Volume 2

Melbourne Airport
M3R MDP

Chapters B1–B5

MELBOURNE AIRPORT


E1

Chapter B1
Airport - Introduction

Overview

Part B of the M3R MDP describes the potential impact of the project on ground-based aspects of the environment. The extent and scope of ground issues considered by this part of the MDP have been informed by the requirements of the Airports Act 1996 (Cth) (Airports Act) and as described in Chapter A8: Assessment and Approvals Process.

Melbourne Airport provides detail on the disturbance impacts the proposed project will have on the 'whole of the environment' (as defined in the Environment Protection and Biodiversity Conservation Act (1999) 'Significant impact guidelines 1.2 Actions on, or impacting upon Commonwealth land, and actions by Commonwealth agencies') including air quality, water quality, ground-based noise, heritage, land contamination, waste and hazardous material, traffic, heritage and flora and fauna (including nationally listed threatened species and ecological communities).

The potential impacts from M3R on these aspects of the environment are informed by existing environmental conditions, assessments of construction and operation, and the measures necessary to avoid, mitigate and manage hazards and risks.

Part B addresses on-ground impact evaluation and assessment requirements in the following chapters:

Chapter B2: Land Use and Planning provides a detailed assessment of the Commonwealth, Victorian and local planning and environmental legislative requirements, land use conditions and land tenure relevant to M3R. This chapter also considers potential offsite impacts and long-term land use issues and opportunities.

Chapter B3: Soils, Groundwater and Waste considers the potential of M3R to impact, and be impacted by, the condition of soil and groundwater and the potential generation of waste during construction and operation of M3R. The soil and groundwater assessment considers the interaction of M3R with changes to groundwater quality and flow and the disturbance of existing soil conditions, and identifies appropriate mitigation and monitoring measures. The waste assessment considers the likely sources of waste generated through the construction and operation of M3R and measures to limit the environmental impacts of the waste.

Chapter B4: Surface Water and Erosion describes the existing waterbodies on and adjoining Melbourne Airport, and assesses the potential for M3R to impact soil erosion, surface water quality and flooding risk of relevant waterbodies. It includes the identification of appropriate mitigation and monitoring measures.

Chapter B5: Ecology describes the existing terrestrial flora and fauna and aquatic fauna attributes within and adjacent to the M3R development footprint, including Commonwealth and State listed endangered and threatened species and ecological communities.

It assesses the potential ecological impacts associated with M3R and associated management and mitigation measures.

Chapter B6: Indigenous Cultural Heritage provides an overview of Indigenous cultural heritage values associated with the development footprint, and the potential impacts associated with construction of M3R. It discusses the Cultural Heritage Management Plan that has been prepared for M3R and associated mitigation proposals.

Chapter B7: European Heritage identifies the European heritage places within and adjacent to the development footprint, in alignment with Heritage Victoria and National Heritage criteria, and assesses the potential impacts associated with M3R. Appropriate mitigation and monitoring measures are identified.

Chapter B8: Surface Transport assesses the implications of the construction and operation of M3R on Melbourne Airport's surface transport network and off-airport arterial road network. Appropriate mitigation measures have been identified to address the impacts.

Chapter B9: Ground-Based Noise and Vibration provides an assessment of the potential noise and vibration impacts associated with M3R construction activities, taxiing noise, use of auxiliary power units, engine ground running and surface access noise from traffic and other modes of transport. Mitigation and monitoring measures are defined to address the noise impacts.

Chapters B10 (Air Quality) and B11 (Greenhouse Gas Emissions): evaluate likely air quality impacts and greenhouse gas emissions associated with the construction and ground-based operational activities of M3R. Relevant mitigation and monitoring measures are identified to address the impacts.

Chapter B12: Landscape and Visual provides an assessment of the impact of construction and operation of M3R on the existing day and night visual environment and landscape values surrounding the airport, with mitigation measures identified where appropriate.

Chapter B13: Climate Change and Natural Hazard Risk presents an assessment of the current risks to M3R associated with climate change and natural hazards, and how these risks may alter with projected climate change. These risks have been incorporated in M3R design and operational procedures.


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Chapter B2
Land Use and Planning

Summary of key findings:

- The majority of works associated with Melbourne Airport's Third Runway (M3R) will occur within the existing Melbourne Airport boundary.
- M3R is entirely consistent with Master Plan 2022 which reflects the changed orientation of the planned third runway. Master Plan 2022 includes a new Australian Noise Exposure Forecast (ANEF) for the airport incorporating M3R.
- Limited works may be undertaken outside airport land to provide connections with existing transport and utility networks. These works will be subject to separate planning assessment processes in accordance with requirements of the relevant local planning scheme.
- M3R is consistent with, and will support, state and local planning policy.
- The Melbourne Airport Environs Overlay (MAEO) applies planning controls for land use and development proposals within the boundary of the overlay to protect against incompatible development and land use. The MAEO is based on the 2018 ANEF contours.
- This MDP includes a 'M3R 2046 Composite ANEC' for the two existing runways and the planned third runway. This ANEC forms part of the new ANEF in Master Plan 2022.
- The M3R 2046 Composite ANEC has been compared to the current MAEO. This provides an indication of those areas that may be impacted by M3R in terms of changed land use restrictions based on the M3R 2046 Composite ANEC.
- The M3R 2046 Composite ANEC may result in some variations to the existing MAEO north and south of the airport. However, the formalisation of any such changes to the MAEO (via a Planning Scheme Amendment) is a separate process undertaken by the Victorian Minister for Planning.


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B2.1
INTRODUCTION

This chapter describes the existing baseline land-use planning context, applicable legislation, and policies relevant to the Melbourne Airport's Third Runway (M3R) Major Development Plan (MDP). It then assesses M3R's consistency with the applicable legislation and policies, and describes M3R's potential land use and planning impacts. Where required, specific measures to avoid, manage, mitigate and/or monitor these impacts are identified.

For the purposes of this chapter, the 'study area' refers to the area up to and including approximately 15 kilometres from the airport (**Figure B2.1**) and also taking into account the primary aircraft noise contours within this radius.

B2.1.1
Overview

Melbourne Airport is located on Commonwealth land. The *Airports Act 1996* (Cth) (Airports Act) is the key piece of legislation setting out the land use regulatory framework for M3R and this land use assessment. Commonwealth land within the Melbourne Airport boundary is exempt from the Victoria Planning Provisions; however, a MDP must address consistency with planning schemes under Victorian law.

The majority of works associated with M3R's footprint will occur on airport (Commonwealth) land, including an allowance for Runway End Safety Areas (RESA), security requirements, and High Intensity Approach Lighting Systems (HIALS). There are also a range of potential off-site impacts associated with M3R that could influence, and be influenced by, the land use and planning of surrounding areas.

Land use planning around Melbourne Airport is primarily the responsibility of local government, and will be in accordance with state and local planning policies, directions and provisions. Effective long-term land use planning is important in minimising incompatible development activities near the airport: off-airport land use and development can have a significant effect on the operations and viability of the airport.

Limited works associated with M3R may be undertaken outside airport land to provide appropriate connections and interface with those existing transportation and utility networks primarily associated with the construction phase of M3R. Separate approvals will be required for any off-airport works. There may also be indirect off-site impacts on land use as a consequence of noise and air quality, which potentially create development constraints requiring management.

The 'development footprint' as described in **Chapter A4: Project Description**, encompasses the existing and proposed runways, aircraft movement areas, and land proposed for the contractors' work compounds, stockpile areas and construction haulage routes. The existing air traffic services area, passenger terminal buildings and land to the east and south-east of the terminals (including Melbourne Airport Business Park) are outside the defined project footprint.

As part of M3R, a new construction access road for vehicles entering the site from the north will be required.

B2.2
METHODOLOGY AND ASSUMPTIONS

This chapter identifies and appraises the existing land use and planning context at and surrounding Melbourne Airport. Collating this has included gathering and reviewing relevant background information, historic data, previous planning investigations and studies, land ownership and tenure data, and planning scheme documents and maps.

The general methodology used for the preparation of the land use and planning assessment included:

- An inspection and analysis of the key characteristics of the airport site and surrounding land. Fieldwork included a visual inspection of the airport, existing facilities and infrastructure and the surrounding area, as relevant to M3R.
- A review of relevant background information and technical reports relevant to M3R.
- A review of existing Commonwealth, Victorian and local government legislation that applies to the airport site and surrounding land - including a review of strategic land use planning documentation to identify key objectives for development of the airport environs and the broader region.
- A review of M3R against the provisions of the relevant planning schemes surrounding the airport to assess the consistency of the proposals with the intent of the local planning provisions.
- Consultation and reference to previous engagement undertaken by Melbourne Airport with the Victorian Government and with planning staff of surrounding councils (particularly Hume and Brimbank City councils) to confirm applicable land use plans, policies and assessment considerations.
- An assessment of the existing conditions and land use within approximately a 15-kilometre radius of the airport, with a particular focus on land identified within the airport's Australian Noise Exposure Forecast (ANEF) contours in proximity to the airport, and with potential to impact the airport's airspace. The ANEF contours are contained within the 15-kilometre radius.
- An assessment of the likely land use and planning-related impacts of M3R (three runways) on surrounding land uses and development, together with recommended mitigation measures to reduce the impacts.

This impact assessment is based on the current and future operation of the airport, with M3R in operation in 2046. The assessment focuses on direct and indirect impacts of the three runways on land use, with the assessment of social and environmental impacts addressed in other chapters of this MDP.

The assessment does not address the ultimate four runway configuration, which is addressed within the approved Melbourne Airport Master Plan 2022.

