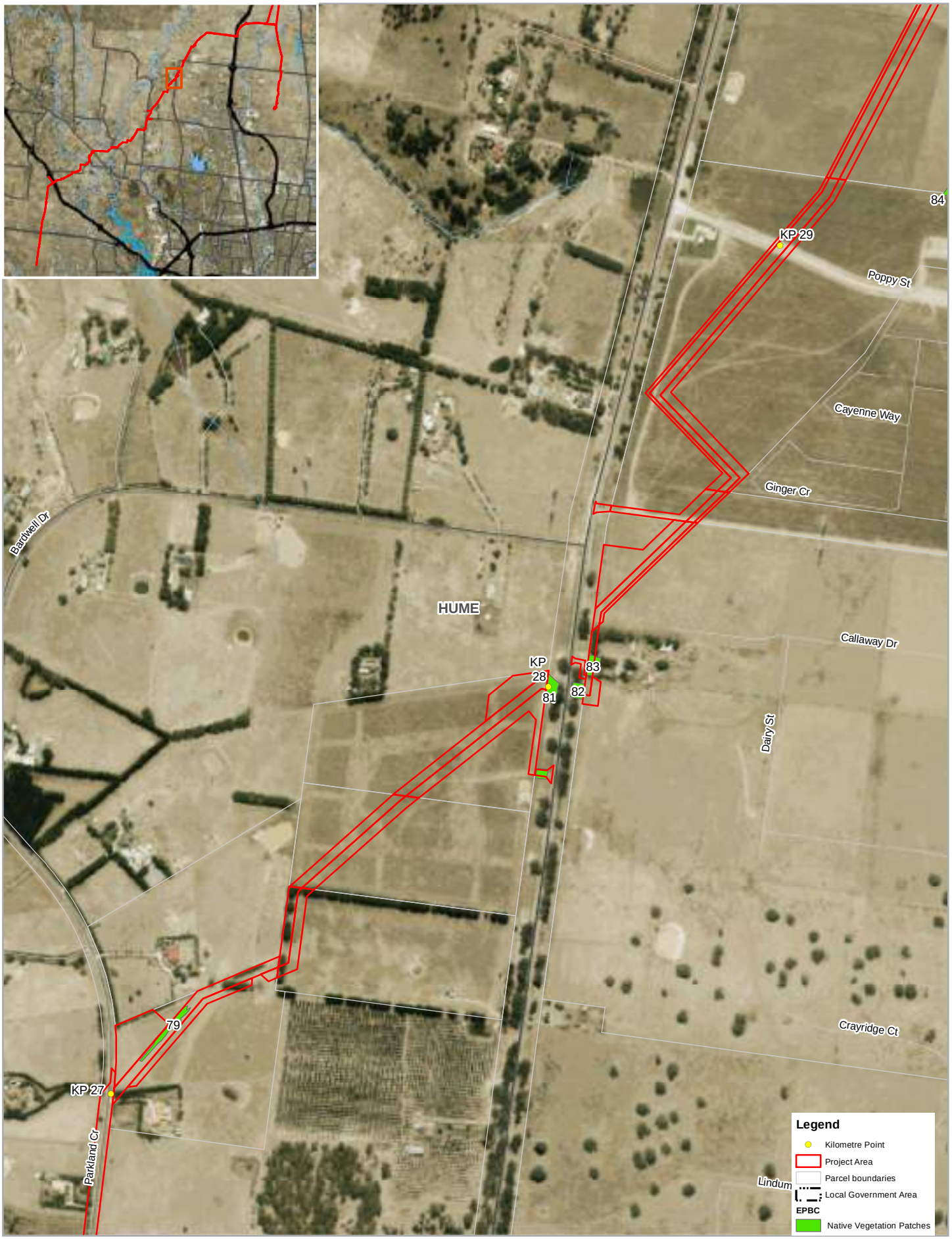
Project No. 12529997
Revision No. C
Date 05/03/2021

FIGURE 0.14

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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N

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Native vegetation mapped with patch ID

Project No. 12529997
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Date 05/03/2021

FIGURE 0.15

\\ghdnet\ghd\A U\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\000_12529997_Native_Vegetation_Mapped_Parcels_ID_MB_A4P_revC_rev8.mxd
Print date: 05 Mar 2021 - 11:06

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped with patch ID

Project No. 12529997
Revision No. C
Date 05/03/2021

FIGURE 0.16

\\ghdnet\ghd\AU\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\000_12529997_Native_Vegetation_Mapped_Parcels_ID_MB_A4P_revC_rev8.mxd
Print date: 05 Mar 2021 - 11:06

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped with patch ID

Project No. 12529997
Revision No. C
Date 05/03/2021

FIGURE 0.17

\\ghdnet\ghd\A U\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\000_12529997_Native_Vegetation_Mapped_Parcels_ID_MB_A4P_revC_rev8.mxd
Print date: 05 Mar 2021 - 11:06

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped with patch ID

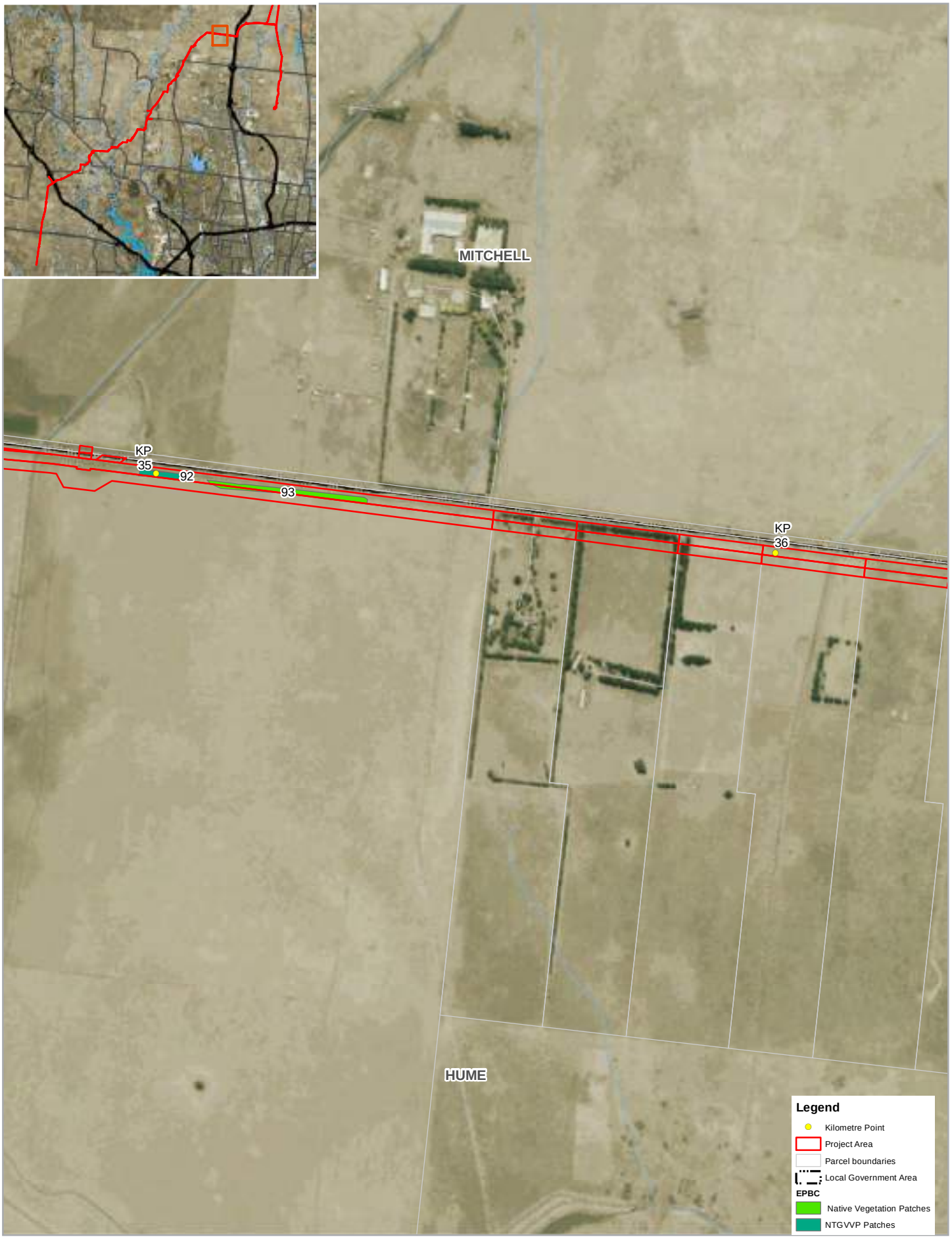
Project No. 12529997
Revision No. C
Date 05/03/2021

FIGURE 0.18

\\ghdnet\ghd\A U\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\000_12529997_Native_Vegetation_Mapped_Parcels_ID_MB_A4P_revC_rev8.mxd
Print date: 05 Mar 2021 - 11:06

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped with patch ID

Project No. 12529997
Revision No. C
Date 05/03/2021

FIGURE 0.19

\\ghdnet\ghd\AU\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\000_12529997_Native_Vegetation_Mapped_Parcels_ID_MB_A4P_revC_rev8.mxd
Print date: 05 Mar 2021 - 11:07

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped with patch ID

Project No. 12529997
Revision No. C
Date 05/03/2021

FIGURE 0.20

\\ghdnet\ghd\AU\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\000_12529997_Native_Vegetation_Mapped_Parcels_ID_MB_A4P_revC_rev8.mxd
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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Western Outer Ring Main Gas Project

Native vegetation mapped with patch ID

Project No. 12529997
Revision No. C
Date 05/03/2021

FIGURE 0.21

\\ghdnet\ghd\AU\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\000_12529997_Native_Vegetation_Mapped_Parcels_ID_MB_A4P_revC_rev8.mxd
Print date: 05 Mar 2021 - 11:07

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped with patch ID

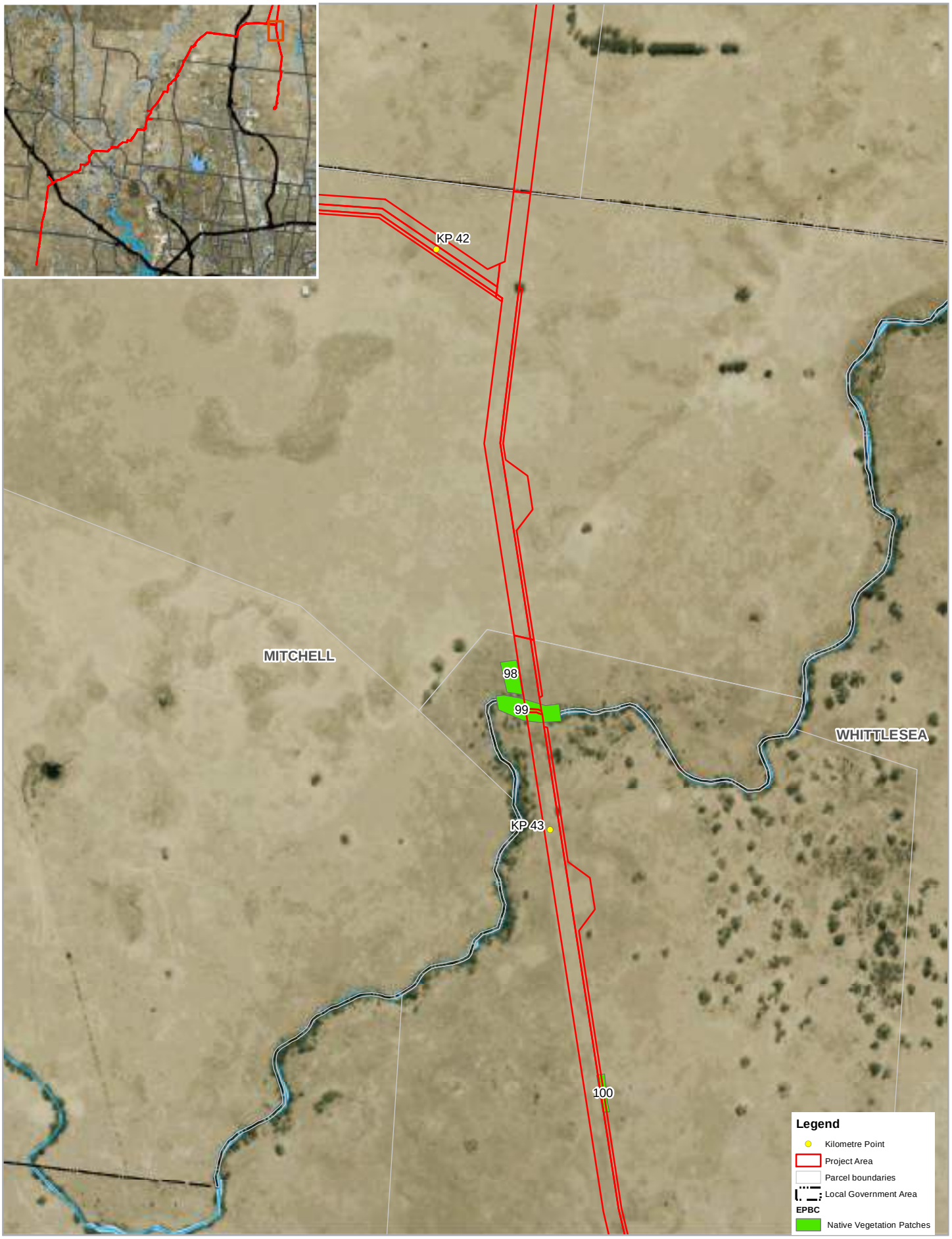
Project No.	12529997
Revision No.	C
Date	05/03/2021

FIGURE 0.22

\\ghdnet\ghd\AU\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\000_12529997_Native_Vegetation_Mapped_Parcels_ID_MB_A4P_revC_rev8.mxd
Print date: 05 Mar 2021 - 11:07

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Western Outer Ring Main Gas Project

Native vegetation mapped with patch ID

Project No. 12529997
Revision No. C
Date 05/03/2021

FIGURE 0.23

\\ghdnet\ghd\A U\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\000_12529997_Native_Vegetation_Mapped_Parcels_ID_MB_A4P_revC_rev8.mxd
Print date: 05 Mar 2021 - 11:07

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped with patch ID

Project No. 12529997
Revision No. C
Date 05/03/2021

FIGURE 0.24

\\ghdnet\ghd\A U\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\000_12529997_Native_Vegetation_Mapped_Parcels_ID_MB_A4P_revC_rev8.mxd
Print date: 05 Mar 2021 - 11:08

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped with patch ID

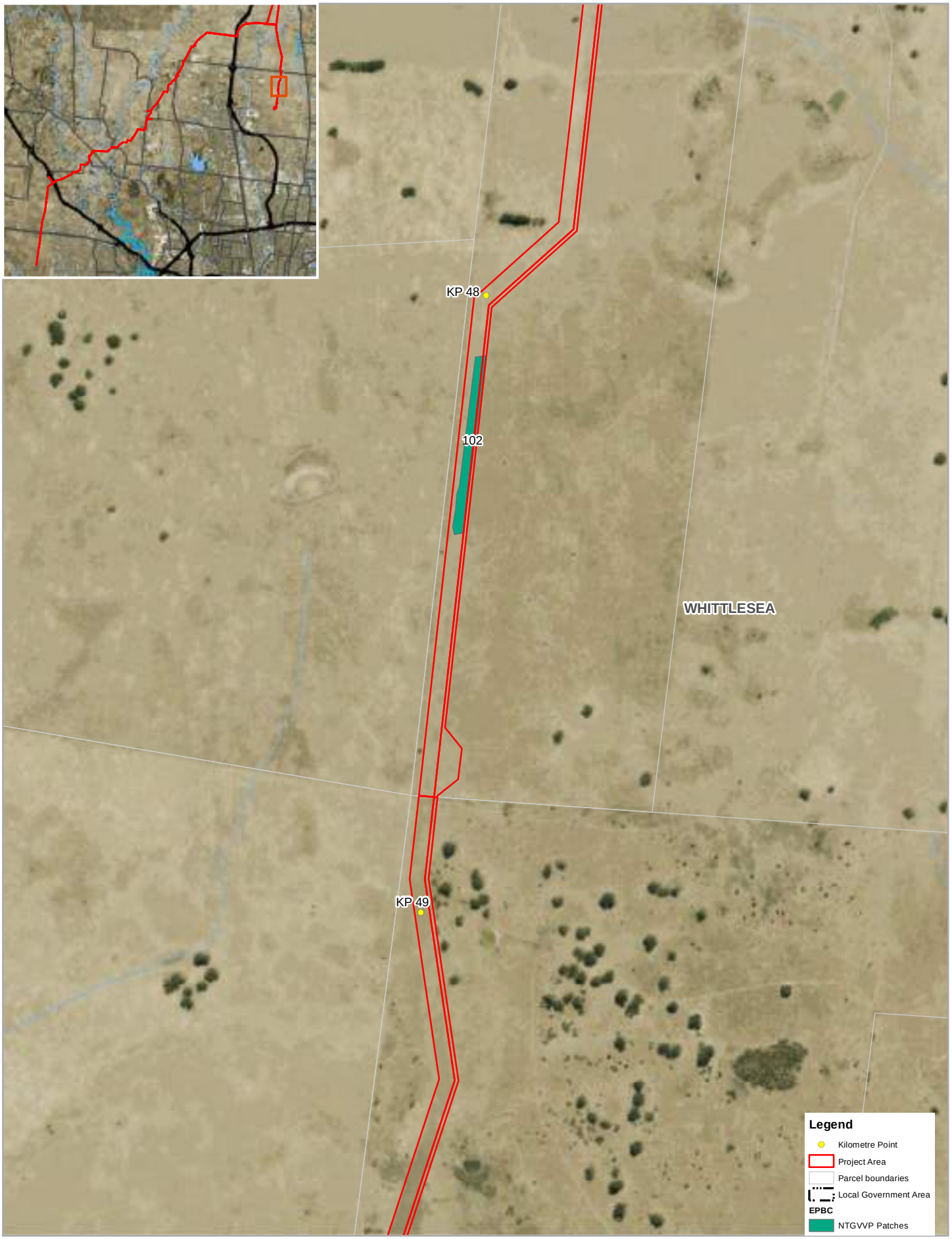
Project No. 12529997
Revision No. C
Date 05/03/2021