B2.3 STATUTORY REQUIREMENTS AND POLICY

This section identifies relevant Commonwealth, Victorian and local statutory requirements, policies and provisions that must be considered during the preparation of a MDP for Melbourne Airport. An assessment of M3R's consistency with these statutory requirements and policy is provided in **Section B2.6.1**.

B2.3.1 Commonwealth legislation and policy

Melbourne Airport is located on Commonwealth land, leased by Australia Pacific Airports (Melbourne) Pty Ltd (APAM). The Airports Act and the EPBC Act are the key pieces of legislation that set the regulatory framework for M3R and this assessment, as discussed in **Chapter A8: Assessment and Approvals Process**.

B2.3.1.1 Airports Act 1996

Section 91(1)(ca) of the Airports Act requires a MDP to set out whether or not the development is consistent with the airport lease. For the M3R MDP, the relevant airport lease is the lease between APAM and the Commonwealth of Australia dated 1 July 1997 (hereafter referred to as the 'Airport Lease').

Section 112 sets out the Commonwealth's intention that Part 5 of the Airports Act applies to the exclusion of the law of a state and, specifically laws of the state relating to land use and planning. Notwithstanding section 112, section 91(1)(ga) requires this MDP to set out the likely effect of M3R on traffic flows at the airport and surrounding the airport, employment levels at the airport and the local and regional economy and community, including an analysis of how the proposed development fits within the local planning schemes for commercial and retail development in the adjacent area. In addition, section 91(4) requires that, in specifying a particular objective or proposal in section 91(1)(ga), this MDP will address the extent (if any) of consistency with planning schemes in force in Victoria and, if this MDP is not consistent with those planning schemes, the justification for the inconsistencies.

Section 91(3) of the Airports Act, and Regulation 5.04 of the Airports Regulations 1997 (Cth), require this MDP to address APAM's obligations (as the 'airport lessee company') as sub-lessor under any sub-lease of the airport site concerned and the rights of any sub-lessee under such sub-lease (including interests or obligations that existed prior to the commencement of the Airport Lease and to which the Airport Lease is subject).

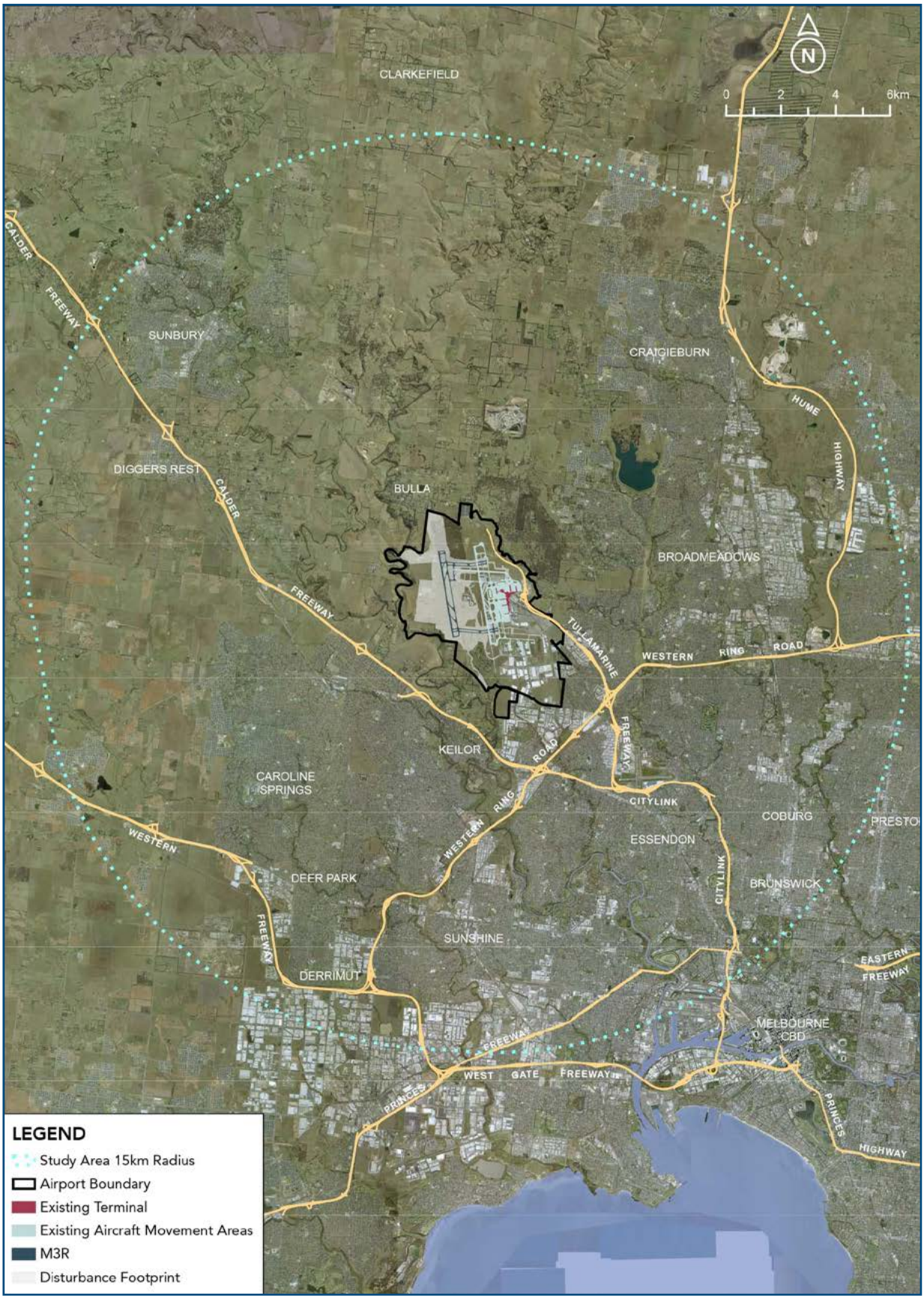
Melbourne Airport's searches indicate that, at the date of writing this MDP, there are overhead electricity assets, underground telecommunications assets and NBN Co assets in the M3R development footprint. The impact of the project on these assets will be addressed through the detailed design and construction process.

Other than as set out above, Melbourne Airport is not aware of any material conflicts or inconsistencies between the interests of any such sub-lessees or interest holders and M3R.

B2.3.1.2 Airports (Protection of Airspace) Regulations 1996

Obstructions on and in the vicinity of an airport have the potential to cause air safety hazards and limit the scope of aviation operations. Part 12 of the Airports Act and the Airports (Protection of Airspace) Regulations 1996 (the Regulations) establish a framework for the protection of airspace at and around airports.

Figure B2.1
Study Area



Under these provisions, the airspace associated with an airport may be declared 'Prescribed Airspace' to protect it for the safe arrival and departure of aircraft.

The Regulations define two sets of virtual 'surfaces' above the ground at and around an airport. These surfaces form the lower boundary of an airport's protected airspace and include:

- Obstacle Limitation Surface (OLS) – generally the lowest surface, designed to provide protection for visual flying, or Visual Flight Rules (VFR), i.e. when the pilot is flying by sight.
- Procedures for Air Navigational Services – Aircraft Operations (PANS-OPS) surface – generally above the OLS, designed to provide protection for instrument flying, or Instrument Flight Rules (IFR), i.e. when the pilot is flying based on instruments - for instance, in poor conditions. The PANS-OPS may also protect airspace around the network of navigational aids that are critical for instrument flying.

The Airports Act defines any activity resulting in an intrusion into an airport's protected airspace to be a 'controlled activity' and requires that controlled activities cannot be carried out without approval. The Regulations provide the Department of Infrastructure, Transport, Regional Development, Communications and the Arts (DITRDCA) or the airport operator with the ability to assess and approve applications to carry out controlled activities and to impose conditions on an approval.

As outlined in the 2022 Master Plan, Melbourne Airport's airspace, based on the ultimate four runway layout, has been declared 'Prescribed Airspace' by the Commonwealth Government. The airport's prescribed airspace, being based on the ultimate four-runway layout, therefore broadly incorporates the airspace associated with the operation of M3R. As part of the 2022 Master Plan, Melbourne Airport is preparing updated prescribed airspace to ensure that the airspace required for the ultimate four-runway system continues to be adequately protected, while taking account of changes which may have occurred since the four-runway airspace was originally prescribed.

These matters are explained and deal with further in **Chapter C5: Airspace Hazards and Risk Assessment**.

B2.3.1.3 Environment Protection Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a national scheme of environment and heritage protection, and biodiversity conservation.

The objectives of the EPBC Act are to:

- Provide for the protection of the environment, especially matters of national environmental significance
- Conserve Australian biodiversity
- Provide a streamlined national environmental assessment and approvals process
- Enhance the protection and management of important natural and cultural places
- Control the international movement of plants and animals (wildlife), wildlife specimens, and products made or derived from wildlife
- Promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources
- Recognise the role of Indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity
- Promote the use of Indigenous peoples' knowledge of biodiversity with the involvement of, and in cooperation with, the owners of the knowledge.

The *Environment Protection and Biodiversity Conservation Regulations 2000* set out the criteria for the environmental impact assessment processes.

The *Actions on, or impacting upon Commonwealth land, and actions by Commonwealth agencies, Significant impact guidelines 1.2 Environment Protection and Biodiversity Conservation Act 1999* (Significant Impact Guidelines 1.2) provide guidance on determining whether an action is likely to have a significant impact on a matter protected under national environmental law; and whether assessment and approval is required under the EPBC Act (DSEWPC, 2013). The Matters of National Environmental Significance (MNES) protected under national environmental law include:

- World heritage properties
- National heritage places
- Wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed)
- Nationally threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions
- A water resource, in relation to coal seam gas development and large coal mining development.

The Significant Impact Guidelines 1.2 of the EPBC Act provide guidance for any person who proposes to take an action which is situated on, or may have an impact on, Commonwealth land - or for representatives of Commonwealth agencies who propose to take an action that may impact on the environment anywhere in the world.

The guidelines assist in deciding whether or not to submit for a referral under the EPBC Act on whether assessment or approval is required.

The EPBC Act also addresses actions that have a significant environmental impact on Commonwealth land, or carried out by a Commonwealth agency, and provides for a 'whole-of-environment' impact assessment. The EPBC Act is administered by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW).

The EPBC Act requires that before a Commonwealth agency or employee gives an authorisation of certain 'actions', that agency or employee will obtain and consider advice from the Minister for the Environment and Water. In relation to M3R, the Minister for Infrastructure, Transport, Regional Development and Local Government ('The Minister' - who will ultimately assess this MDP for approval) will obtain and consider advice from the Minister for the Environment and Water.

To formalise this process and the approach to the assessment of the action under the EPBC Act, a referral is submitted to the Minister for the Environment and Water under section 160 of the EPBC Act. The Minister then confirms the assessment approach to be adopted under the EPBC Act.

As outlined in Chapter A8: Assessment and Approvals Process, the Exposure Draft version of this MDP was referred to the Department of Agriculture, Water and the Environment (DAWE, now DCCEEW) for consideration under section 160 of the EPBC Act. In March 2021, DAWE formally advised that the Environment Minister's advice is required to be obtained and considered before the MDP is approved by the Minister for Infrastructure, Transport, Regional Development and Local Government and adopted or implemented. DAWE also decided that the proposal requires further assessment under the EPBC Act by an accredited process, being the MDP process as defined under the Airports Act.

The MDP therefore constitutes the assessment mechanism for whole-of-environment impacts under the EPBC Act.

B2.3.1.4
Native Title Act 1993

The *Native Title Act 1993* (NT Act) recognises and protects the Native Title rights and interests of Aboriginal and Torres Strait Islanders across Australia. Native Title does not provide Indigenous people with ownership of the land. Freehold titles and most leases over land extinguish (or put at an end) native title completely (except some titles held by Aboriginal people). Pastoral leases only partially extinguish native title and, Aboriginal titles, like land rights title or Aboriginal-owned pastoral stations, will generally have no effect on Native Title.

If a commercial lease (that is not an agricultural lease or pastoral lease), residential lease, community purpose lease or any other lease that provides for a party's exclusive use existed prior to 1 January 1994, then Native Title is completely extinguished over the lease area. The authorised construction of public works (for example roads) on Crown land prior to 1 January 1994 will have completely extinguished Native Title over the land on which the public work is situated.

The NT Act provides a mechanism for acknowledging the existence of Native Title and sets out procedures that must be complied with by the managers of Crown land. Any activity on Crown land where Native Title is not considered to be extinguished may impact Native Title.

Land adjacent to (but not forming part of) the development footprint contains unreserved and reserved Crown land, primarily off-airport land along the bed and banks of rivers and creeks, road reserves and parkland. Any works in these areas may require Native Title notification in accordance with the provisions of the NT Act.

However, the development footprint is located within the Melbourne Airport boundary and is Commonwealth land leased to APAM under the Airports Act. The majority of the land was previously freehold land where Native Title had already been extinguished.

B2.3.1.5
Australian Standard AS2021:2015 Acoustics – Aircraft noise intrusion – Building siting and construction

Australian Standard AS2021:2015 provides guidance on the siting and construction of buildings in the vicinity of airports to minimise aircraft noise intrusion. AS2021:2015 was developed to assist in land use planning and forms the basis of the Melbourne Airport Environs Overlay (MAEO) control. Aircraft noise intrusion within a building depends substantially on:

- The location, orientation and elevation of the site relative to the aircraft flight paths
- The types and frequency of aircraft operating from the aerodrome
- Meteorological conditions
- The types of activity (including sleep) to be, or being, accommodated in the building
- The type of layout, construction and ventilation used
- The internal acoustic environment.

The assessment of potential aircraft noise exposure at a given site is based on the ANEF system, which is widely referred to in guiding statutory land use planning in the vicinity of airports. AS2021:2015 notes that:

> *'…experience has shown that communities that are newly-exposed to aircraft noise (e.g. as a result of the construction of new runways…) tend to be more sensitive to such noise than communities that are accustomed to it. Land use planning must by necessity use a long-term horizon, and the building siting acceptability recommendations in [this Standard] are based on the reactions of noise-accustomed communities. Regulatory authorities are cautioned that a transient heightened reaction could result from substantial new noise exposure.'*

B2.3.1.6
National Airports Safeguarding Framework

The Commonwealth Government recognises that responsibility for land use planning rests primarily with the state, territory and local governments, but that a national approach can assist in improving planning outcomes on and near airports and under flight paths. To this end, the National Airports Safeguarding Advisory Group (NASAG) has developed the National Airports Safeguarding Framework (NASF) which has been agreed to by the Commonwealth, states and territories including Victoria.

The NASF is comprised of a set of principles and guidelines that seek to:

- Improve community amenity by minimising aircraft noise-sensitive developments near airports including the use of additional noise metrics and improved noise-disclosure mechanisms
- Improve safety outcomes by ensuring aviation safety requirements are recognised in land use planning through guidelines being adopted by jurisdictions on various safety-related issues.

NASF applies at all airports and their environs, and seeks to protect communities living and working near airports. NASF provides guidance and information on planning and development around airports, including development activity that might penetrate operational airspace and/or affect navigational procedures for aircraft. It seeks to enhance the current and future safety, viability and growth of aviation operations at Australian airports and provide guidance on planning requirements for development that affects aviation operations.

The NASF also seeks to provide guidance to Commonwealth, state, territory and local government decision-makers, which in turn can be used to guide assessment and approvals for land use and development on and around airports. It is the responsibility of each jurisdiction to implement the framework into their respective planning schemes.

In Victoria, the requirements of NASF have been given effect through its inclusion as a policy document in clause 18.02-7S of the Planning Policy Framework (PPF). The NASF principles and guidelines must be considered in all planning decisions as relevant. A detailed summary of clause 18.02-7S of the PPF is provided in **B2.3.2.11**.

A summary of the current NASF guidelines is outlined in **Table B2.1**. An assessment of M3R's consistency with the NASF guidelines is provided in **Section B2.6.1.1**.

B2.3.2
State legislation and policy

Planning requirements for the Melbourne Airport site (Commonwealth land) are administered under the Airports Act and, as such, state and local planning provisions are not directly applicable. However, the Airports Act requires master plans to address the extent of consistency with relevant planning schemes in force within the state in which the airport is located (which includes local planning schemes). Similarly, the preparation of a MDP is required to address the extent of consistency with these planning schemes.

In preparing this MDP, Melbourne Airport has had regard to the PPF, the Local Planning Policy Framework, and the zones, overlays and other planning provisions derived from the Victoria Planning Provisions (VPP). The Master Plan and development approval processes for Melbourne Airport land are aligned with Victorian processes insofar as ensuring that any such development is compatible with broader strategic planning directions for the airport and adjoining areas as a whole. The state and local planning provisions considered as part of this MDP process are summarised below.

An assessment of M3R's consistency with the relevant state legislation and policy provided in **Section B2.6.1.3** of this chapter.

B2.3.2.1
Planning and Environment Act 1987

The *Planning and Environment Act 1987* (Vic) (P&E Act) establishes a framework for the use, development and conservation of land in Victoria and is administered by the Department of Transport and Planning (DTP). Commonwealth land within the Melbourne Airport boundary is exempt from the requirements of the P&E Act, including the requirement to obtain a planning permit, however any off-airport works are subject to relevant provisions of the P&E Act.

The P&E Act provides for the preparation and administration of planning schemes that control the use and development of land. The Ministerial Direction on the Form and Content of Planning Schemes requires relevant planning schemes to incorporate Australian Standard AS 2021-2015. Planning schemes prepared under the provisions of the P&E Act apply to, and have effect in, each municipality in Victoria. Objectives of the P&E Act relevant to the planning, design and development of M3R are to:

- Provide for the fair, orderly, economic and sustainable use and development of land
- Provide for the protection of natural and man-made resources and the maintenance of ecological processes and genetic diversity
- Secure a pleasant, efficient and safe working, living and recreational environment for all Victorians and visitors to Victoria