FIGURE 0.25

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Print date: 05 Mar 2021 - 11:08

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped with patch ID

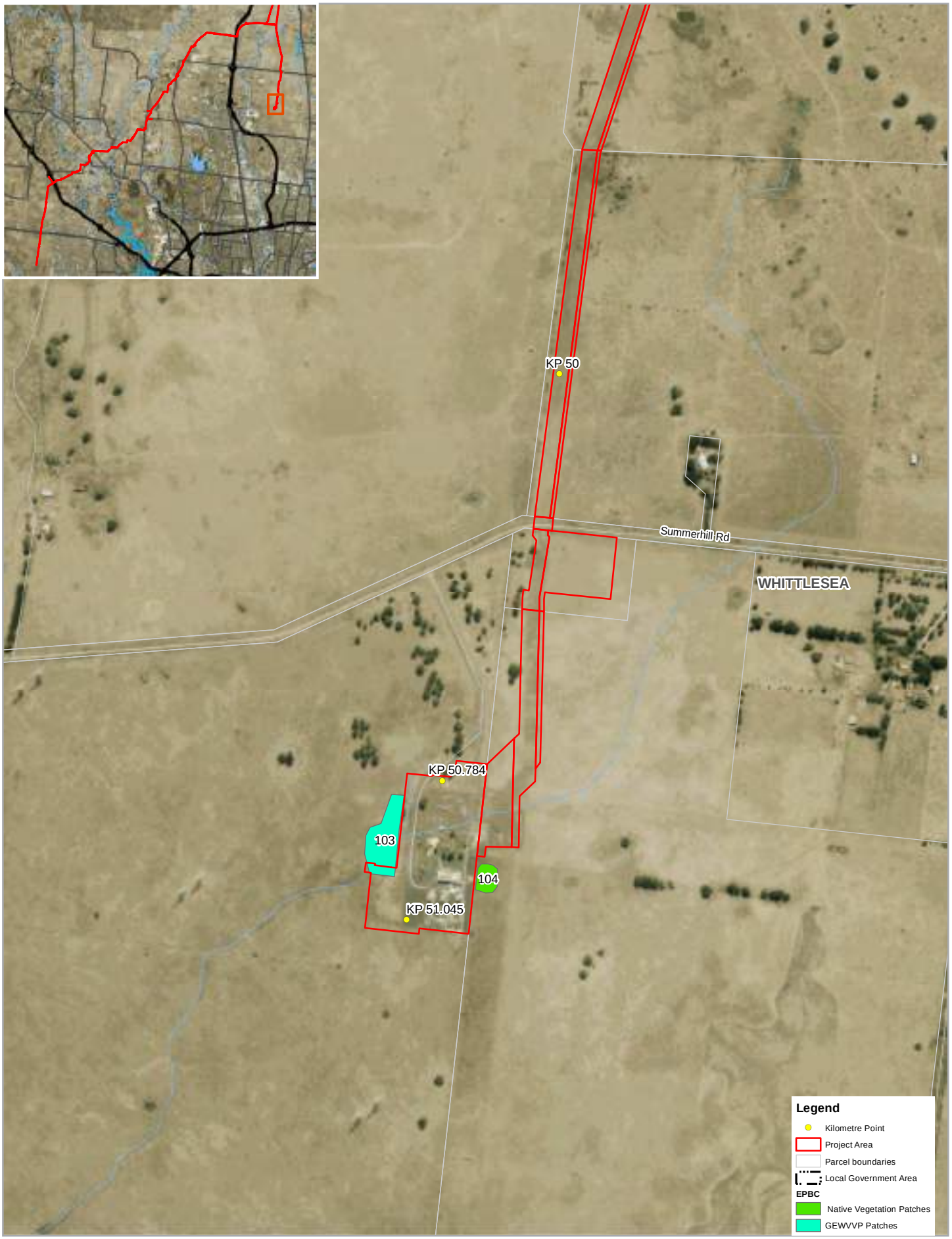
Project No. 12529997
Revision No. C
Date 05/03/2021

FIGURE 0.26

\\ghdnet\ghd\AU\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\000_12529997_Native_Vegetation_Mapped_Parcels_ID_MB_A4P_revC_rev8.mxd
Print date: 05 Mar 2021 - 11:08

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Western Outer Ring Main Gas Project

Native vegetation mapped with patch ID

Project No. 12529997
Revision No. C
Date 05/03/2021

FIGURE 0.27

\\ghdnet\ghd\AU\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\000_12529997_Native_Vegetation_Mapped_Parcels_ID_MB_A4P_revC_rev8.mxd
Print date: 05 Mar 2021 - 11:08

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Appendix EE – Vegetation mapping recorded throughout all surveys GHD and Biosis



Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.1

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Western Outer Ring Main Gas Project

Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.2

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

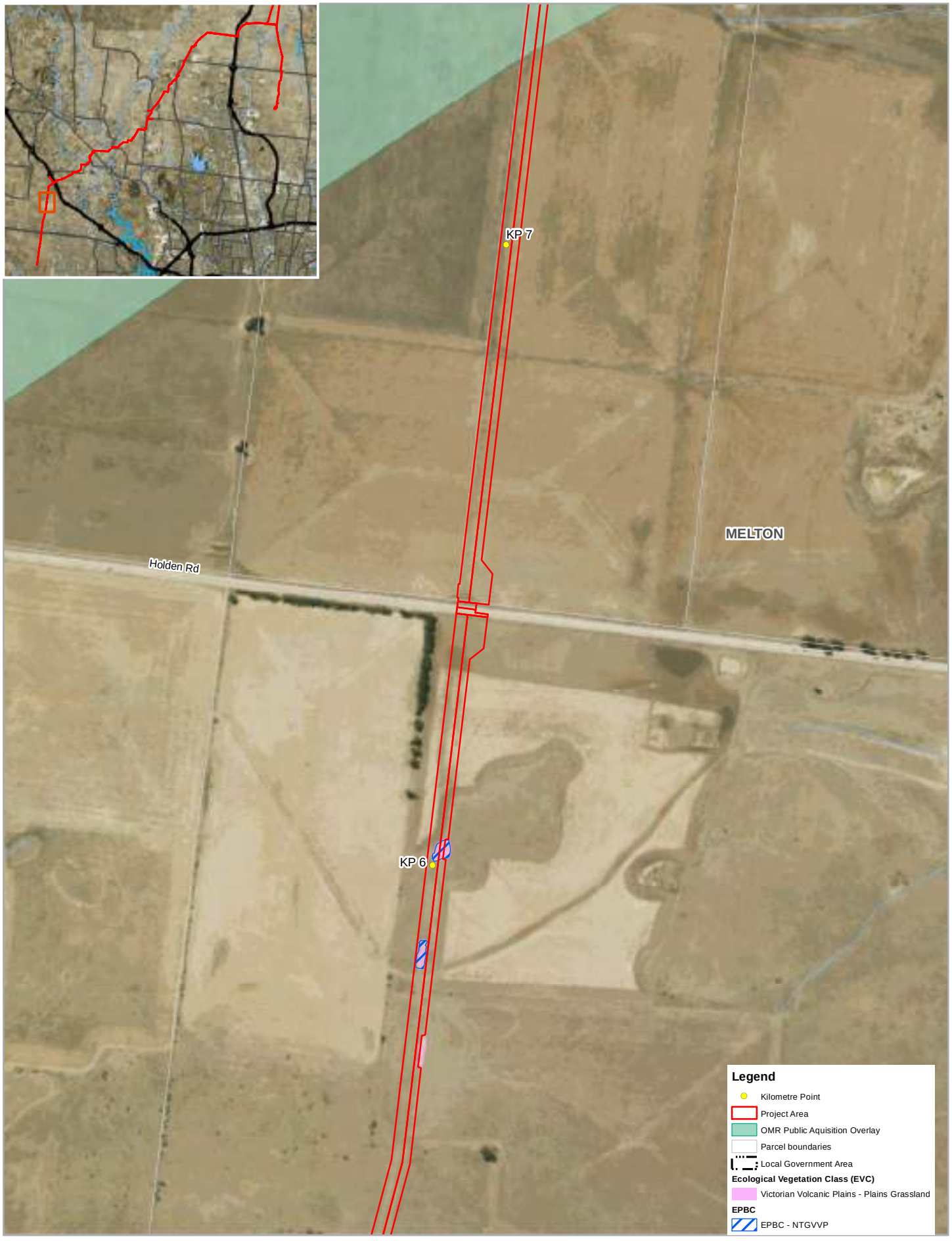
Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.3

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

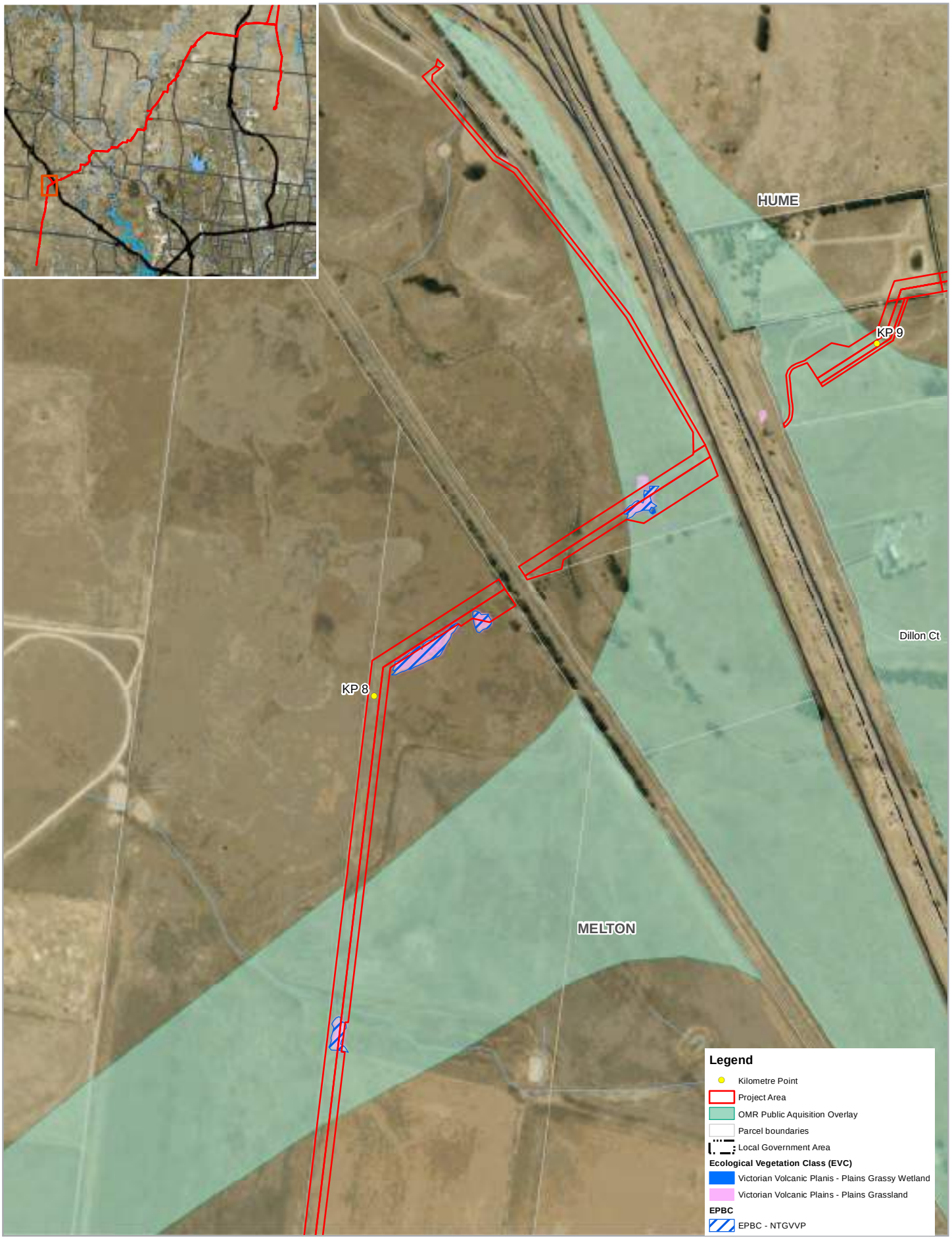
Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.4

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

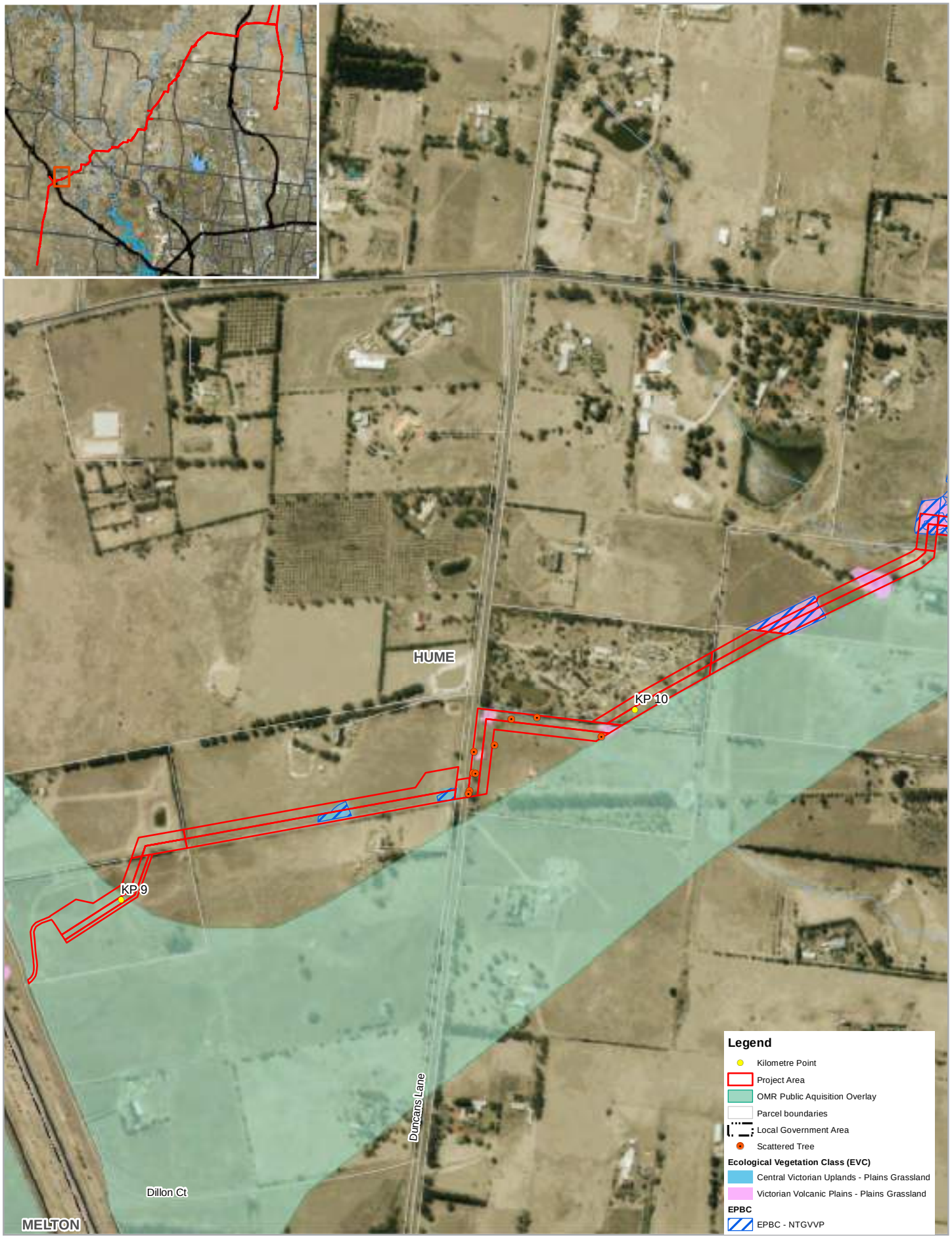
Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.5

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

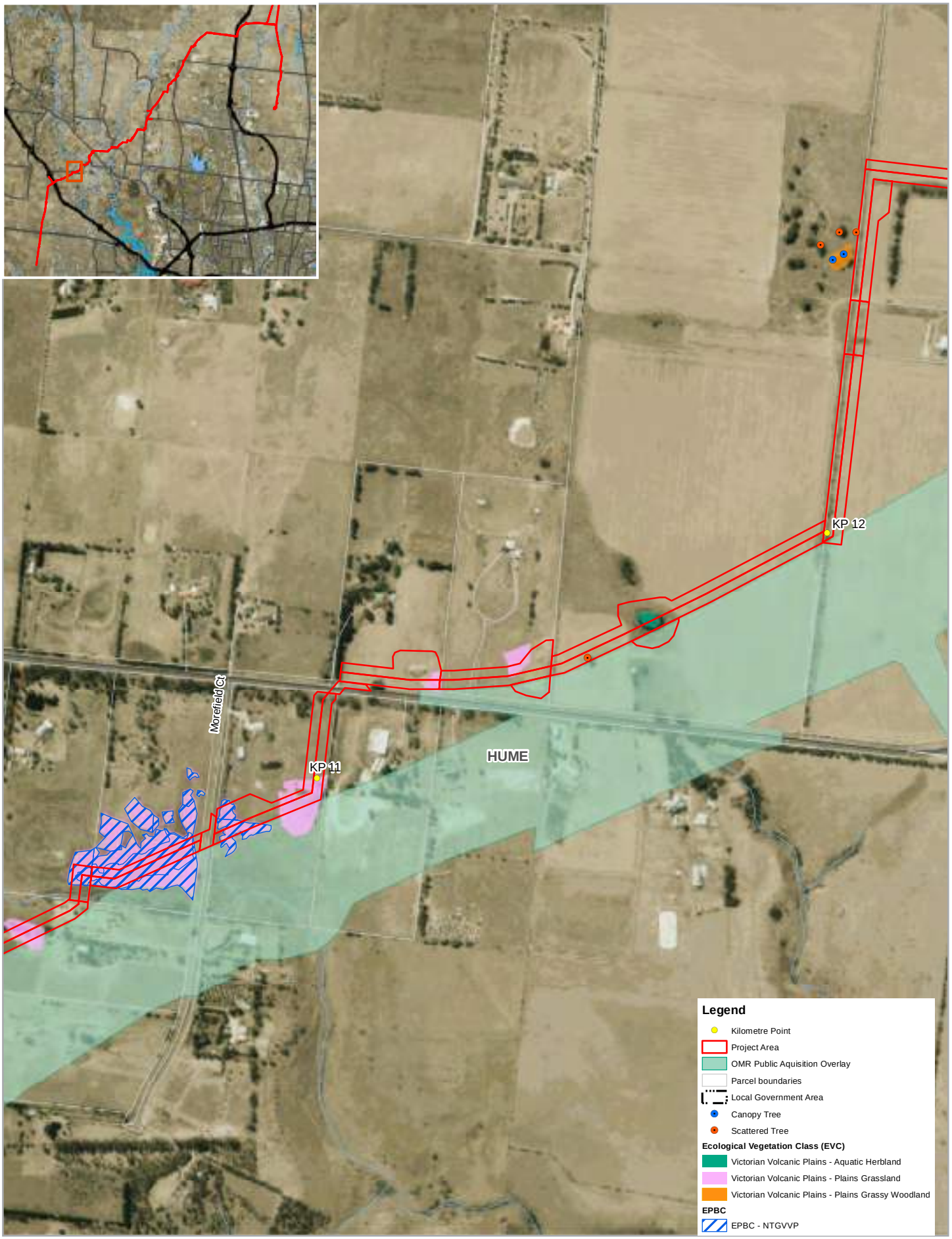
Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.6

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

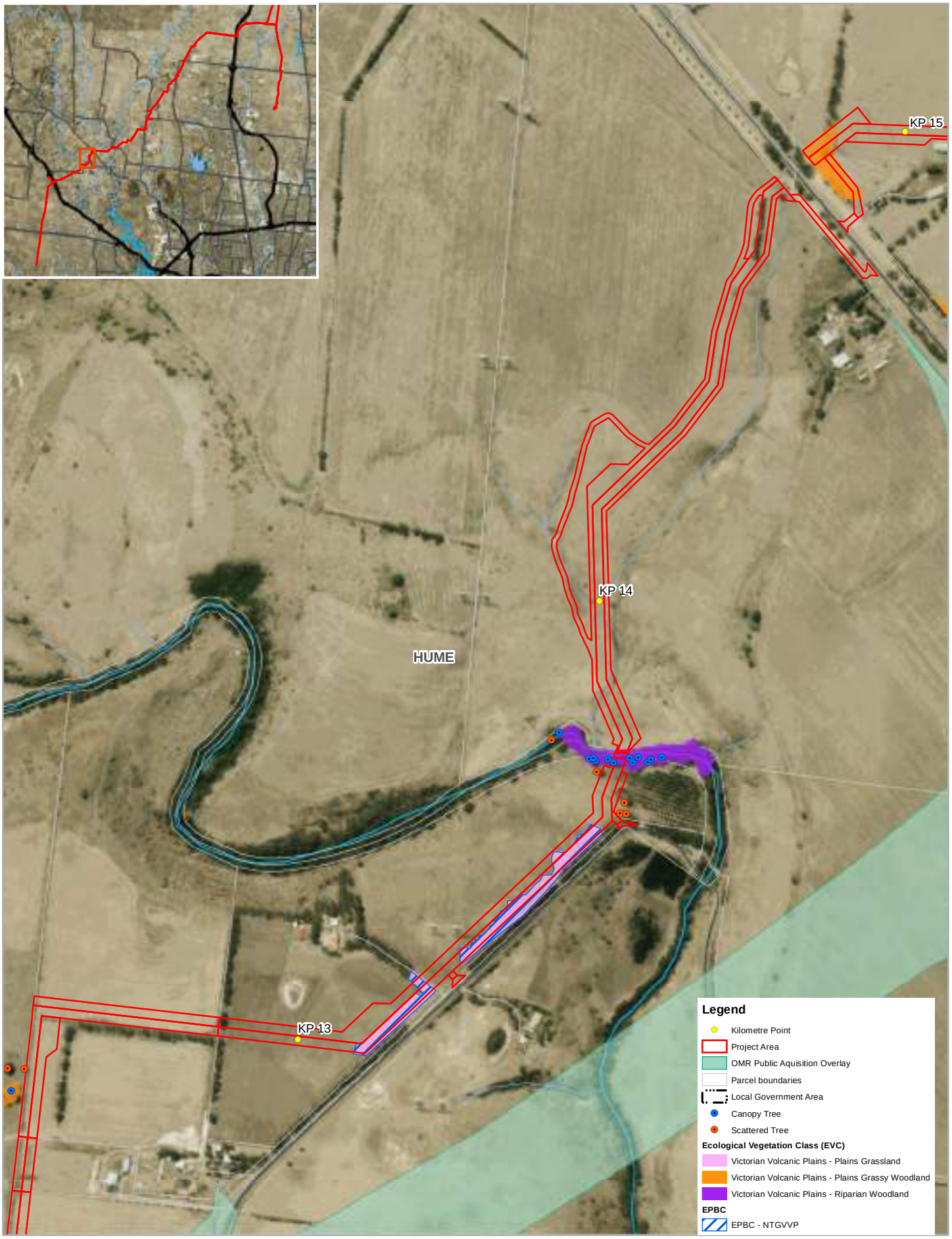
Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.7

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

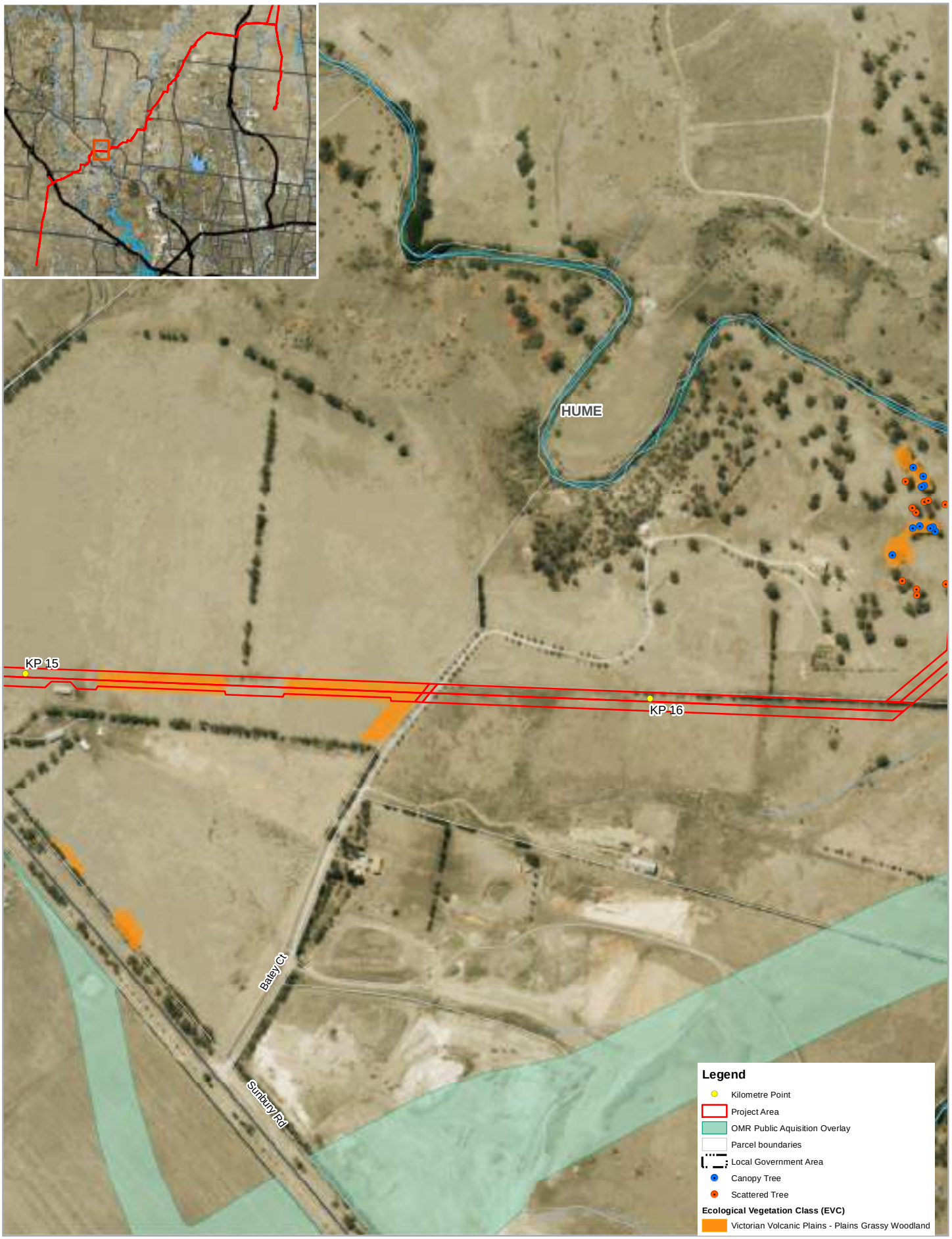
Native vegetation mapped within study area

Project No. 12529997
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FIGURE 7.8

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

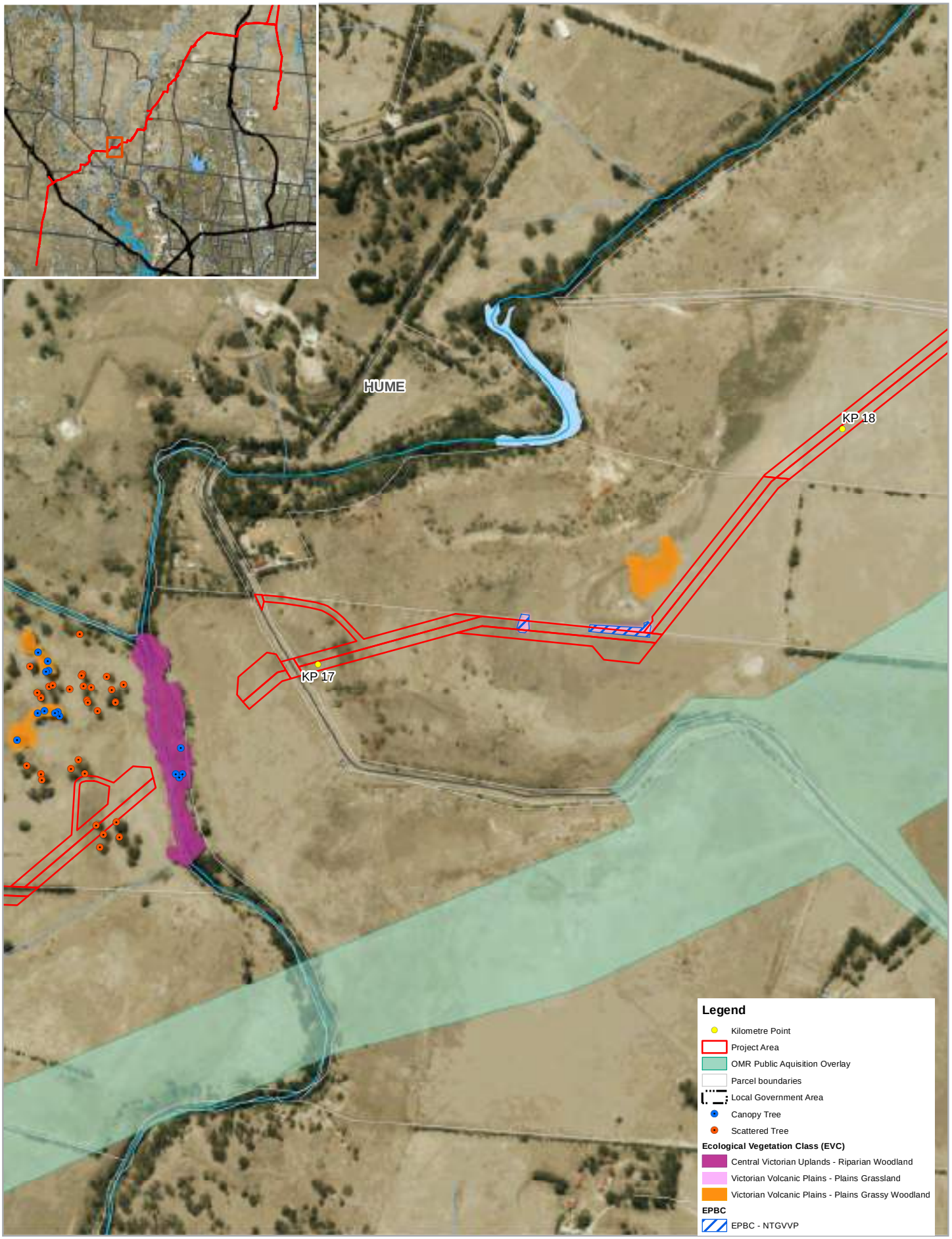
Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.9

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

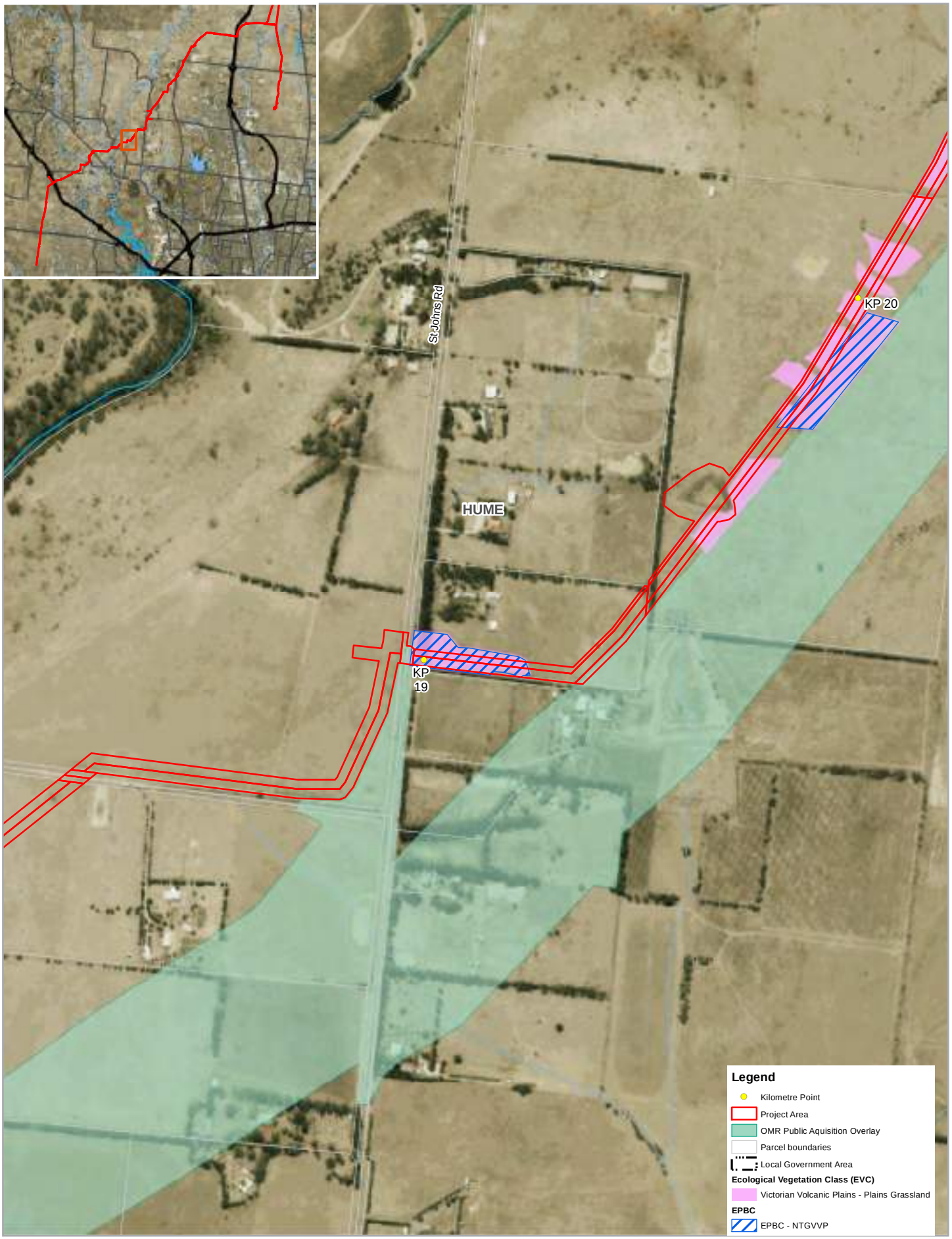
Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.10