Table B2.1
NASF guidelines

NASF guidelines	Purpose
Guideline A: Measures for Managing Impacts of Aircraft Noise	Guideline A acknowledges that inappropriate development around airports can result in unnecessary constraints on airport operations and negative impacts on community amenity. Guideline A provides guidance on the use of a complementary suite of noise metrics, including the ANEF system and frequency-based noise metrics to inform strategic planning and provide communities with comprehensive and understandable information about aircraft noise. Guideline A also recommends using the 'Number above' ('N') contour system to supplement the ANEF contours. N Contours help to inform strategic planning decisions. NASF is referenced within the Victoria Planning Provisions Planning Policy Framework clause 18.02-7S of the PPF, further detailed under Section **B2.3.2.11** of this chapter.
Guideline B: Managing the Risk of Building Generated Windshear and Turbulence at Airports	Guideline B identifies the negative impacts that building-induced windshear can have on aviation operations in cases where structures are situated close to airport runways. Guideline B presents a layered risk approach to the siting and design of buildings near airport runways to assist land use planners and airport operators to reduce the risk of building-generated windshear and turbulence. The current Guideline B, developed in 2011, was updated in 2018 to reflect current world-best practice and available science, and to encourage the use of existing assessment technologies and methodologies. Measures for managing the risk of building-generated windshear and turbulence are generally associated with building works.
Guideline C: Managing the Risk of Wildlife Strikes in the Vicinity of Airports	Guideline C seeks to manage wildlife strikes, avoid major damage to aircraft and protect aircraft safety. Guideline C provides advice to help protect against wildlife hazards originating around airports and guidance to facilitate appropriate land use planning decisions in the vicinity of airports. The guideline identifies land uses that have the potential to increase wildlife strike potential and provides guidance on buffer zones within which certain activities around airports should be controlled.
Guideline D: Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation	Guideline D addresses risks associated with wind turbines and low flying aviation operations. This guideline is not applicable to the proposed development.
Guideline E: Managing the Risk of Distractions to Pilots from Lighting in the Vicinity of Airports	Guideline E acknowledges the importance of aeronautical ground lights during inclement weather and outside daylight hours. Guideline E therefore provides advice on the risks of lighting distractions to ensure that they are minimised or avoided.
Guideline F: Managing the Risk of Intrusions into the Protected Airspace of Airports	Guideline F provides advice for planners and decision-makers about working within and around protected airspace, including OLS and PANS-OPS intrusions, and how these can be better integrated into local planning processes to protect aircraft from obstacles or activities that could be a threat to safety.
Guideline G: Protecting Aviation Facilities – Communication, Navigation and Surveillance (CNS)	Guideline G provides land use planning guidance to better protect CNS facilities that support the systems and processes in place by Airservices Australia, the Department of Defence or other agencies under contract with the Commonwealth Government to safely manage the flow of aircraft into, out of and across Australian airspace
Guideline H: Protecting Strategically Important Helicopter Landing Sites	Guideline H provides guidance to ensure the ongoing operation of Strategically Important Helicopter Landing Sites (SHLS), and that the use of an SHLS is not compromised by any proposed development encroaching into flight paths. In addition, new development (and associated activities) should not present a hazard to helicopters arriving or departing from the SHLS and any new SHLS are to be appropriately located. For the purposes of Guideline H, a SHLS is an area not located on an aerodrome. Therefore, this guideline does not apply to Melbourne Airport.
Guideline I: Managing the Risk in Public Safety Areas at the End of Runways	Guideline I was developed to mitigate the risk of on-ground fatalities from an aircraft incident, by informing a consistent approach to land use at the end of airport runways. Public safety areas are a designated area of land at the end of an airport runway within which development may be restricted in order to control the number of people on the ground at risk of injury in the event of an aircraft accident on take-off or landing.

- Conserve and enhance those buildings, areas or other places which are of scientific, aesthetic, architectural or historical interest, or otherwise of special cultural value
- Protect public utilities and other assets and enable the orderly provision and coordination of public utilities and other facilities for the benefit of the community
- Facilitate development in accordance with the objectives set out in the points above
- Facilitate the provision of affordable housing in Victoria
- Balance the present and future interests of all Victorians.

The local planning authority administers municipal planning scheme provisions and development approval requirements as per the processes in the P&E Act. As Melbourne Airport is located on Commonwealth land, planning scheme provisions do not directly apply, however they must be considered when preparing a MDP. Furthermore, it is anticipated that off-airport impacts will be managed via the provisions of the P&E Act.

Pursuant to the P&E Act, planning approval can be pursued through two primary pathways: a planning permit application or Planning Scheme Amendment (PSA).

A Planning Permit may be required for use and/or for buildings and works associated with development, while a PSA allows planning schemes to be modified. A PSA may be prepared by any planning authority (including the relevant Council or the Minister for Planning) but can only be approved by the Minister for Planning, in order to ensure consistency with state and regional planning objectives.

Under the P&E Act, the Minister for Planning can amend the planning scheme with exemption from public notice requirements or to expedite an amendment in accordance with section 20 of the P&E Act. The section 20 process also enables the coordination of multiple planning approval requirements across different planning jurisdictions.

The general tests for the Minister for Planning exercising this power are that the interests of Victoria make an exemption appropriate and that further consultation is not warranted.

Considerations informing such an action may include:

- The matter being of genuine state or regional significance
- The matter giving effect to an outcome where the issues have been reasonably considered and the views of affected parties are known
- The matter introducing an interim provision which is substantially the same as a provision that is subject to a separate process of review
- The matter raising issues of fairness or public interest
- The matter requiring co-ordination to facilitate decision-making by more than one agency
- If consultation is required, the Minister can also establish separate and more time-efficient processes, such as focused consultation periods and hearings.

Part 3C of the P&E Act relates to the Melbourne Airport Environs Strategy Plan (MAESP) and applies to land surrounding the airport. The MAESP includes a recommendation for applying a planning overlay that includes restrictions for development within the Melbourne Airport surrounds. During the preparation of the 2018 Master Plan, the Minister for Planning formally advised he would amend the MAEO using the powers set out under s20(4) and s20(5) of the P&E Act to apply the 2018 ANEF, in consultation with affected councils and property owners.

This, and related actions to review the MAESP and associated planning provisions, were outlined by the Minister for Planning in his September 2017 letter to APAM and the 10 current noise contour-affected councils. The MAEO was updated to apply the 2018 ANEF in October 2021 via Amendment VC173.

In December 2019, the Minister for Planning appointed a Standing Advisory Committee pursuant to Part 7, section 151 of the P&E Act to review the effectiveness of controls intended to safeguard Melbourne Airport. The Melbourne Airport Environs Safeguarding Standing Advisory Committee (MAESSAC) was established by the Minister to consider:

- Planning proposals of strategic importance within the Melbourne Airport Environs Area and approved Melbourne Airport Master Plan noise contours, including planning scheme amendments and planning permit applications, or proposals which may be inconsistent with Victorian policy safeguarding Melbourne Airport
- The effectiveness of the Melbourne Airport Environs Area, the Melbourne Airport Environs Strategy Plan 2003, the Melbourne Airport Environs Overlay and other related planning provisions, in safeguarding Melbourne Airport's ongoing curfew-free operation and its environs.

In relation to the review of planning provisions safeguarding Melbourne Airport, the Committee's final report and the Victorian Government's response were released in April 2022.

The Committee's report made 15 recommendations. The Victorian Government's response supported most of the Committee's recommendations either in full, in part or in principle, and sets out eight actions it will take to safeguard Victoria's airports into the future:

- Strengthen the Planning Policy Framework and further implement the National Airports Safeguarding Framework.
- Review the role and content of the Melbourne Airport Environs Strategy Plan.
- Update planning controls, subject to further evidence, to provide targeted responses for: aircraft noise,

wildlife strike risk, pilot distraction from lighting, airspace intrusion and public safety areas.

- Update helicopter landing site provisions to address the risk of airspace intrusion, subject to further evidence.
- Review opportunities to require the expert input of relevant authorities as part of the planning approval process and expand notice provisions for airport operators if appropriate.
- Provide new and updated guidance for practitioners about planning for airports and airports safeguarding.
- Improve access to spatial information.
- Provide information about aircraft noise impacts to potentially affected people.

The first planning scheme amendment arising from MAESSAC and the Government's response was Amendment VC218 (gazetted 18 May 2022). This amendment made changes to Clause 18.02-7S of the Planning Policy Framework to strengthen implementation of the matters set out in the National Airports Safeguarding Framework.

Further planning scheme changes and other initiatives are expected as outlined in the Victorian Government's response.

B2.3.2.2
Environment Effects Act 1978

In Victoria, the assessment of potential environmental impacts or effects of a proposed development may be required under the *Environment Effects Act 1978* (Vic) (EE Act). The process enables statutory decision-makers (ministers, local government and statutory authorities) to decide whether a project with potentially significant environmental effects should proceed. As M3R is being constructed on Commonwealth land and is the subject of approvals under Commonwealth legislation, approval under the EE Act is not required.

B2.3.2.3
Environment Protection Act 2017

The *Environment Protection Act 2017* (Vic) seeks to protect human health and the environment by reducing the harmful effects of pollution and waste through setting environmental quality objectives and establishing programs to meet them. State Environment Protection Policies (SEPPs) are subordinate legislation made under the provisions of the Act to provide more detailed requirements and guidance for the application of the Act to Victoria. SEPPs are used to implement the policies outlined in the primary legislation to protect the environment. The SEPPs relate to emissions to air, water and land in Victoria (including through noise and waste). The Act establishes the powers, duties and functions of EPA, including recommending SEPPs and Industrial Waste Management Policies (IWMPs) to the Governor in Council, issuing works approvals, licences, permits, pollution abatement notices and implementing National Environment Protection Measures (NEPMs). For off-site impacts of M3R, the MDP has taken into consideration the requirements of the relevant SEPPs as detailed in the relevant environmental impact assessment chapters of this MDP (particularly **Chapter B3: Soils, Groundwater and Waste**, **Chapter B4: Surface Water and Erosion**, **Chapter B9: Ground-Based Noise and Vibration** and **Chapter B10: Air Quality**).

B2.3.2.4
Water Act 1989

The *Water Act 1989* (Vic) is the legislation that governs water entitlements and establishes the mechanisms for managing Victoria's water resources. Approval is required to connect to the stormwater system (including open waterways) or to commence work on any utility installations (such as gas, electricity and water) or excavate near Melbourne Water assets. Melbourne Airport is located on Commonwealth land but ultimately discharges stormwater to waterways, which are outside the airport boundary.

Desired environmental conditions of receiving waterways are stipulated under Victorian Government legislation, including the SEPP (Waters).

Further details are provided in **Chapter B3: Soils, Groundwater and Waste** and **Chapter B4: Surface Water and Erosion**.