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

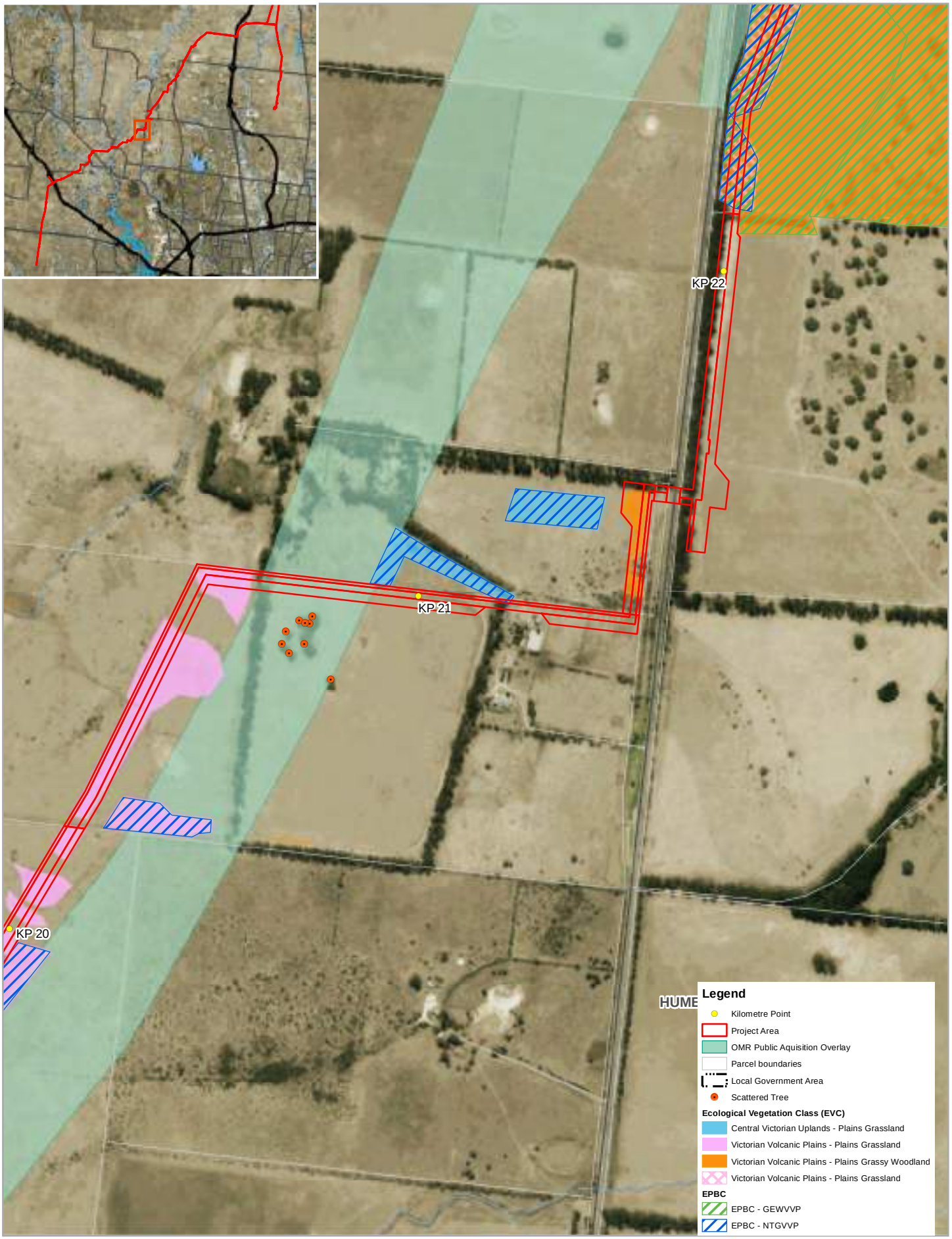
Native vegetation mapped within study area

Project No. 12529997
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FIGURE 7.11

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

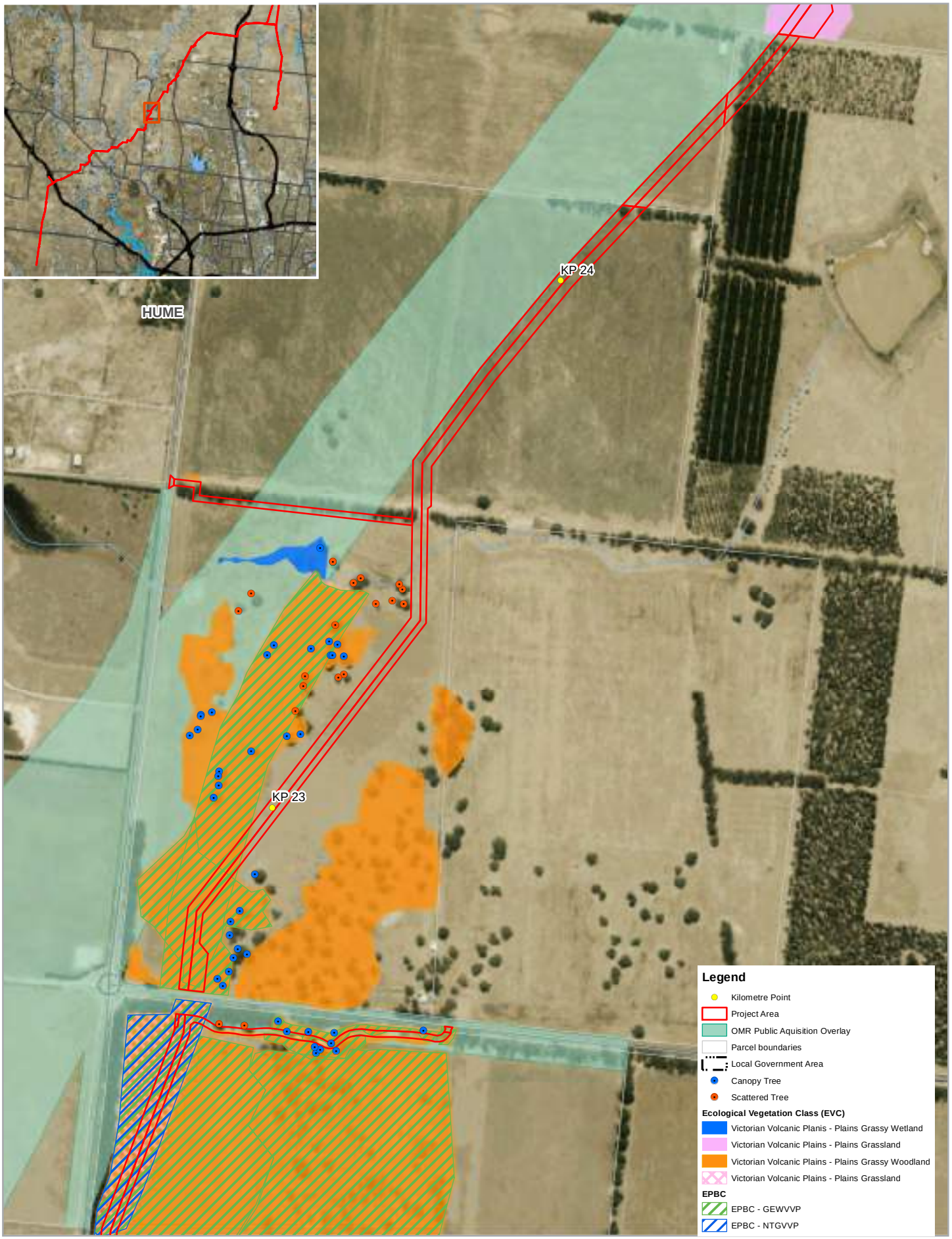
Native vegetation mapped within study area

Project No. 12529997
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FIGURE 7.12

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

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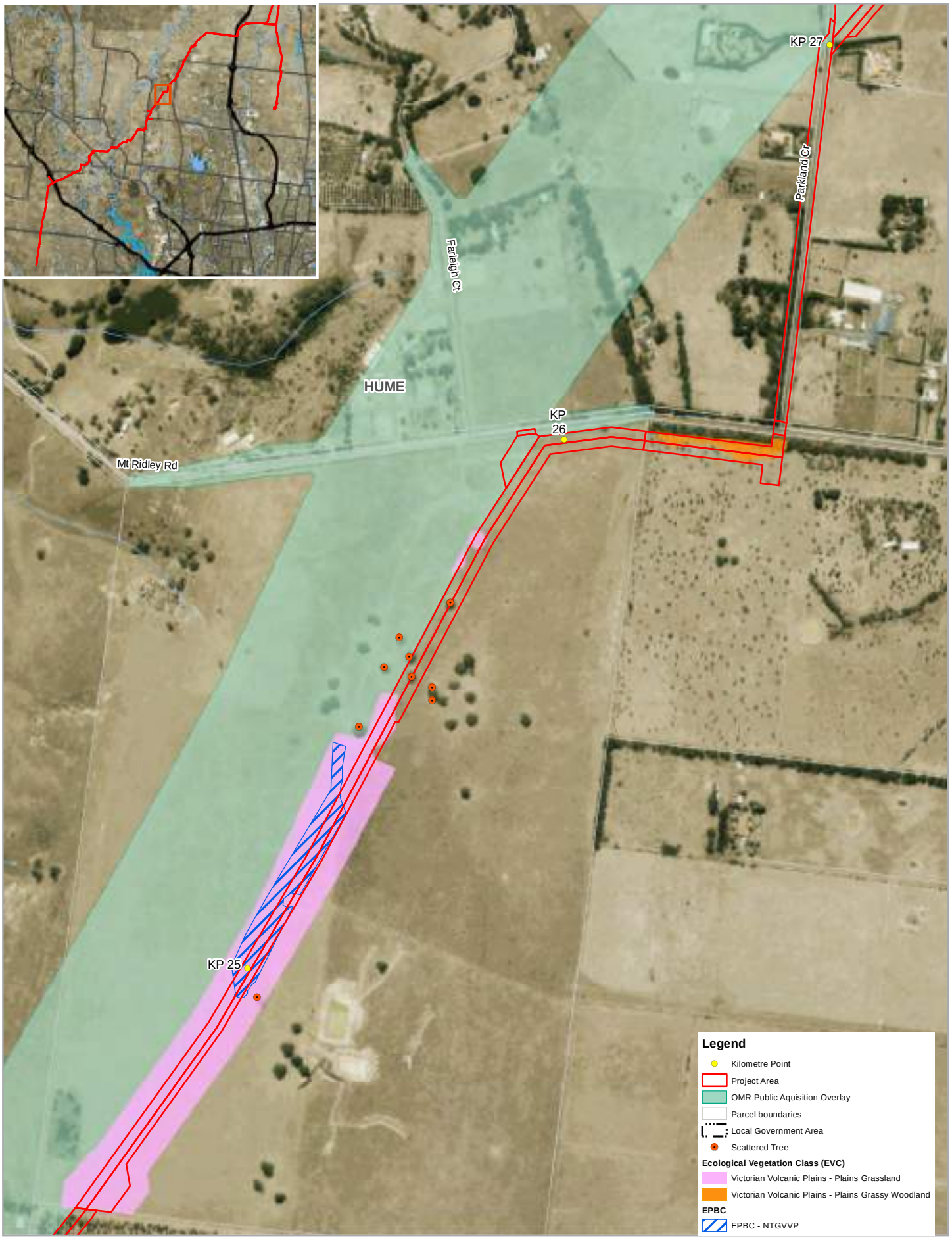
Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.13

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
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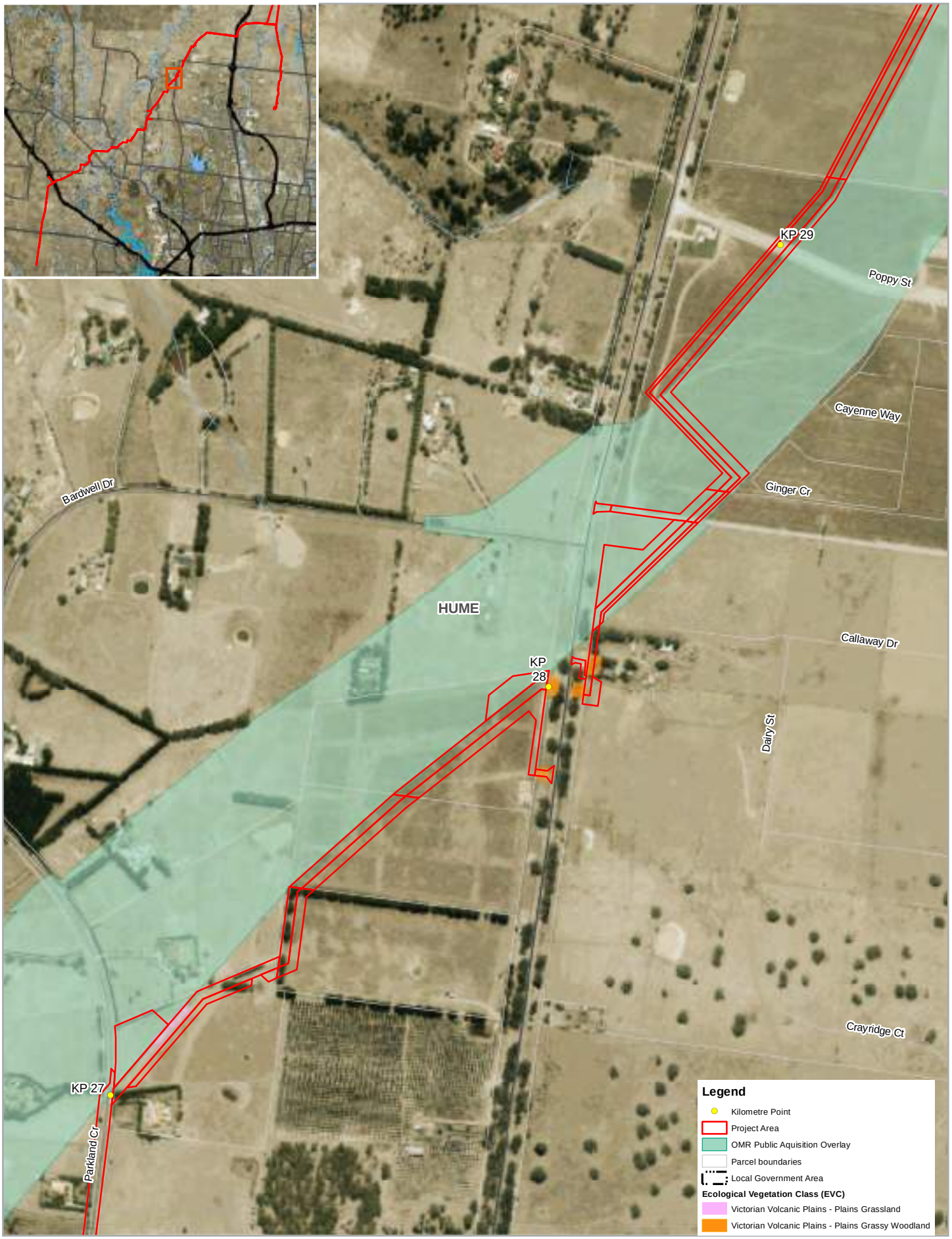
Native vegetation mapped within study area

Project No. 12529997
Revision No. D
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FIGURE 7.14

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

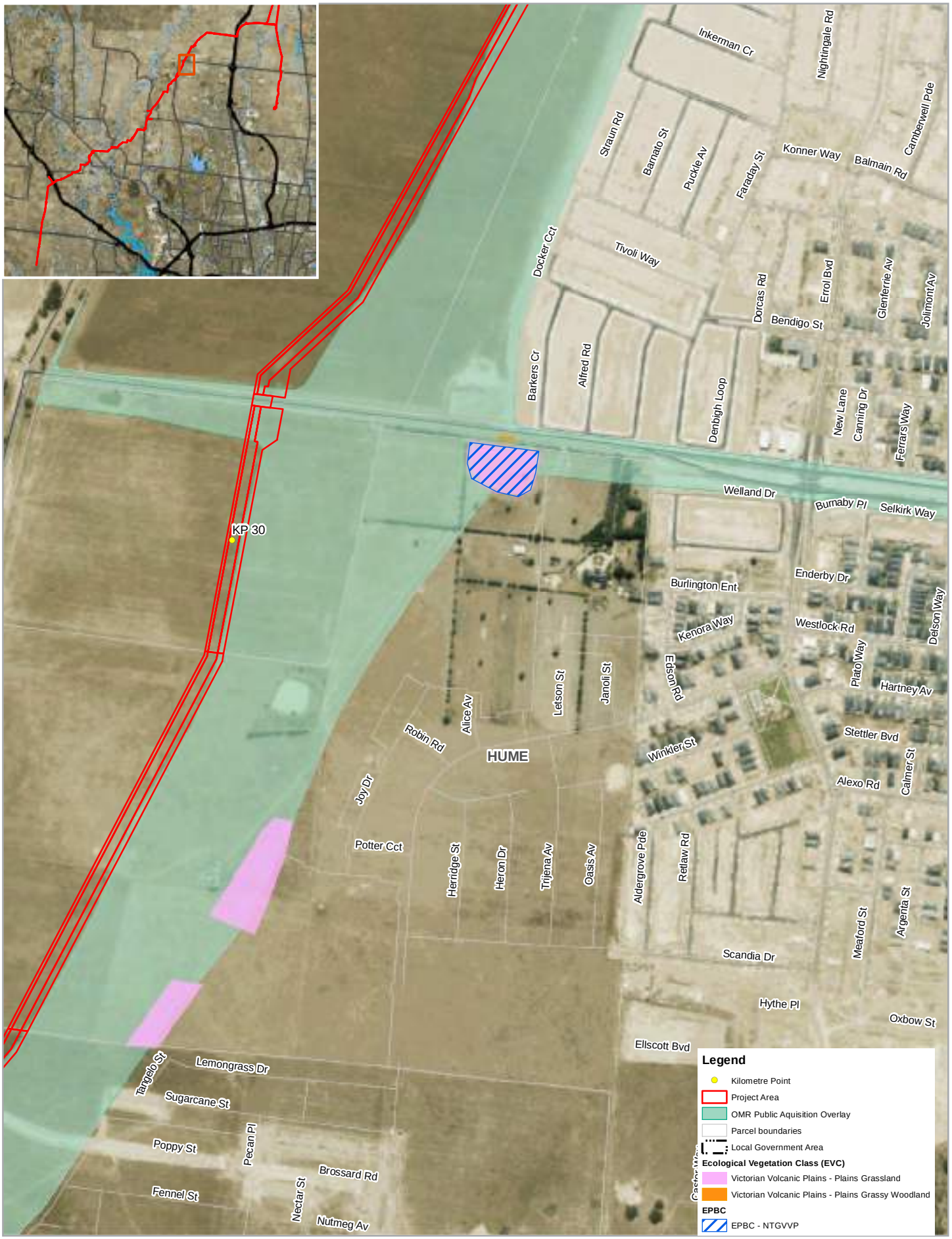
Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.15

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

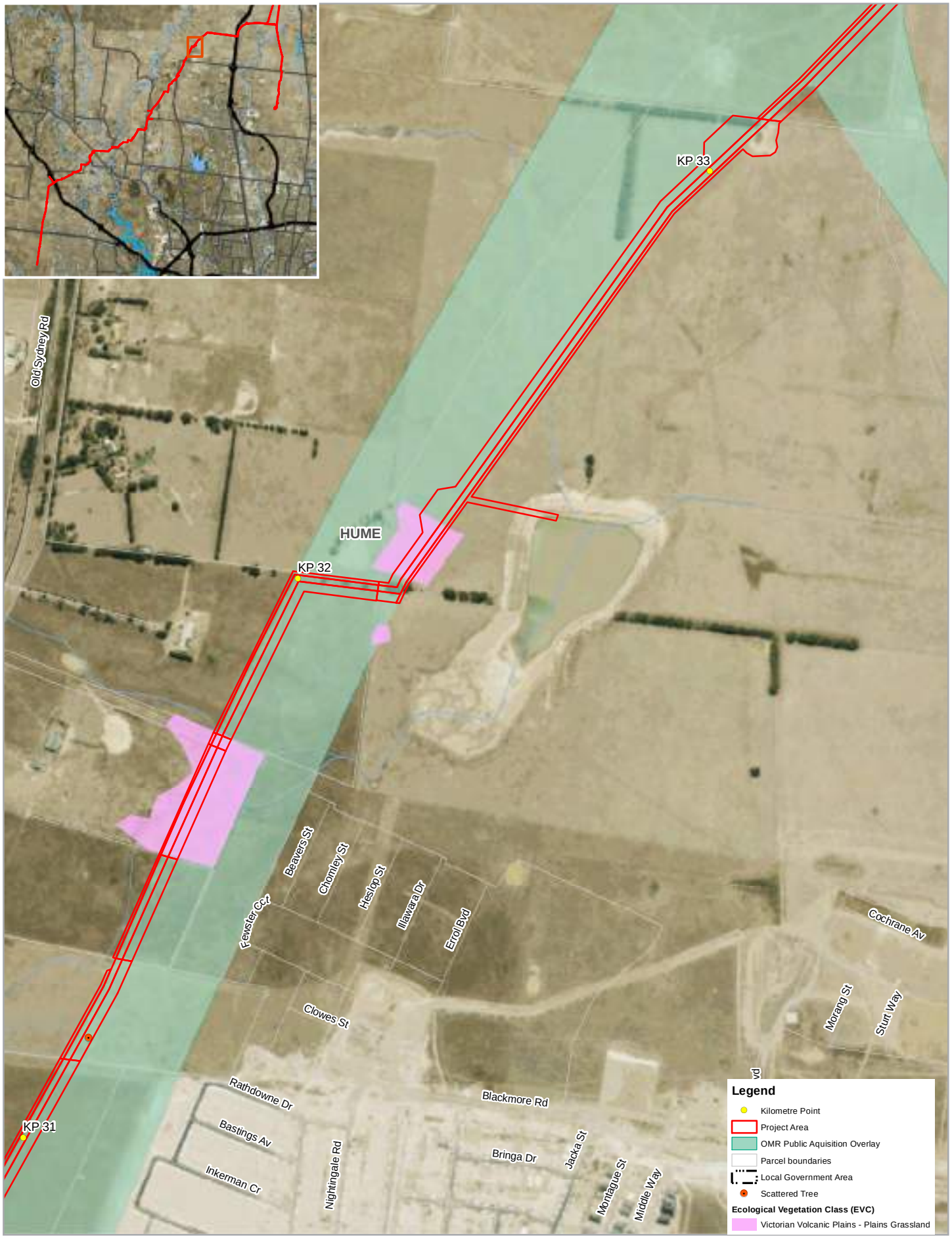
Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.16

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

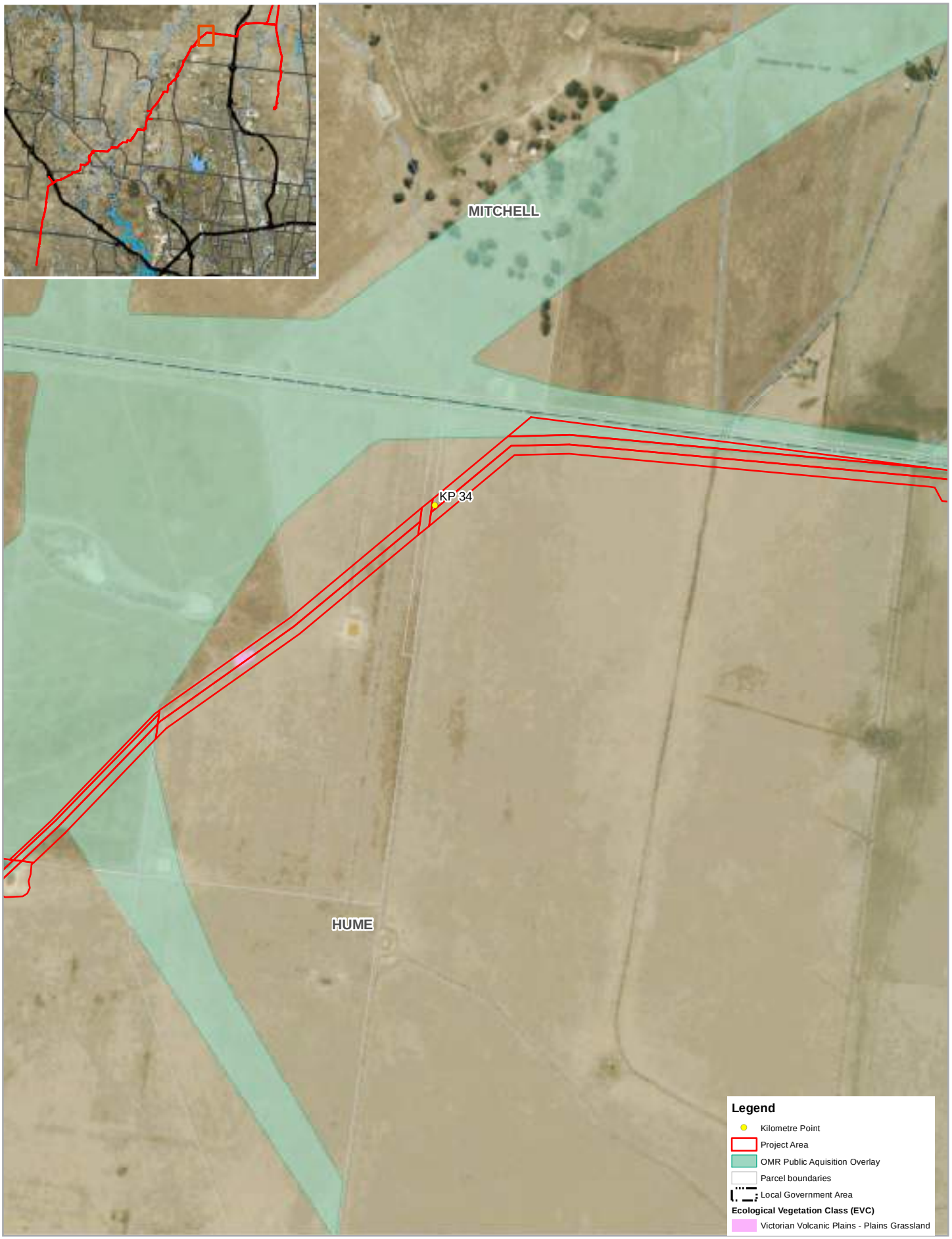
Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.17

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Western Outer Ring Main Gas Project

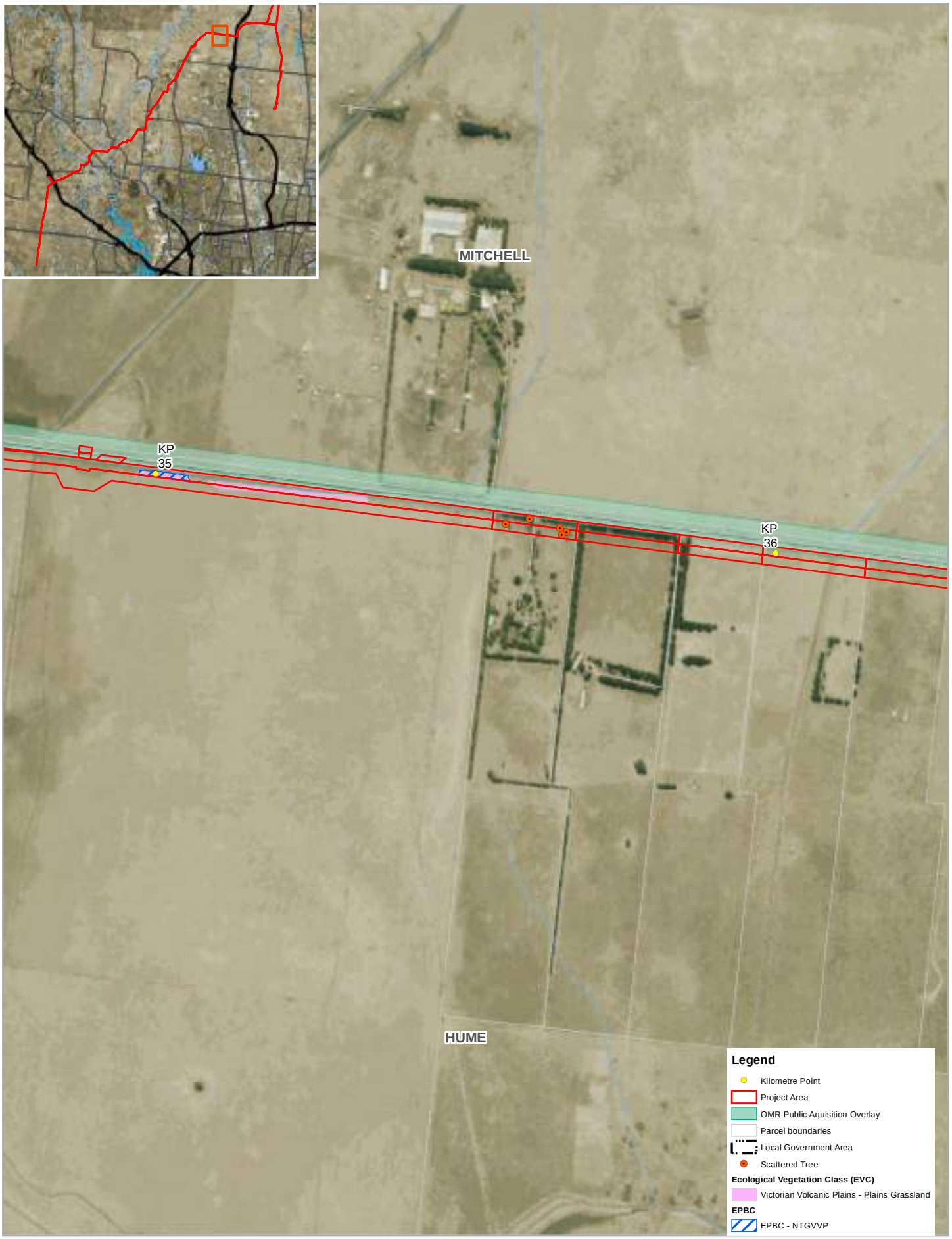
Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.18

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.19

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.20

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
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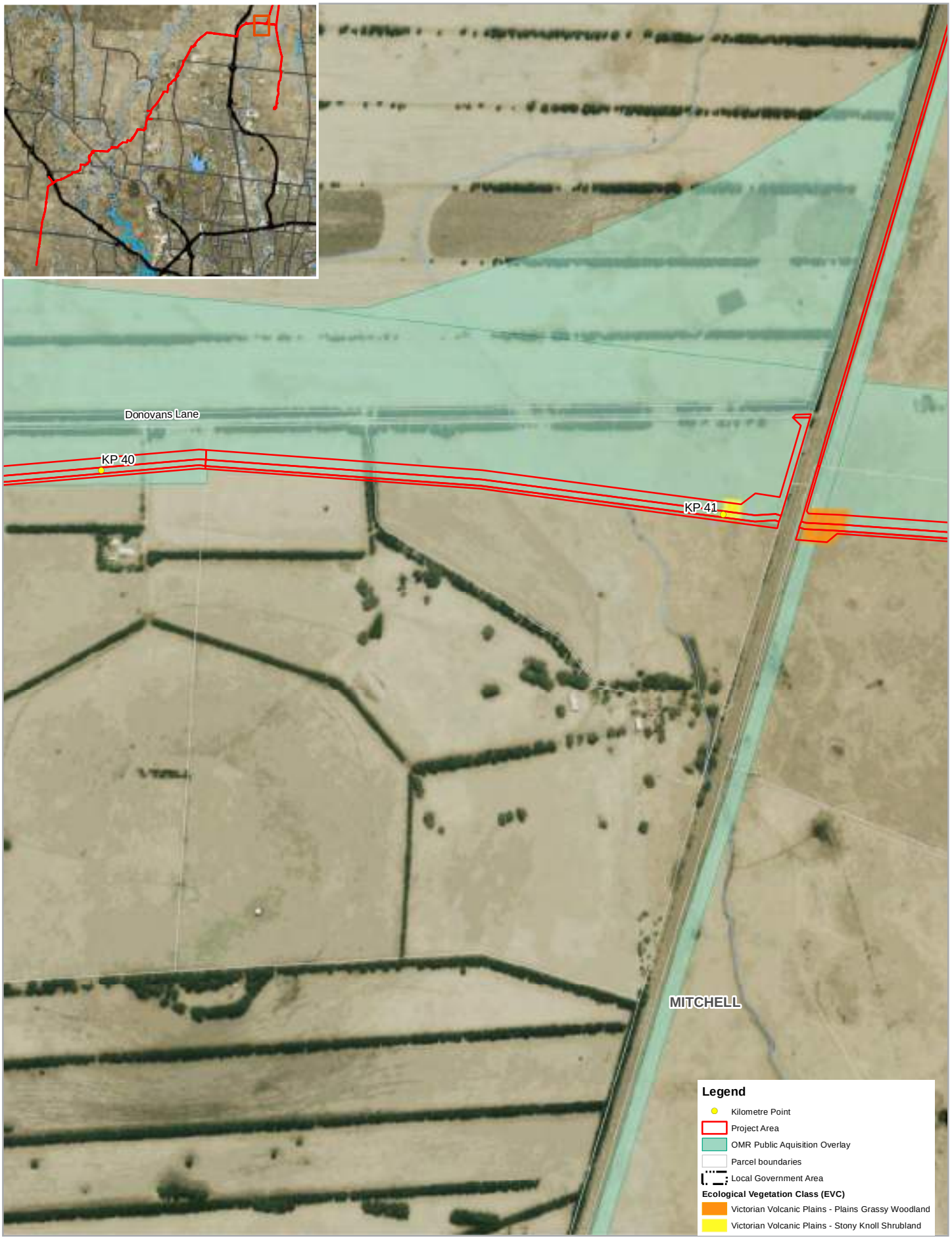
Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.21

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

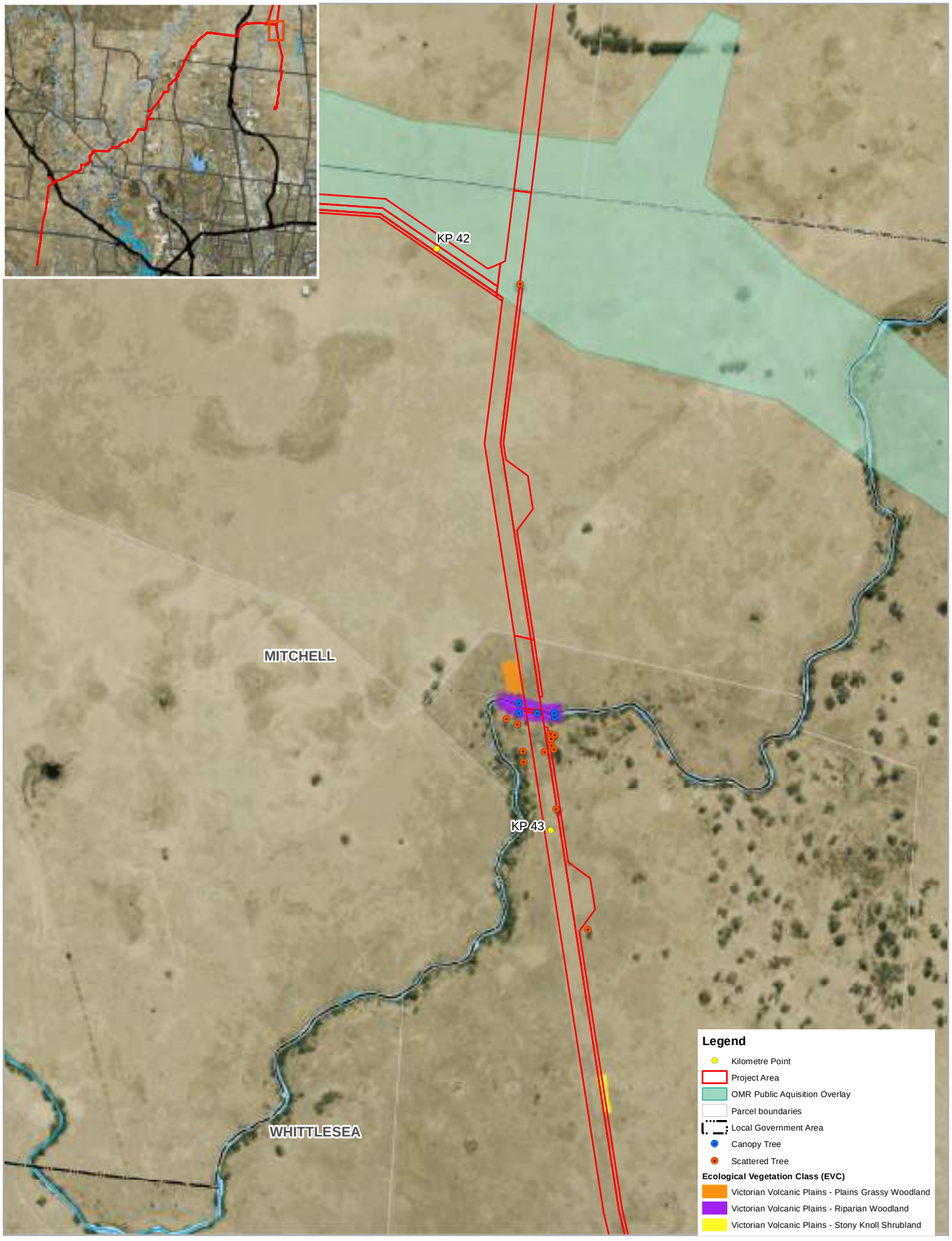
Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.22