B2.3.2.5
Aboriginal Heritage Act 2006

The purpose of the *Aboriginal Heritage Act 2006* (Vic) (AH Act) is to provide for the protection of Aboriginal cultural heritage in Victoria. The AH Act is administered by Aboriginal Victoria and is the Victorian Government's key cultural heritage legislation for Indigenous heritage, and identifying and protecting Indigenous heritage places and objects in Victoria. The Act establishes a Victorian Aboriginal Heritage Register (VAHR) that records all the Indigenous heritage places and objects.

Aboriginal Victoria does not have jurisdiction on Commonwealth land and, therefore, the provisions of the AH Act do not apply. Obtaining an approved Cultural Heritage Management Plan (CHMP) or Cultural Heritage Permit would be the normal process for obtaining statutory approval for any works that may cause harm to places listed on the VAHR. While Aboriginal Victoria does not have jurisdiction on Commonwealth land, Melbourne Airport has sought to meet the standards of state heritage assessment in order to address cultural heritage impacts and a voluntary CHMP under the AH Act was considered appropriate to facilitate this. Further details are described in **Chapter B6: Indigenous Cultural Heritage**, which assesses cultural heritage impacts.

B2.3.2.6
Heritage Act 2017

The Victorian *Heritage Act 2017* (Heritage Act) is administered by Heritage Victoria and is the principal

legislation for the identification and management of heritage places and objects of state significance, historical archaeological sites and maritime heritage. The Heritage Act establishes the Victorian Heritage Register (VHR) for places of state significance, the Victorian Heritage Inventory (VHI) for places that have historical archaeological values and the Heritage Council of Victoria.

Heritage Victoria does not have jurisdiction on Commonwealth land and, therefore, the provisions of the Heritage Act do not apply to Commonwealth property that is part of M3R development footprint. Obtaining a 'Consent to Damage' would be the normal process for obtaining statutory approval for any works that may cause harm to places listed on the VHI. As with cultural heritage, Melbourne Airport seeks to meet standards of Victorian European heritage assessment and management legislation given the absence of specific guidance on Commonwealth land. This is addressed in **Chapter B7: European Heritage**.

B2.3.2.7 Flora and Fauna Guarantee Act 1988

The *Flora and Fauna Guarantee Act 1988* (Vic) (FFG Act) is the primary legislation dealing with biodiversity conservation and sustainable use of native ecology in Victoria. Under the FFG Act, a permit is required for the potential impacts and removal of listed flora and fauna. Any species or ecological community listed as threatened under the FFG Act is considered to be of state significance. The FFG Act also sets out protected flora controls, which provide protection over public land for listed threatened flora, plants belonging to a listed threatened community or protected plants declared under section 46 of the FFG Act. The FFG Act listed species, ecological communities and any species listed as rare, vulnerable, endangered or critically endangered on a DELWP advisory list are considered to be of state significance and may also be of relevance under the EPBC Act.

For direct impacts to significant ecological values that cannot be avoided, the provision of appropriate offsets in accordance with the EPBC Act Environmental Offsets Policy (DSEWPaC, 2012) will be the primary mitigation measure. The proposed offset strategy is described in **Chapter E3: Offset Management Strategy**. There is no legislative requirement to provide offsets for state significant ecological values, but as these values largely correspond with nationally listed species and ecological communities, it is anticipated that any proposed offset strategy will assist in mitigating impacts on these values.

A formal ecological assessment has occurred as part of the MDP process which identifies ecological assets impacted by M3R. Further details are described in **Chapter B5: Ecology** which assesses ecological impacts.

B2.3.2.8 Metropolitan Planning Strategy: Plan Melbourne 2017-2050

Plan Melbourne 2017-2050 (Plan Melbourne) is Melbourne's overarching Metropolitan Planning Strategy, released by the Victorian Government in March 2017. A key challenge identified within this strategy is 'keeping up with the growing transport needs of the city', which is 'coming under increased pressure from growth'.

Plan Melbourne's vision for the city is guided by nine principles. Principle 2 seeks to 'develop and deliver infrastructure to support its competitive advantages in sectors such as business services, health, education, manufacturing and tourism'. This principle is further supported by relevant 'outcomes' and corresponding 'policy directions' that are set out in the strategy. The following outcomes are considered relevant to the operation and future expansion of the Melbourne Airport:

- Outcome 1: Melbourne is a productive city that attracts investment, supports innovation and creates jobs
- Outcome 3: Melbourne has an integrated transport system that connects people to jobs, and services and goods to market
- Outcome 4: Melbourne is a distinctive and liveable city with quality design and amenity.

These outcomes are supported through the following directions and policies:

- Direction 1.1 seeks to 'create a city structure that strengthens Melbourne's competitiveness for jobs and investment'. This direction is supported by policy 1.1.5 which:
  - Endeavours to 'support major transport gateways as important locations for employment and economic activity'
  - Identifies that Melbourne Airport is 'well placed to capitalise on growing labour markets and supporting employment and economic development opportunities', which together with Essendon Fields Airport's expanding regional services, 'has the potential to become one of Australia's leading transport and logistic hubs'
  - Highlights the need to protect Melbourne Airport from 'incompatible land uses' through policies that encourage complementary uses and employment generating activity.
- Direction 3.1 seeks to 'transform Melbourne's transport system to support a productive city'. This direction is supported through policy 3.1.4 which:
  - Aims to 'provide guidance and certainty for land-use and transport development through the Principal Public Transport Network and Principal Freight Network'
  - Identifies that the Principal Freight Network will help direct land-use decisions to minimise uses that might conflict with areas expected to have intense freight activity.

- Direction 3.4 aims to 'improve freight efficiency and increase capacity of gateways while protecting urban amenity' and identifies the need to protect Melbourne Airport's curfew-free status and support its expansion. This direction is supported by policy 3.4.3 which:
  - Seeks to 'avoid negative impacts of freight movement on urban amenity' through a more consistent approach to land use planning in freight precincts and corridors.
- Direction 4.5 identifies the need to 'plan for Melbourne's green wedges and peri-urban areas', which provides for food production, stone supply, biodiversity, recreation, tourism and critical infrastructure including airports. The direction seeks to use green wedges and peri-urban areas to protect state infrastructure and is further supported by policy 4.5.2, which:
  - Endeavours to 'protect and enhance valued attributes of distinctive areas and landscapes'
  - Identifies that a desired outcome for GWZ and peri-urban areas is to protect state significant infrastructure, including airports and flight paths.

B2.3.2.9 Growth Corridor Plans 2012

Growth Corridor Plans (GCPs) are high-level integrated land use and transport plans that provide a strategy for the development of Melbourne's four growth corridors over the coming decade (refer to **Figure B2.2**). The plans were prepared by the Growth Areas Authority (now Victorian Planning Authority) to provide a strategy for the development of Melbourne's growth corridors over the next 30 to 40 years. The GCPs provide for housing, jobs, transport, town centres, open space and key infrastructure across Melbourne's newest metropolitan suburbs. The plans also identify broad transport networks, industrial and employment zones, residential areas and recreation precincts.

The GCPs consist of multiple Precinct Structure Plan (PSP) areas, which are at various stages of completion. PSPs are developed in accordance with the PSP guidelines. More specific information regarding the implementation of PSPs has not been prepared as part of this report because the overarching GCP is considered sufficient for the purposes of this land use assessment.

GCPs are relevant to this MDP as they provide information regarding proposed future development around the airport, particularly future residential development. This is important information in terms of airport safeguarding, noise, health and social impact assessments.

GCPs considered relevant to the development and operation of Melbourne Airport are summarised below:

The North Growth Corridor Plan

- The area covered by the North Growth Corridor Plan (north-east of the airport) will eventually accommodate a population of 260,000 or more people and has the capacity to provide for at least 83,000 jobs. It also shows the proposed Outer Metropolitan Ring Road to the north-west of the airport. The majority of new industrial land for the northern metropolitan region will be located within the North Growth Corridor.
- The Plan identifies Broadmeadows as the Central Activities Area (CAA) for Melbourne's north; supported by a network of principal town centres in Epping and Donnybrook and major town centres in Mernda, South Morang, Wollert, Roxburgh Park, Gladstone Park, Craigieburn and Mickleham. Many of these town centres have been located on public transport networks to maximise accessibility (refer to **Figure B2.3**).
- The Plan identifies Melbourne Airport as a 'Specialised Town Centre'.