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.23

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped within study area

Project No.	12529997
Revision No.	D
Date	05/03/2021

FIGURE 7.24

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

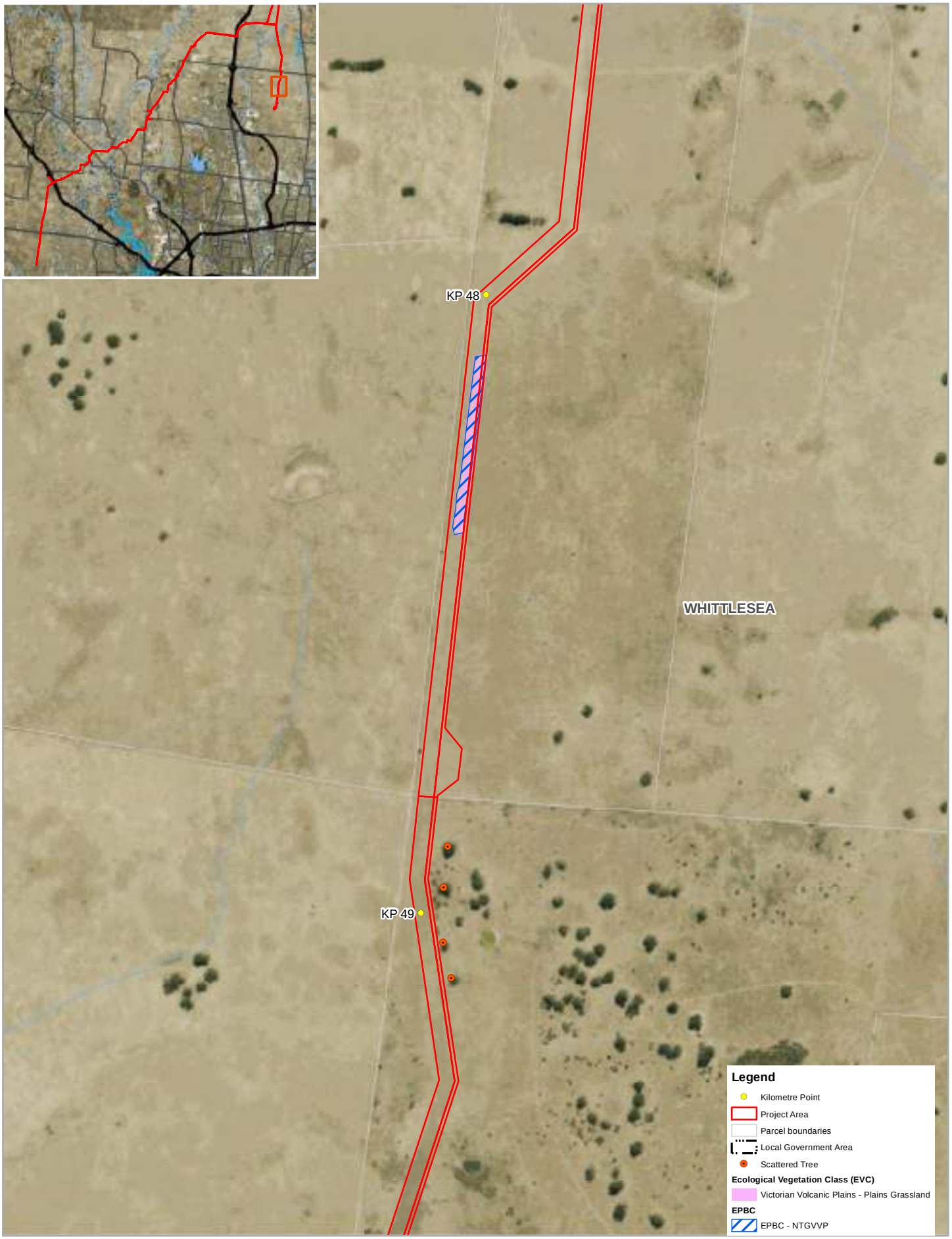
Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.25

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

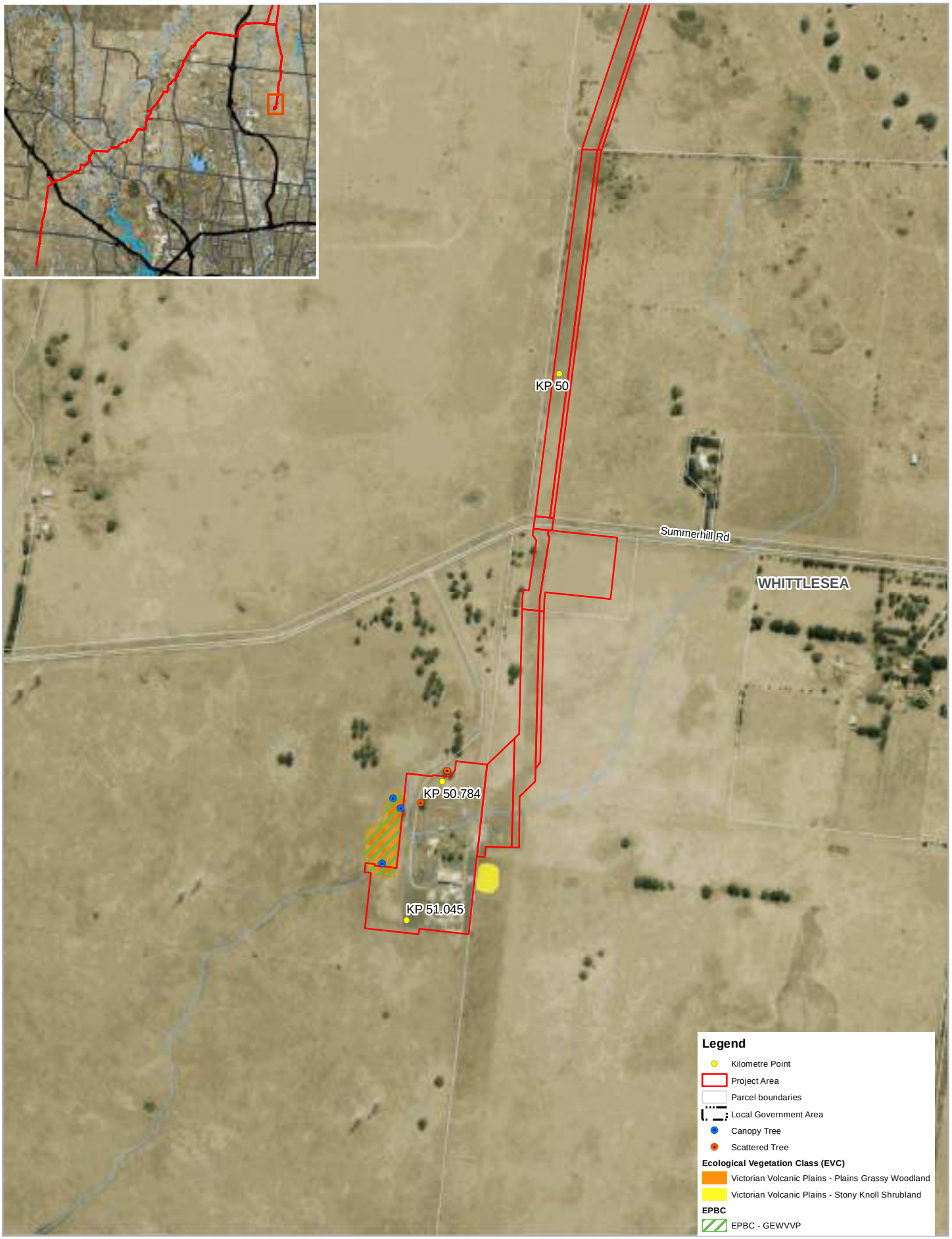
Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.26

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped within study area

Project No. 12529997
Revision No. D
Date 05/03/2021

FIGURE 7.27

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Appendix FF – Protected Matters Search Tool

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

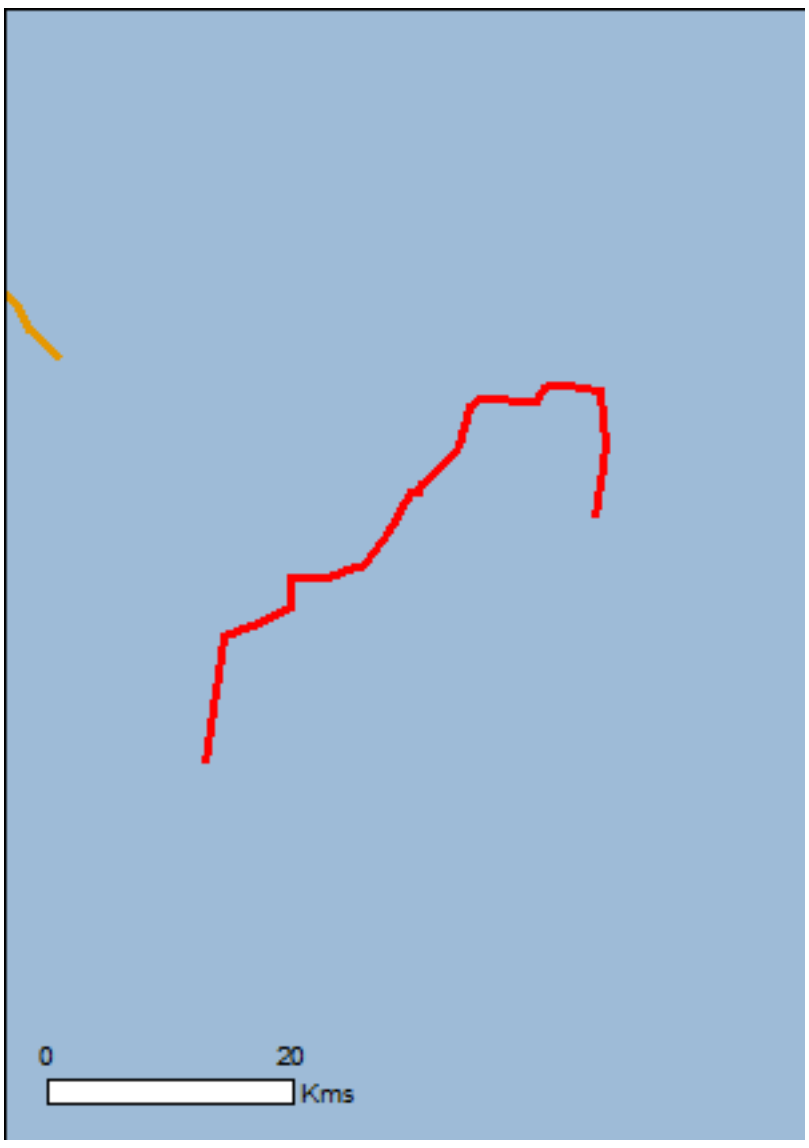
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 02/04/19 15:37:00

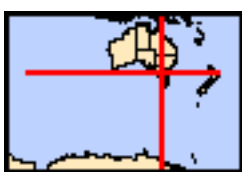
Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 5.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	38
Listed Migratory Species:	14

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	21
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	9
Regional Forest Agreements:	2
Invasive Species:	46
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Port phillip bay (western shoreline) and bellarine peninsula	10 - 20km upstream

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	Critically Endangered	Community known to occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community may occur within area
Natural Temperate Grassland of the Victorian Volcanic Plain	Critically Endangered	Community likely to occur within area
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pedionomus torquatus Plains-wanderer [906]	Critically Endangered	Species or species habitat known to occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Fish		
Galaxiella pusilla		
Eastern Dwarf Galaxias, Dwarf Galaxias [56790]	Vulnerable	Species or species habitat likely to occur within area
Maccullochella peelii		
Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Prototroctes maraena		
Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Litoria raniformis		
Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog [1828]	Vulnerable	Species or species habitat known to occur within area
Insects		
Synemon plana		
Golden Sun Moth [25234]	Critically Endangered	Species or species habitat known to occur within area
Mammals		
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area
Perameles gunnii Victorian subspecies		
Eastern Barred Bandicoot (Mainland) [88020]	Endangered	Translocated population known to occur within area
Petauroides volans		
Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Pseudomys fumeus		
Smoky Mouse, Konoom [88]	Endangered	Species or species habitat may occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Plants		
Amphibromus fluitans		
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat known to occur within area
Dianella amoena		
Matted Flax-lily [64886]	Endangered	Species or species habitat known to occur within area
Diuris basaltica		
Small Golden Moths Orchid, Early Golden Moths [64654]	Endangered	Species or species habitat likely to occur within area
Dodonaea procumbens		
Trailing Hop-bush [12149]	Vulnerable	Species or species habitat likely to occur within area
Glycine latrobeana		
Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat likely to occur within area
Lachnagrostis adamsonii		
Adamson's Blown-grass, Adamson's Blowngrass [76211]	Endangered	Species or species habitat known to occur within area
Leucochrysum albicans var. tricolor		
Hoary Sunray, Grassland Paper-daisy [56204]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Pimelea spinescens subsp. spinescens		
Plains Rice-flower, Spiny Rice-flower, Prickly Pimelea [21980]	Critically Endangered	Species or species habitat known to occur within area
Pomaderris vacciniifolia		
Round-leaf Pomaderris [4256]	Critically Endangered	Species or species habitat likely to occur within area
Prasophyllum frenchii		
Maroon Leek-orchid, Slaty Leek-orchid, Stout Leek-orchid, French's Leek-orchid, Swamp Leek-orchid [9704]	Endangered	Species or species habitat likely to occur within area
Pterostylis chlorogramma		
Green-striped Greenhood [56510]	Vulnerable	Species or species habitat may occur within area
Pterostylis cucullata		
Leafy Greenhood [15459]	Vulnerable	Species or species habitat may occur within area
Rutidosis leptorrhynchoides		
Button Wrinklewort [7384]	Endangered	Species or species habitat likely to occur within area
Senecio macrocarpus		
Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat likely to occur within area
Senecio psilocarpus		
Swamp Fireweed, Smooth-fruited Groundsel [64976]	Vulnerable	Species or species habitat likely to occur within area
Thelymitra matthewsii		
Spiral Sun-orchid [4168]	Vulnerable	Species or species habitat may occur within area
Xerochrysum palustre		
Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Aprasia parapulchella		
Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area
Delma impar		
Striped Legless Lizard [1649]	Vulnerable	Species or species habitat known to occur within area
Tympanocryptis pinguicolla		
Grassland Earless Dragon [66727]	Endangered	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis		
Black-faced Monarch [609]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Breeding known to occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat likely to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Defence - RADIO RECEIVING STATION - ROCKBANK

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Banchory Grove Grassland N.C.R.	VIC
Beveridge B.R	VIC
Bulla Bulla SS.R.	VIC
Clarke Road SS.R.	VIC
Craigieburn Grassland N.C.R.	VIC
Holden F.R.	VIC
Jacksons Creek SS.R.	VIC
Mount Ridley N.C.R.	VIC
Organ Pipes National Park	VIC

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
Central Highlands RFA	Victoria
West Victoria RFA	Victoria

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Turdus philomelos Song Thrush [597]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-37.718672 144.711543,-37.644087 144.724933,-37.637562 144.74948,-37.627502 144.772826,-37.610642 144.7742,-37.61105 144.801322,-37.604658 144.81969,-37.60493 144.826385,-37.585616 144.844237,-37.561535 144.86209,-37.561263 144.867583,-37.5565 144.868098,-37.547246 144.882518,-37.534451 144.895564,-37.512668 144.904834,-37.506812 144.911529,-37.508583 144.952556,-37.505451 144.953929,-37.501774 144.959251,-37.500276 144.963542,-37.499458 144.975043,-37.502591 144.996501,-37.503272 144.998218,-37.533226 145.003024,-37.546021 145.000449,-37.576502 144.995299

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix GG – List of trees lost (inside footprint), and requiring protection (within 15m of footprint) *see map below appendix HH for locations

Species	DBH	Location	Unique identifier
Eucalyptus microcarpa	100	Inside Footprint	9
Eucalyptus camaldulensis	98	Inside Footprint	13
Eucalyptus camaldulensis	118	Inside Footprint	14
Eucalyptus melliodora	65	Inside Footprint	15
Eucalyptus camaldulensis	10	Inside Footprint	24
Eucalyptus viminalis	122	Inside Footprint	29
Eucalyptus melliodora	131	Inside Footprint	39
Eucalyptus camaldulensis	28	Inside Footprint	43
Eucalyptus camaldulensis	37	Inside Footprint	44
Eucalyptus camaldulensis	43	Inside Footprint	45
Eucalyptus camaldulensis	30	Inside Footprint	46
Eucalyptus camaldulensis	34	Inside Footprint	47
Eucalyptus camaldulensis	110	Inside Footprint	76
Eucalyptus leucoxylon subsp. leucoxylon	54	Inside Footprint	80
Eucalyptus leucoxylon subsp. leucoxylon	54	Inside Footprint	81
Eucalyptus leucoxylon subsp. leucoxylon	46	Inside Footprint	82
Eucalyptus leucoxylon subsp. leucoxylon	20	Inside Footprint	84
Eucalyptus leucoxylon subsp. leucoxylon	52	Inside Footprint	85
Eucalyptus camaldulensis	5	Inside Footprint	86
Eucalyptus leucoxylon subsp. leucoxylon	8	Inside Footprint	87
Eucalyptus leucoxylon subsp. leucoxylon	13	Inside Footprint	88
Eucalyptus camaldulensis	87	Inside Footprint	91
Eucalyptus camaldulensis	89	Inside Footprint	94
Eucalyptus camaldulensis	90	Inside Footprint	110
Eucalyptus microcarpa	34	Inside Footprint	119
Eucalyptus microcarpa	5	Within 15m	3
Eucalyptus camaldulensis	75	Within 15m	4
Eucalyptus camaldulensis	84	Within 15m	8
Eucalyptus camaldulensis	90	Within 15m	10
Eucalyptus camaldulensis	113	Within 15m	11
Eucalyptus camaldulensis	173	Within 15m	12
Eucalyptus camaldulensis	50	Within 15m	16
Eucalyptus camaldulensis	141	Within 15m	18
Eucalyptus camaldulensis	10	Within 15m	23
Eucalyptus camaldulensis	10	Within 15m	25
Eucalyptus camaldulensis	10	Within 15m	28
Eucalyptus viminalis	126	Within 15m	30
Eucalyptus camaldulensis	10	Within 15m	32
Eucalyptus camaldulensis	10	Within 15m	33
Eucalyptus camaldulensis	10	Within 15m	34
Eucalyptus viminalis	45	Within 15m	35
Eucalyptus camaldulensis	125	Within 15m	36
Eucalyptus camaldulensis	143	Within 15m	37
Eucalyptus melliodora	86	Within 15m	38
Eucalyptus melliodora	73	Within 15m	40
Eucalyptus melliodora	121	Within 15m	42
Eucalyptus camaldulensis	85	Within 15m	64