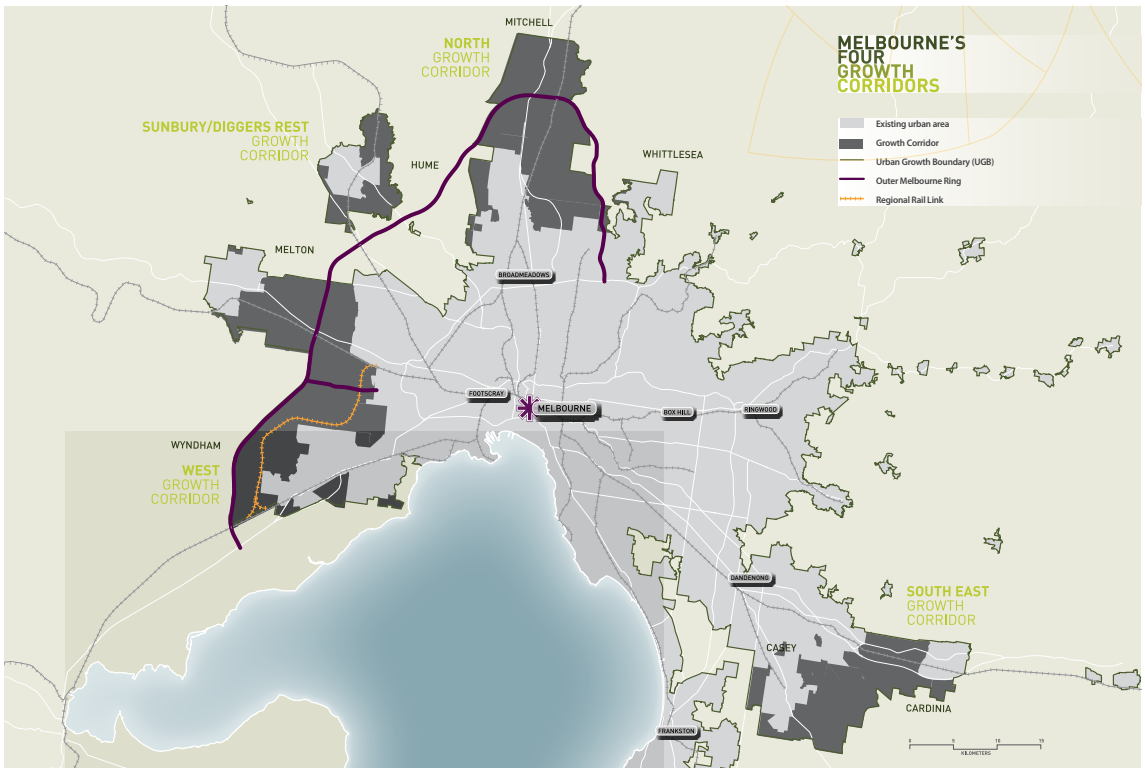
The West Growth Corridor Plan

- The area covered by the West Growth Corridor Plan (south-west of the airport) will eventually accommodate a population of 377,000 or more people and have the capacity to accommodate at least 164,000 jobs.
- Development includes the creation of attractive and accessible locations for a wide range of jobs, investment, and services – including in six new higher-order town centres.
- Creating a network of principal and major town centres at Toolern, Rockbank North, Rockbank South, Plumpton, Sayers Road and Tarneit.
- Connections between districts will be provided by a grid of arterial roads and extended public transport networks. Each town centre is located centrally within its district and will be accessible by multiple transport modes (refer to **Figure B2.4**).
- The Plan identifies Melbourne Airport as a 'Specialised Town Centre'.

The Sunbury Growth Corridor Plan

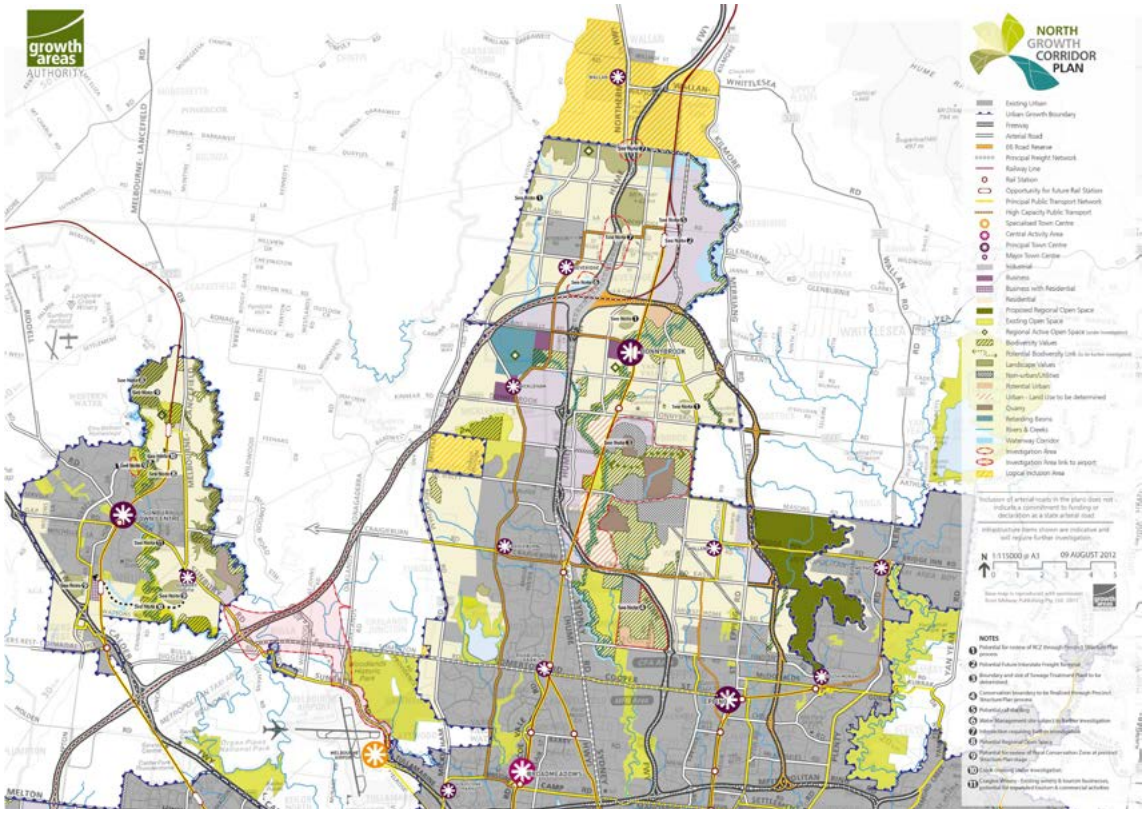
- The area covered by the Sunbury Growth Corridor Plan will eventually accommodate a population of a least 71,000 people and approximately 10,000 jobs.
- There is relatively limited local employment within Sunbury and Diggers Rest at present, primarily due to proximity to other larger employment locations (including Melbourne Airport, which is a major employer in the north).
- The need to improve local transport links (including creek crossings and improved capacity on the main approach roads to the town) are identified as key issues to be addressed in future development of Sunbury and Diggers Rest (refer to **Figure B2.5**).
- The Plan identifies Melbourne Airport as a 'Specialised Town Centre'.

Figure B2.2
Melbourne's four growth corridors



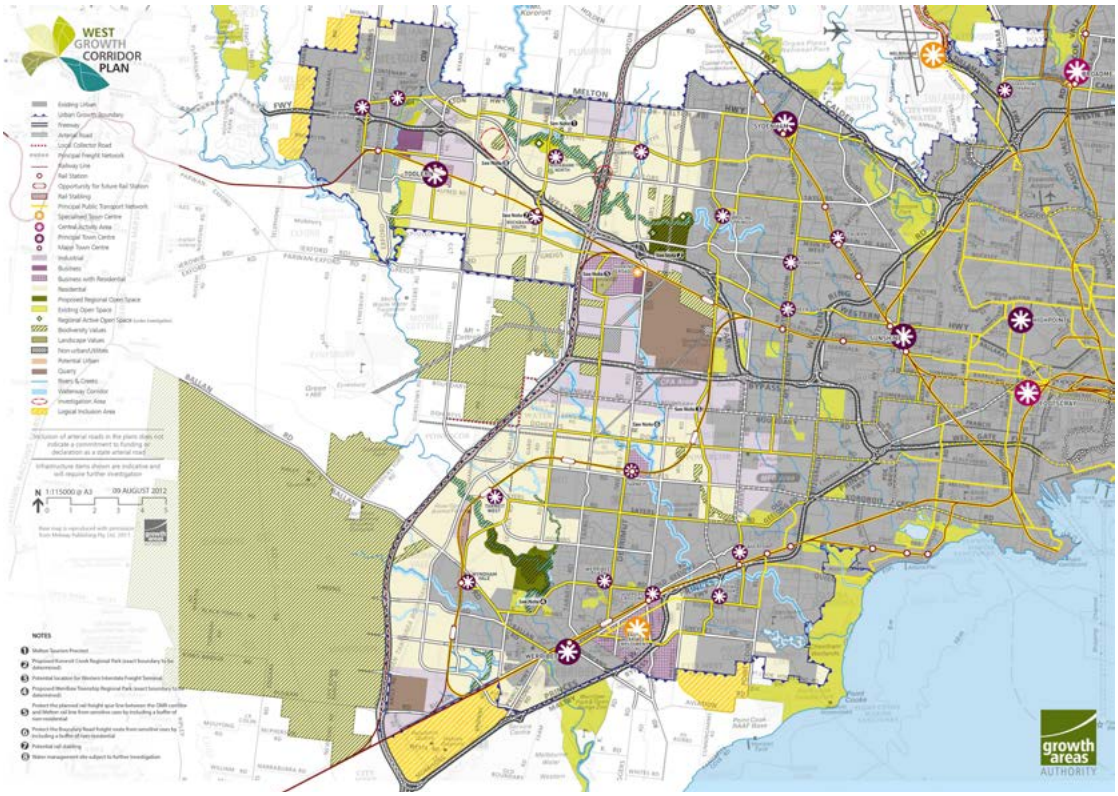
Source: GAA, 2012

Figure B2.3
North Growth Corridor Plan



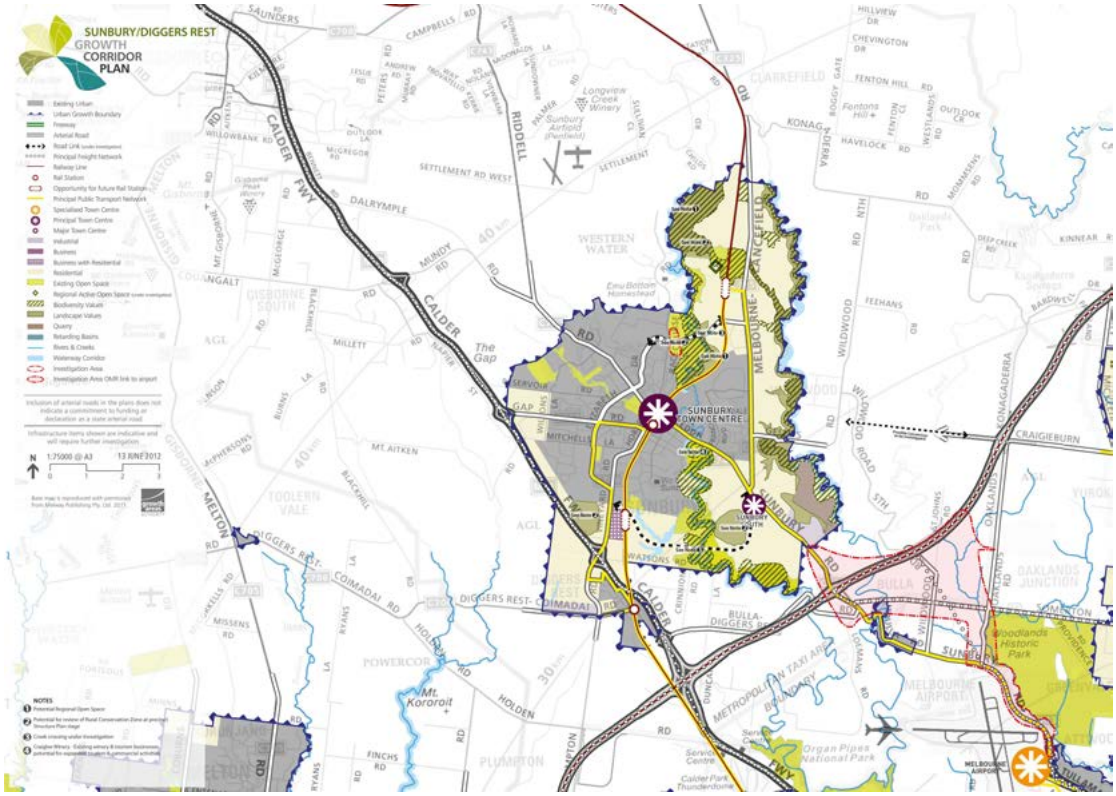
Source: GAA, 2012

Figure B2.4
West Growth Corridor Plan



Source: GAA, 2012

Figure B2.5
Sunbury Growth Corridor Plan



Source: GAA, 2012

B2.3.2.10
Melbourne Airport Environs Strategy Plan 2003

Part 3C of the P&E Act identifies the MAESP as an approved strategy plan and a prescribed document applicable to every municipal council whose municipal district is wholly or partly within the Melbourne Airport Environs Area. It also requires works by a government department, public authority or council to be in conformity with the MAESP unless otherwise approved by the Premier of Victoria.

The Victorian Government prepared MAESP to address a number of issues and concerns with the Airport Environs Overlay in place at the time. The overall aim was to ensure that Victoria could retain a 24-hour, curfew-free airport and manage associated aircraft noise impacts on residential areas. The MAESP's recommendations took the form of a new overlay control (PSA VC30), the MAEO. The introduction of the MAEO reflected the State Government's response to the MAESP Steering Committee's report recommendations and is applied to areas of high and moderate aircraft noise exposure (in excess of the 20 ANEF noise contour) as detailed under **Section B2.3.4.7** of this chapter. The boundaries of the MAEO are based on the 2018 ANEF contours.

The Ministerial Direction on the Form and Content of Planning Schemes requires relevant planning schemes to incorporate Australian Standard AS 2021-2015: Acoustics – Aircraft noise intrusion – Building siting and construction. The MAEO in the relevant planning schemes references AS2021-2015. Land that is or will be subject to high levels of aircraft noise based on the 25 ANEF contour is classified under MAEO Schedule 1 and generally applies to land close to the runway ends. Land that is or will be subject to moderate levels of aircraft noise based on the 20 to 25 ANEF contour is classified under MAEO Schedule 2.

The purpose of the MAEO control is to:

- Implement the Municipal Planning Strategy and the Planning Policy Framework
- Ensure that land use and development are compatible with Melbourne Airport's operation under the relevant airport strategy or Master Plan, and with safe air navigation for aircraft approaching and departing the airfield
- Assist in shielding people from the impact of aircraft noise by requiring appropriate noise attenuation measures in dwellings and other noise-sensitive buildings
- Provide for appropriate levels of noise attenuation depending on the level of forecast noise exposure.

The effectiveness of the Melbourne Airport Environs Area, the Melbourne Airport Environs Strategy Plan 2003, the Melbourne Airport Environs Overlay and other related planning provisions in safeguarding Melbourne Airport's ongoing, curfew-free operation and its environs, was at the time of writing, being reviewed by the Minister for Planning following the MAESSAC review (discussed earlier in **Section B2.3.2.1**).

B2.3.2.11
Planning Policy Framework

All planning schemes contain the Planning Policy Framework (PPF) which establishes the context for spatial planning and decision-making in Victoria. Planning and responsible authorities are to have regard to, and be consistent with, the PPF when formulating and implementing local planning schemes for their municipal area. At an overarching level, the PPF seeks to ensure that the needs of existing and future communities are properly planned having regard to factors ranging from the provision of appropriately zoned and located land, to understanding and minimising environmental impacts.

The relevant sections of the PPF in relation to M3R are summarised below:

- *Clause 11 Settlement* seeks to ensure that planning recognises the need for and contributes towards, among other things, accessibility and land use and transport integration.
    - *Clause 11.01-1R Settlement – Metropolitan Melbourne* aims to create a city structure that attracts investment and drives growth, with particular focus on supporting major Transport Gateways such as airports.
    - *Clause 11.01-1R Green Wedges – Metropolitan Melbourne* endeavours to plan and protect major infrastructure and resource assets that serve the wider Victorian community, such as airports and ports with their associated access corridors.
- *Clause 12 Environmental and landscape values* seeks to ensure that planning protects ecological systems and biodiversity, and conserves areas with identified environmental and landscape values. In particular, the clause identifies that planning must implement environmental principles for ecologically sustainable development that have been established by international and national agreements.
    - *Clause 12.01-1S Protection of biodiversity* seeks to assist in the protection and conservation of Victoria's biodiversity and encourages the use of strategic planning as the primary tool for the protection and conservation of Victoria's biodiversity.
    - *Clause 12.01-2S Native vegetation management* seeks to ensure that there is no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation.
- *Clause 13 Environmental risks and amenity* identifies that 'planning should aim to avoid or minimise natural and human-made environmental hazards, environmental degradation and amenity conflicts'.
    - *Clause 13.05-1S Noise abatement* seeks to assist in the control of noise effects on sensitive land uses by ensuring that development is not prejudiced and community amenity is not reduced by noise emissions by using a range of building design, urban design and land use separation techniques as appropriate to the land use functions and character of the area.

- *Clause 15 Built Environment and heritage* identifies that land use and development planning must support the development and maintenance of communities with adequate and safe physical and social environments for their residents through the appropriate location of uses and development, and quality of urban design.
    - *Clause 15.03-1S Heritage* conservation endeavours to ensure the conservation of places of heritage significance.
    - *Clause 15.03-2S Aboriginal cultural heritage* seeks to ensure the protection and conservation of places of Aboriginal cultural heritage significance.
- *Clause 17 Economic development* acknowledges that planning must provide for a strong and innovative economy and seeks to support and foster economic growth and development by providing land, facilitating decisions and resolving land use conflicts, so that districts may build on strengths and economic potential.
    - *Clause 17.04-1S Facilitating tourism* and *Clause 17.04-1R Tourism in Metropolitan Melbourne* seek to ensure that tourism facilities have access to suitable transport and to maintain Metropolitan Melbourne as a desirable tourist destination by improving transport infrastructure.
- *Clause 18 Transport* seeks to ensure an integrated and sustainable transport system that provides access to social and economic opportunities, facilitates economic prosperity, contributes to environmental sustainability, coordinates reliable movements of people and goods, and is safe.
    - *Clause 18.01-1S Land use and transport integration* seeks to create a safe and sustainable transport system by integrating land use and transport and coordinating development of all transport modes to provide a comprehensive transport system.
    - *Clause 18.02-7S Airport and airfields* seeks to strengthen the role of Victoria's airports and airfields within the state's economic and transport infrastructure, facilitate their siting and expansion and protect their ongoing operation. This clause notes that the NASF must be considered as a relevant policy document. Key strategies include to:
        - Protect airports from incompatible land-uses
        - Prevent land use or development that poses risks to the safety or efficiency of an airport or airfield
        - Minimise the detrimental effects of aircraft noise when planning for areas around airports and airfields
        - Ensure land use and development at airports and airfields contributes to the aviation needs of the state and the efficient and functional operation of the airport or airfield
        - Ensure land use and development at airports complements the role of the airport
        - Plan for areas around airports and airfields so that land use or development does not prejudice future airport or airfield operations or expansions in accordance with an approved strategy or master plan for that airport or airfield
    - *Clause 18.02-7R Melbourne Airport* seeks to protect the curfew-free status of Melbourne Airport and ensure any new use or development does not prejudice its operation. The clause notes that planning must consider as relevant the Melbourne Airport Master Plan 2018 (now superseded by the 2022 Master Plan) and the Melbourne Airport Strategy 1990 (MAS) for planning decisions affecting land in the vicinity of the Melbourne Airport.
- *Clause 19 Infrastructure* seeks to ensure that growth and redevelopment of settlements is planned in a manner that allows for the logical and efficient provision and maintenance of infrastructure, including the setting aside of land for the construction of future transport routes.

B2.3.3
Local planning schemes

The local planning authority administers municipal planning scheme provisions and development approval requirements as per the processes provided for in the state's legislation. The local content of planning schemes must be consistent with the PPF and the Ministerial Direction on the Form and Content of Planning Schemes set out under section 7(5) of the P&E Act. As Commonwealth land, planning scheme provisions do not directly apply to Melbourne Airport land, although they must be considered when preparing a MDP.