Species	DBH	Location	Unique identifier
Eucalyptus camaldulensis	81	Within 15m	65
Eucalyptus camaldulensis	95	Within 15m	75
Eucalyptus camaldulensis	113	Within 15m	79
Eucalyptus leucoxylon subsp. leucoxylon	5	Within 15m	83
Eucalyptus camaldulensis	93	Within 15m	89
Eucalyptus camaldulensis	156	Within 15m	90
Eucalyptus camaldulensis	77	Within 15m	92
Eucalyptus camaldulensis	125	Within 15m	93
Eucalyptus camaldulensis	87.5	Within 15m	95
Eucalyptus camaldulensis	94	Within 15m	96
Eucalyptus camaldulensis	122	Within 15m	97
Eucalyptus camaldulensis	116	Within 15m	98
Eucalyptus camaldulensis	87.5	Within 15m	99
Eucalyptus camaldulensis	80	Within 15m	100
Eucalyptus camaldulensis	118	Within 15m	105
Eucalyptus camaldulensis	122	Within 15m	106
Eucalyptus camaldulensis	100	Within 15m	107
Eucalyptus camaldulensis	80	Within 15m	109
Eucalyptus camaldulensis	90	Within 15m	111
Eucalyptus camaldulensis	90	Within 15m	112
Eucalyptus camaldulensis	133	Within 15m	120
Eucalyptus camaldulensis	91	Within 15m	123

Appendix HH – Location Map of native trees



Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped trees

Project No. 12529997
Revision No. A
Date 05/03/2021

FIGURE 12.1

\\ghdnet\ghd\AU\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\012_12529997_Native_Vegetation_AllTrees_MB_A4P_revA_rev8.mxd
Print date: 24 Mar 2021 - 12:01

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped trees

Project No. 12529997
Revision No. A
Date 05/03/2021

FIGURE 12.2

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Print date: 24 Mar 2021 - 12:01

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Western Outer Ring Main Gas Project

Native vegetation mapped trees

Project No. 12529997
Revision No. A
Date 05/03/2021

FIGURE 12.3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Western Outer Ring Main Gas Project

Native vegetation mapped trees

Project No. 12529997
Revision No. A
Date 05/03/2021

FIGURE 12.4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Western Outer Ring Main Gas Project

Native vegetation mapped trees

Project No.	12529997
Revision No.	A
Date	05/03/2021

FIGURE 12.5

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Western Outer Ring Main Gas Project

Native vegetation
mapped trees

Project No. 12529997
Revision No. A
Date 05/03/2021

FIGURE 12.6

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Paper Size ISO A4

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Western Outer Ring Main Gas Project

Native vegetation
mapped trees

Project No. 12529997
Revision No. A
Date 05/03/2021

FIGURE 12.7

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Western Outer Ring Main Gas Project

Native vegetation mapped trees

Project No. 12529997
Revision No. A
Date 05/03/2021

FIGURE 12.8

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Western Outer Ring Main Gas Project

Native vegetation mapped trees

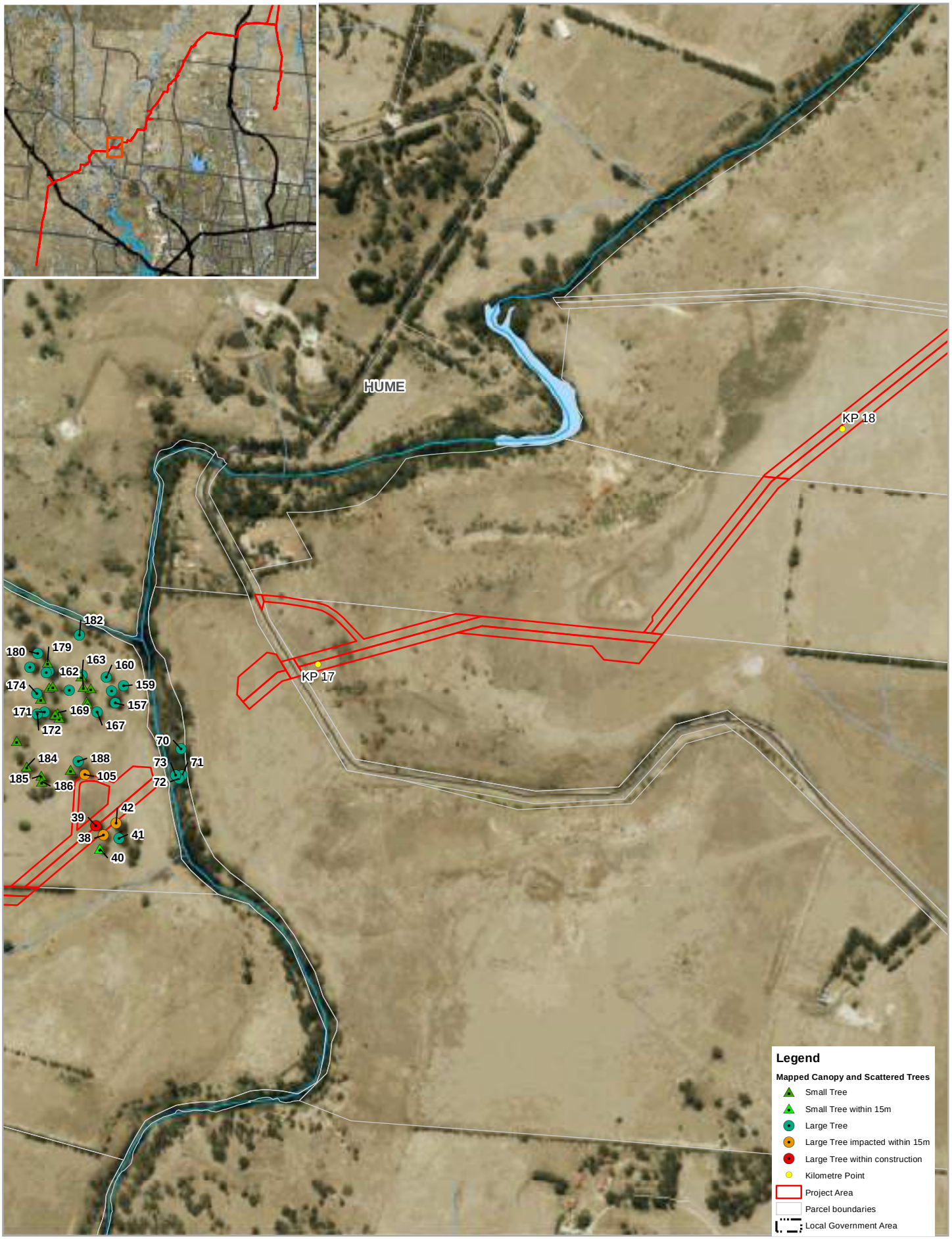
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Revision No.	A
Date	05/03/2021

FIGURE 12.9

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Native vegetation mapped trees

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FIGURE 12.10

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

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Native vegetation mapped trees

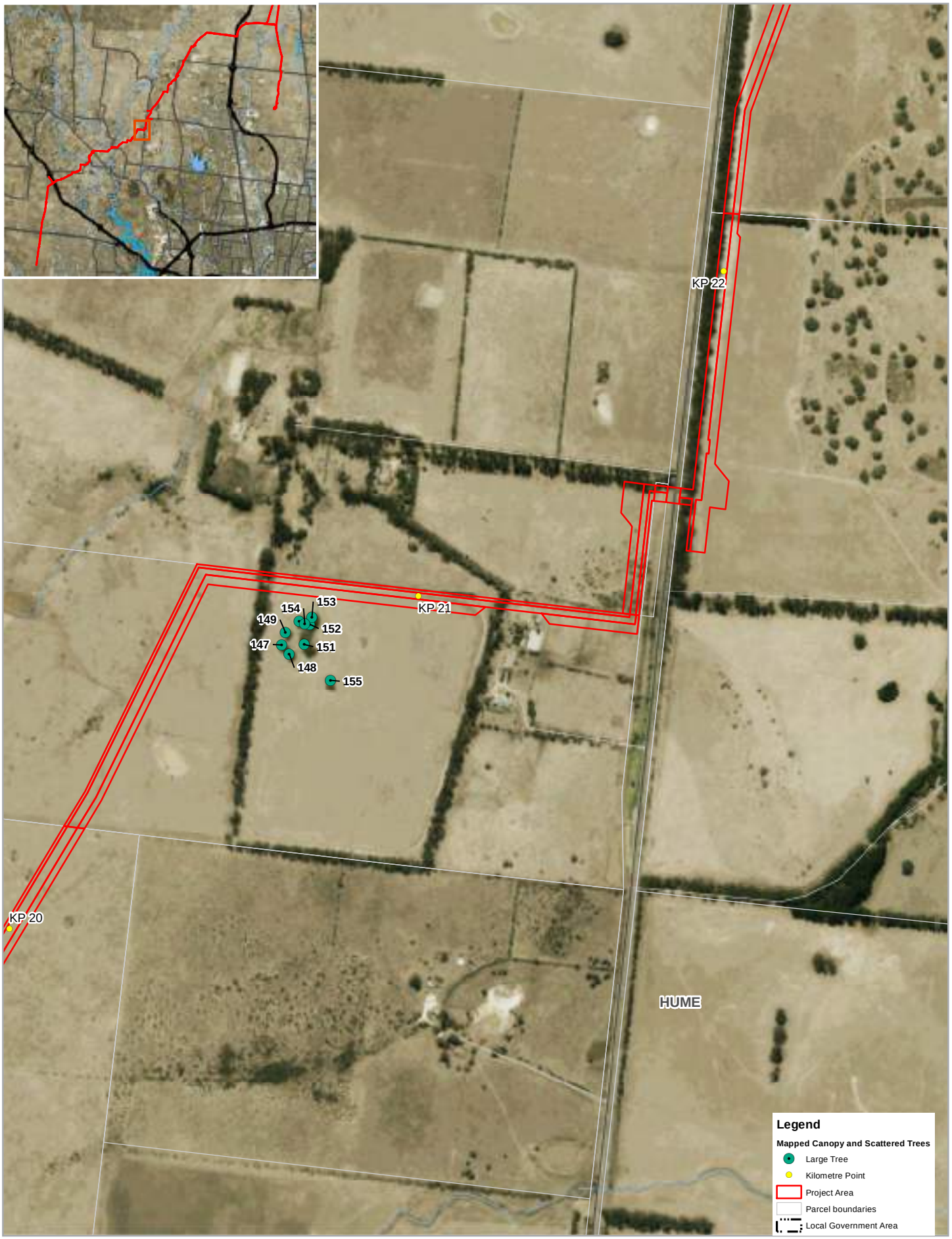
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FIGURE 12.11

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Western Outer Ring Main Gas Project

Native vegetation mapped trees

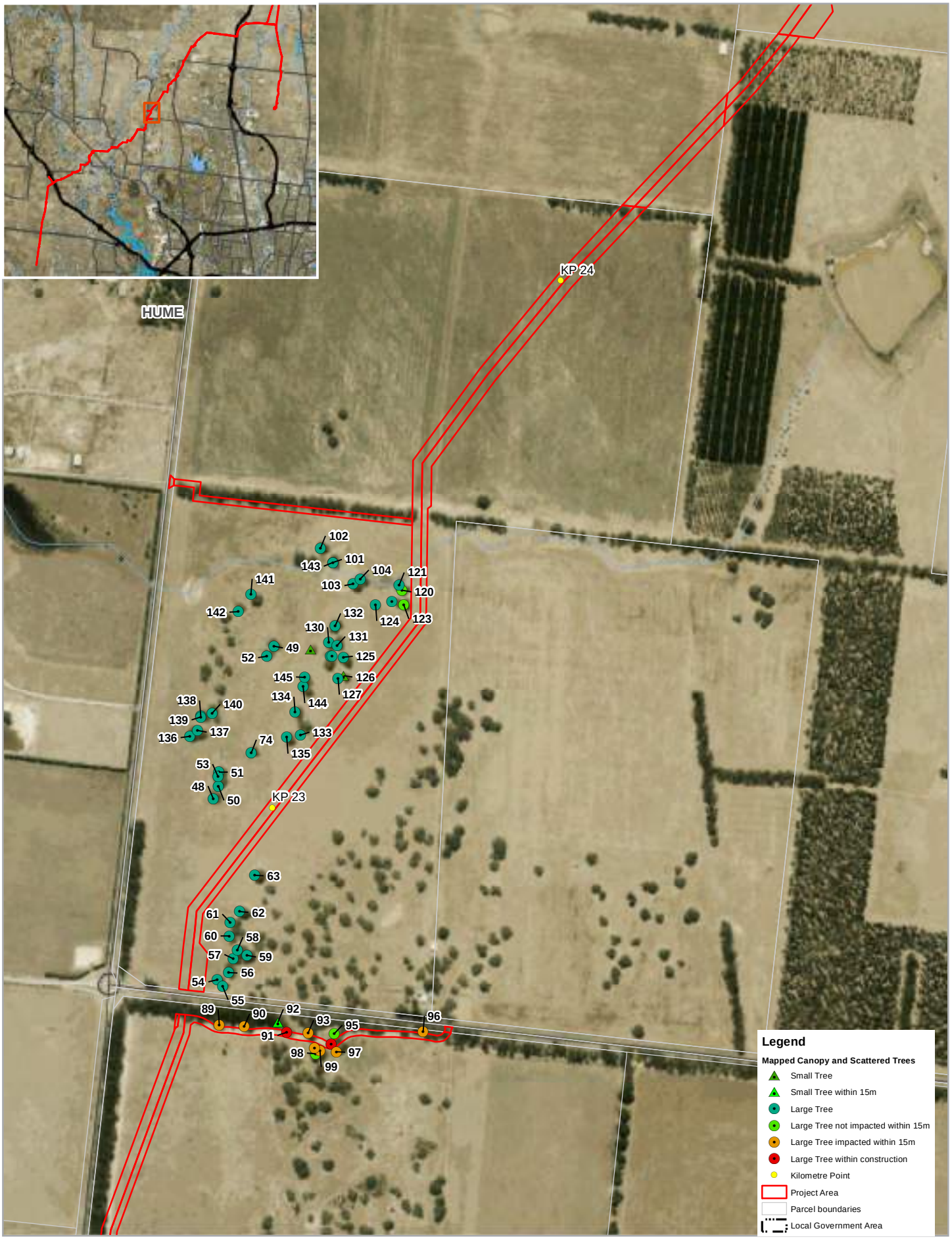
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FIGURE 12.12

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Native vegetation
mapped trees

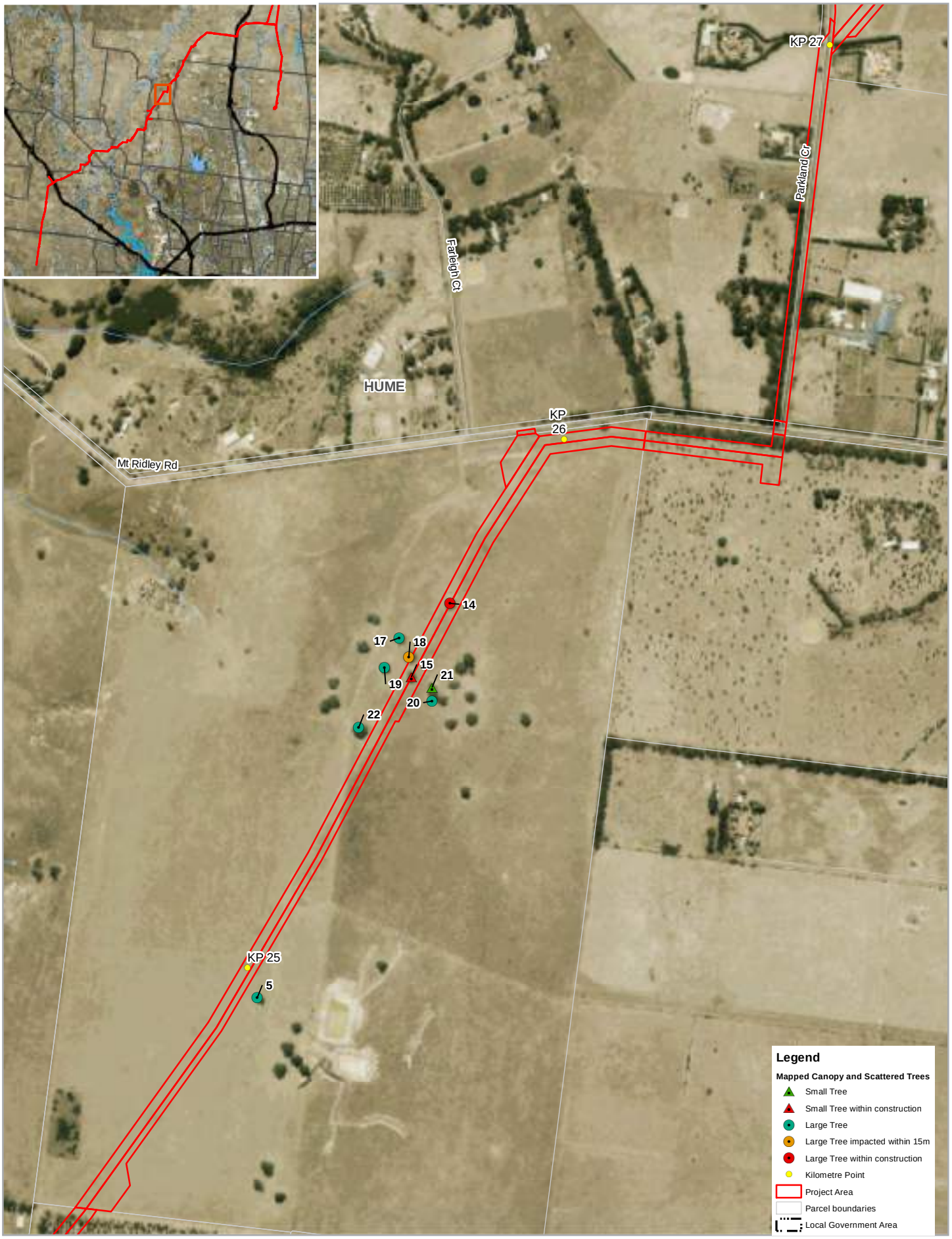
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FIGURE 12.13

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Native vegetation mapped trees

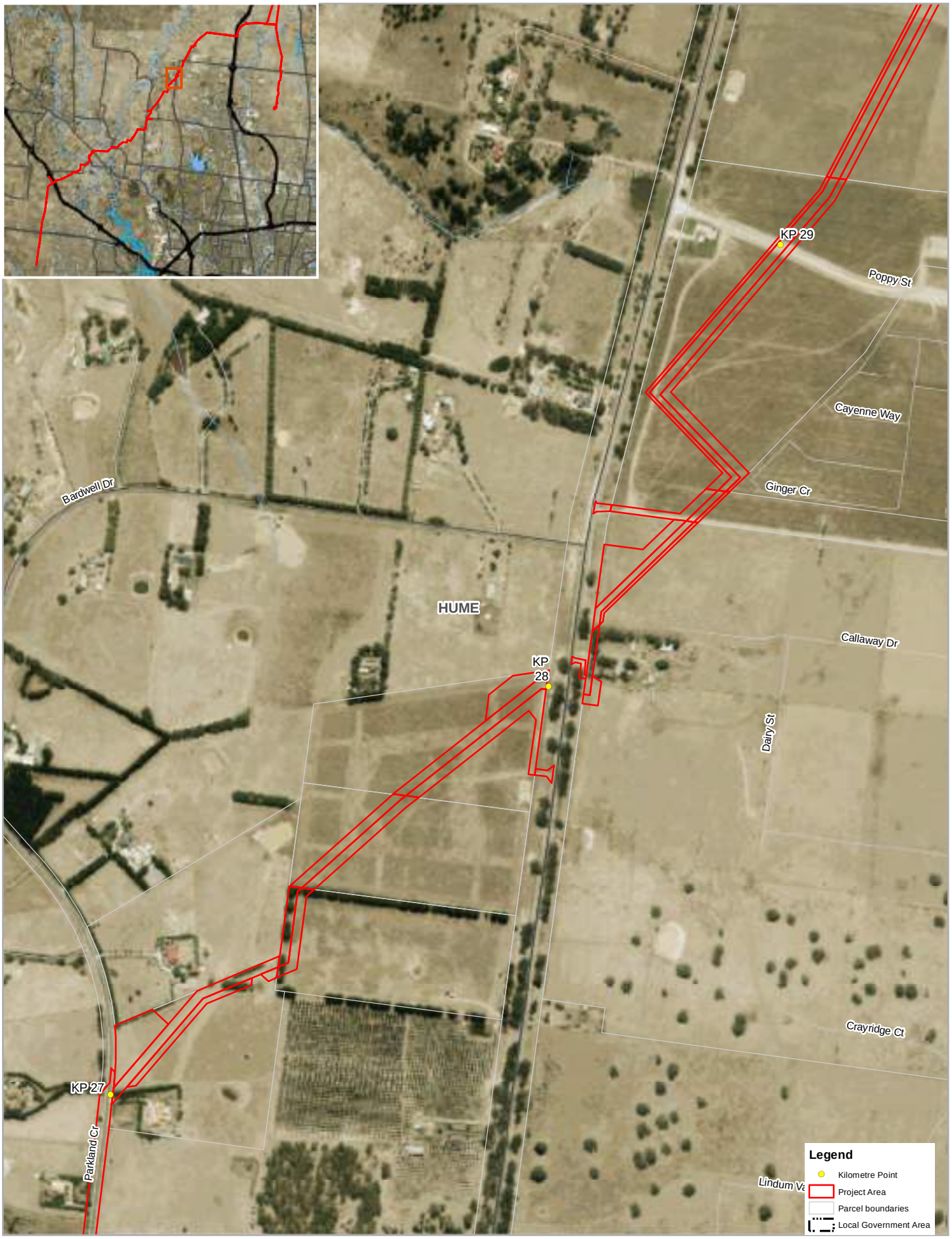
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Date	05/03/2021

FIGURE 12.14

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Western Outer Ring Main Gas Project

Native vegetation mapped trees

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FIGURE 12.15

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Western Outer Ring Main Gas Project

Native vegetation mapped trees

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FIGURE 12.16

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FIGURE 12.17

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Western Outer Ring Main Gas Project

Native vegetation mapped trees

Project No. 12529997
Revision No. A
Date 05/03/2021

FIGURE 12.18

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Western Outer Ring Main Gas Project

Native vegetation mapped trees

Project No. 12529997
Revision No. A
Date 05/03/2021

FIGURE 12.19

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Western Outer Ring Main Gas Project

Native vegetation mapped trees

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FIGURE 12.20

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Western Outer Ring Main Gas Project

Native vegetation mapped trees

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FIGURE 12.21

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped trees

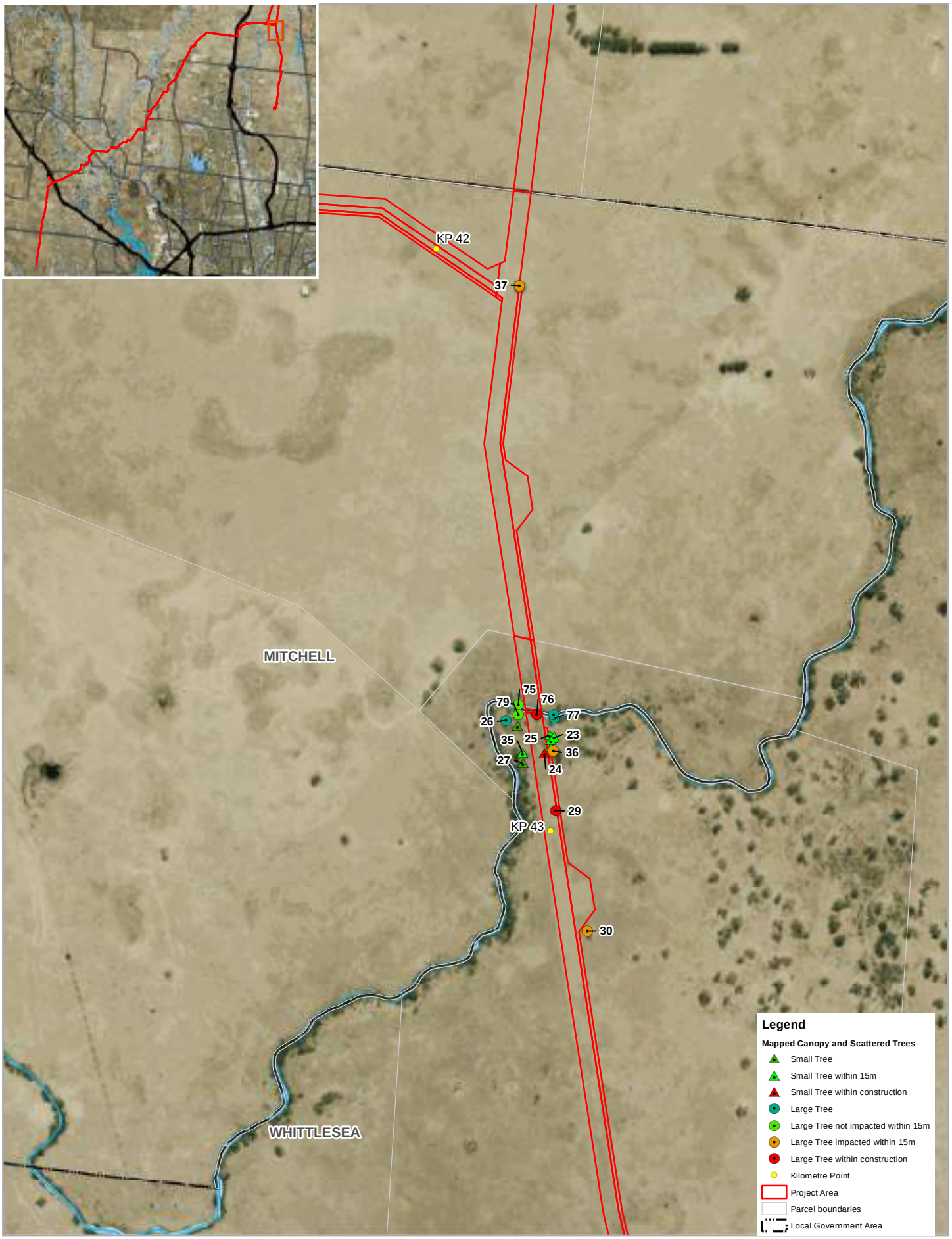
Project No. 12529997
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FIGURE 12.22

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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Western Outer Ring Main Gas Project

Native vegetation mapped trees

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FIGURE 12.23

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Date 05/03/2021

FIGURE 12.24

\\ghdnet\ghd\AU\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\012_12529997_Native_Vegetation_AllTrees_MB_A4P_revA_rev8.mxd
Print date: 24 Mar 2021 - 12:05

Data source: DELWP, VicMap, 2020; Geoscience australia 2012, GHD, 2020; Biosis, 2020. . Created by: kgardner

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped trees

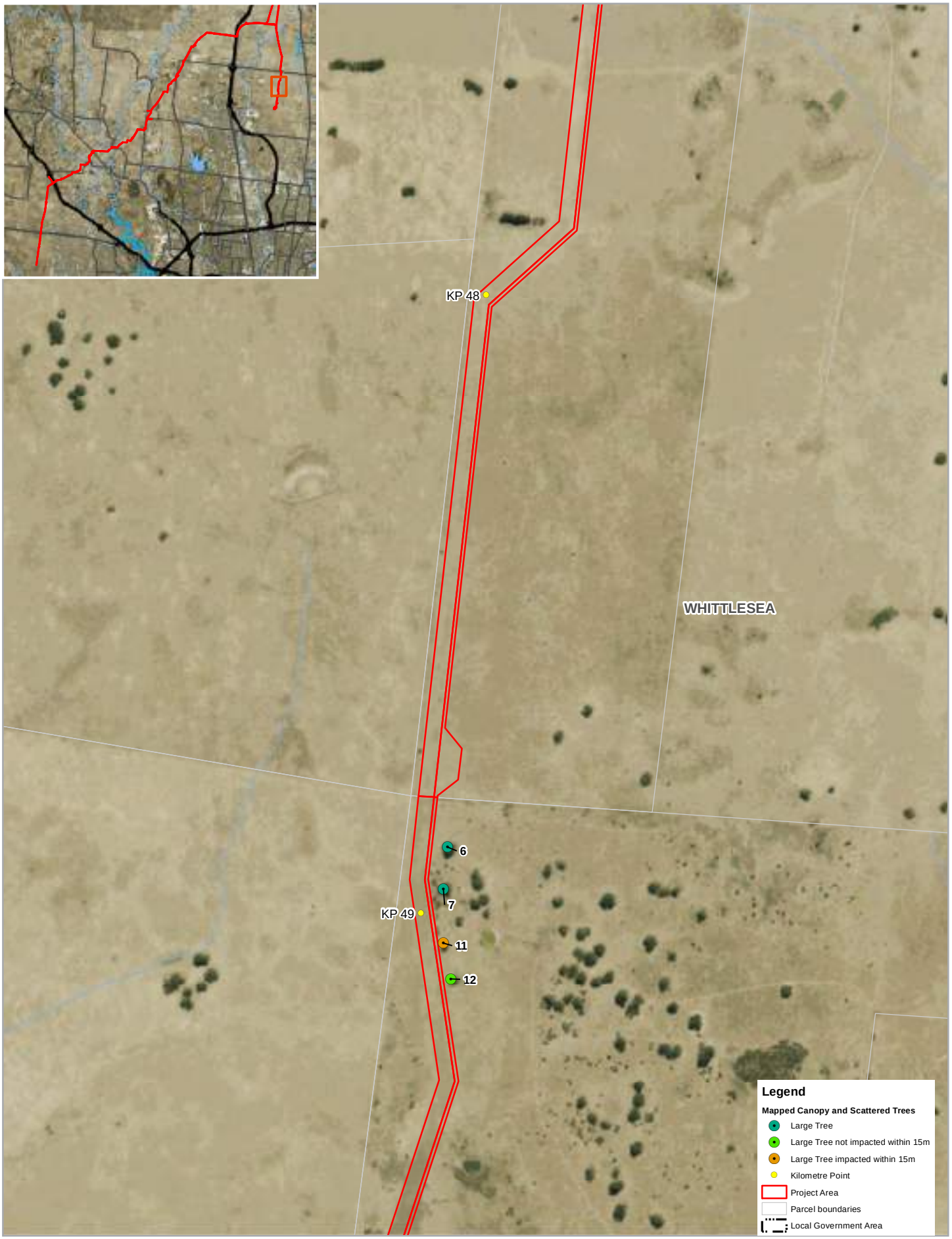
Project No. 12529997
Revision No. A
Date 05/03/2021

FIGURE 12.25

\\ghdnet\ghd\AU\Melbourne\Projects\31\12529997\GIS\Maps\Working\Enviro\012_12529997_Native_Vegetation_AllTrees_MB_A4P_revA_rev8.mxd
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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation
mapped trees

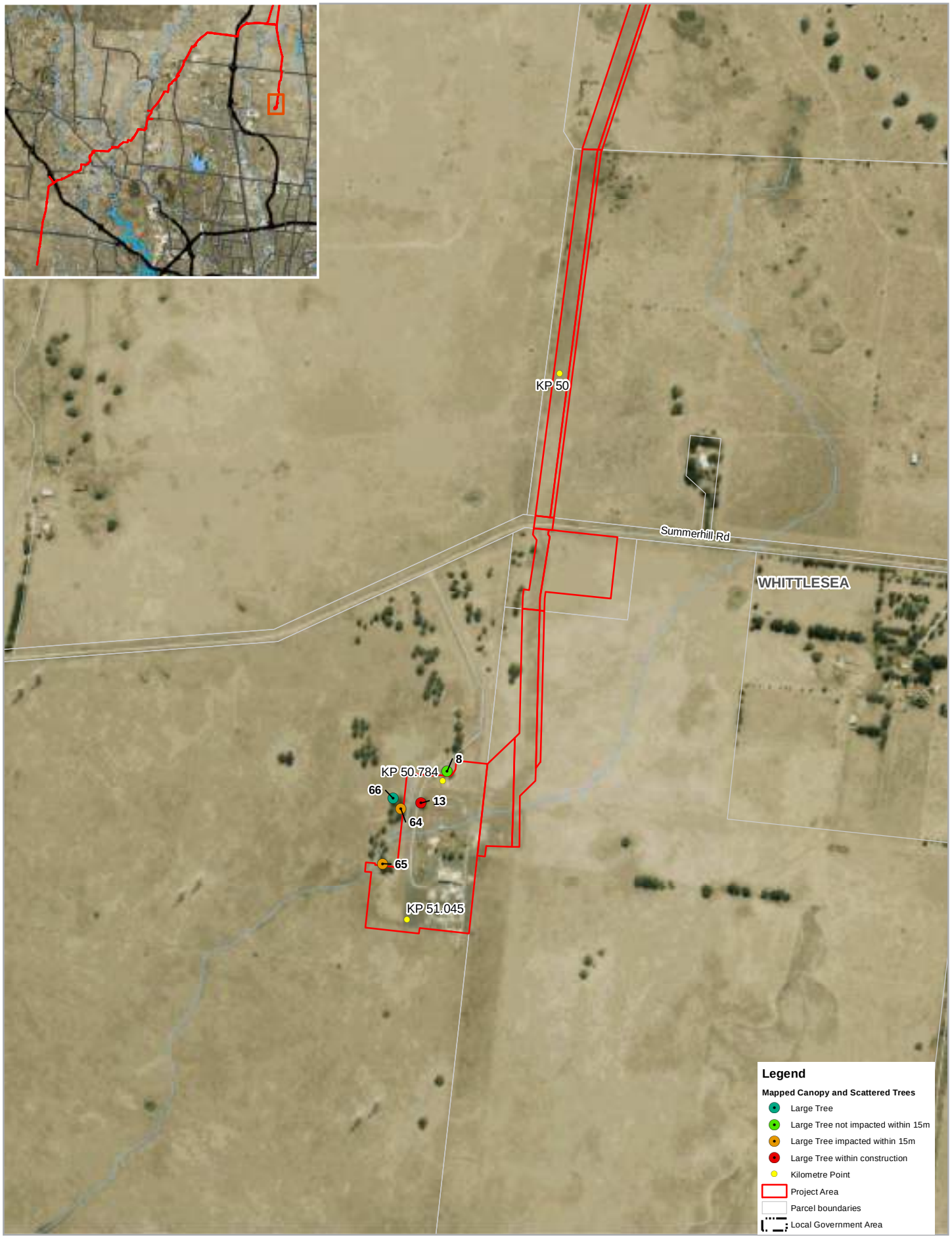
Project No. 12529997
Revision No. A
Date 05/03/2021

FIGURE 12.26

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Paper Size ISO A4

0 100 200

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

APA VTS (Operations) Pty Ltd
Western Outer Ring Main Gas Project

Native vegetation mapped trees

Project No. 12529997
Revision No. A
Date 05/03/2021

FIGURE 12.27

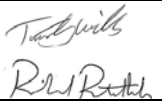
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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
1	K Dalton J Comber	T Wills R Retallick		S Brattle		13/05/2021

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