Melbourne Airport is wholly located within the City of Hume and therefore the Hume Planning Scheme must be considered. The airport's MAEO noise control traverses the City of Hume and four other municipalities, and therefore the planning schemes for those other four municipalities must also be considered. The following sub-sections identify the relevant clauses of these local planning schemes.

B2.3.3.1
Hume Planning Scheme

The City of Hume's LPPF contained within the Hume Planning Scheme includes the Municipal Strategic Statement (MSS) and local planning policies.
The following clauses of the MSS are particularly relevant to Melbourne Airport and M3R:

- *Clause 21.01 Municipal profile* provides local and regional context for the municipality, noting that it is located approximately 20 kilometres north-west of the Melbourne city centre, is one of Melbourne's seven growth area municipalities and recognises Melbourne Airport as a 'transport gateway' and one of Victoria's key strategic assets and economic drivers.
- *Clause 21.01-2 Protecting the operation of Melbourne Airport* states that the 'importance of the Melbourne Airport to the State's economy, and the accessibility of Melbourne to global markets, depends upon the continued curfew free operation of the airport'. It also states 'As the airport continues to grow it will attract

significant demand for development in proximity to the airport. It will also generate an increase in traffic and increased aircraft noise. Council recognises the need to achieve a balanced approach that protects the curfew free status of the airport and supports economic growth and businesses, whilst at the same time minimising the impacts on existing residents.'

- *Clause 21.01-3 Vision and Strategic Framework Plan* sets the following vision for the municipality 'Hume City Council will be recognised as a leader in achieving social, environmental and economic outcomes with a common goal of connecting our proud community and celebrating the diversity in Hume'. In addition, the land use and development vision identifies Melbourne Airport as an employment precinct that employs local people across a range of trades and professions.
- *Clause 21.02-1 Managing growth and increasing choice* identifies that Growth Corridor Plans and Plan Melbourne have been developed at the metropolitan level which set the strategic direction for the future urban development of land within Melbourne's Urban Growth Boundary.
- *Clause 21.02-2 Hume corridor* identifies key issues for the municipality including the protecting and promotion of Melbourne Airport operations. The clause seeks to 'encourage job growth and diversity' and 'reinforce the role of Melbourne Airport as one of Victoria's key economic assets'.
- *Clause 21.02-4 Non-urban land* sets out Hume's strategy to support land uses and development on non-urban land (green wedge) that are compatible and sympathetic to the rural landscape; and take into account the presence of the Melbourne Airport Environs Overlay and the need to maintain the airport's curfew-free status.
- *Clause 21.08 Natural Environment and Environmental Risk* sets out Hume's objectives and strategies relating to natural heritage, environmental land management and water quality and conservation. Objectives relating to these matters are:
  - To protect, conserve and enhance natural heritage for biodiversity, amenity and landscape character purposes.
  - To improve the land health of the natural environment.
  - To protect water quality and ensure that water resources are managed in a sustainable way.

B2.3.3.2 Brimbank, Melton, Whittlesea and Moonee Valley planning schemes

Brimbank Local Planning Policy Framework

- *Clause 21.06 Built environment* contains several objectives for areas that contribute to the built environment. The following clauses are of relevance to Melbourne Airport and M3R:
  - *Clause 21.06-3 Escarpments and ridgelines* relates to development of escarpments and ridgelines and identifies a number of key policies to guide decision-makers, including that development should not impact on Melbourne Airport's prescribed airspace.
  - *Clause 21.06-4 Landscaping* seeks to ensure landscaping within new developments respects the natural environment and landscape character of the surrounding area. It is strategy that *'Landscaping within the MAEO Schedule 1 and Schedule 2 areas should not be bird attracting and comply with the Melbourne Airport Urban Landscape Plantings Guide'.*
- *Clause 21.07 Housing* identifies the City's opportunities for residential development with an appropriate scale and built form. It is an objective to protect the operations of Melbourne Airport. A strategy in achieving this is to limit residential development within the MAEO areas and apply the Neighbourhood Residential Zone. Further strategic work to support this objective is to investigate mechanisms to control development within the prescribed airspace of Melbourne Airport.
- *Clause 21.09 Industrial land use* also states that development should not impact Melbourne Airport's prescribed airspace.

Melton Local Planning Policy Framework

- *Clause 21.02-2 Established Areas* states that the 'proximity of Melbourne Airport provides significant economic opportunities to the municipality'. It also states that the 'need to ensure the airport's curfew-free status is protected considerably restricts development opportunities within the areas under the Melbourne Airport Environs Overlay. Sensitive land uses on land affected by the Melbourne Airport Environs Overlay Schedule 1 and 2 need to be controlled in order to protect airport operations and maintain appropriate levels of amenity for the Melton community'.

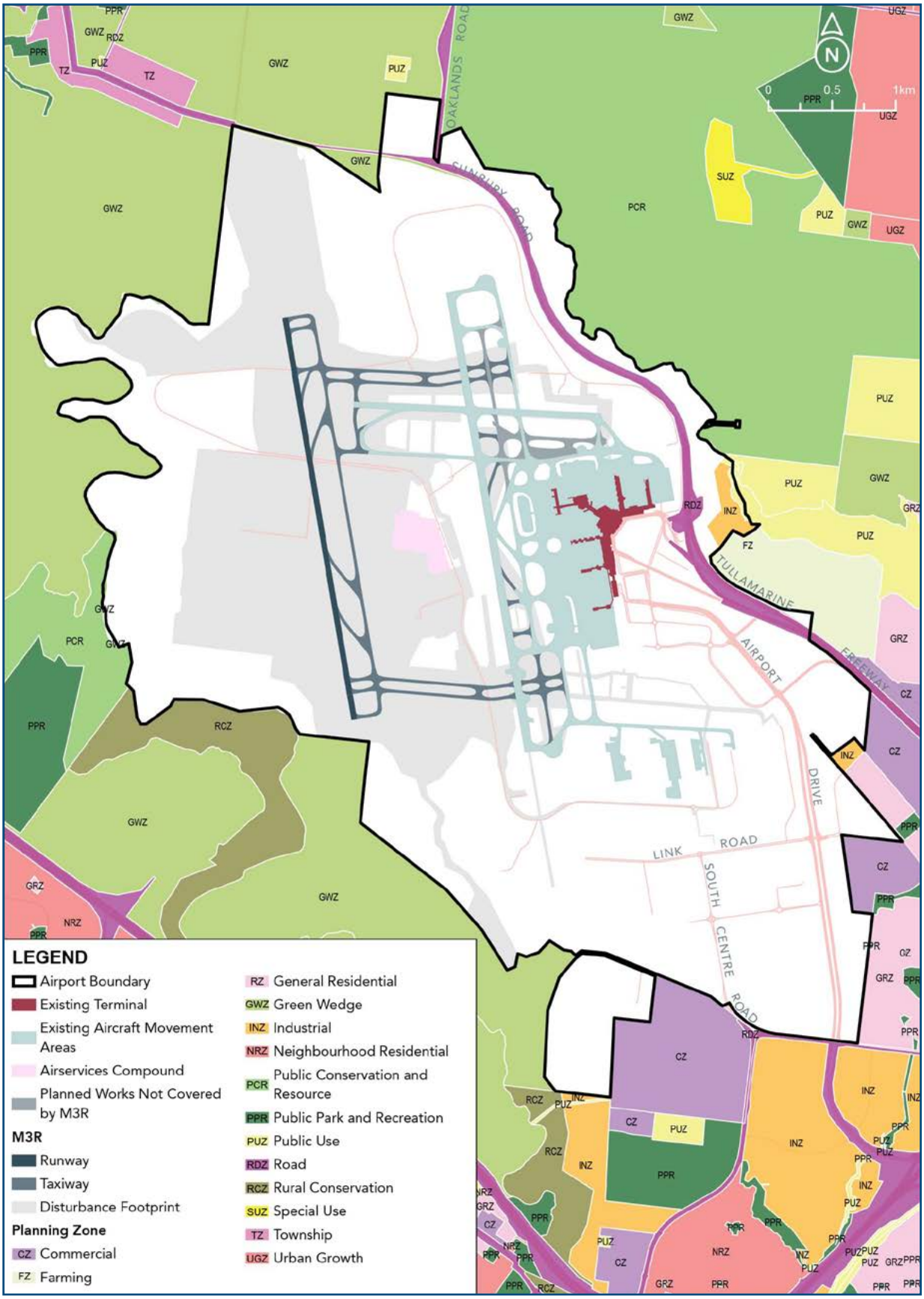
Whittlesea Local Planning Policy Framework

- *Clause 21.04 Settlement* identifies opportunities for activity centres throughout the city with a key focus on strengthening existing centres. Further strategic work is required to support options for strengthening local planning provisions to protect Melbourne Airport and manage the impacts on the community.

Moonee Valley Local Planning Policy Framework

- *Clause 02.01 Context* states that 'Moonee Valley holds strong economic potential as a premier location for business and investment. This is due to its strategic location in the Melbourne CBD-Tullamarine Airport corridor'.

Figure B2.6
Zoning plan



B2.3.3.3 Planning controls

Zones

With the exception of Commonwealth land (a 'Commonwealth Place'), which is not subject to the controls of planning schemes, land within Victoria has a zone, with standard zones used in all planning schemes as required. The following zoning provisions apply to land in the immediate vicinity of the development footprint as shown in Figure B2.6.

- Clause 35.04 Green Wedge Zone (Hume and Brimbank planning schemes)
  - The purpose of this zone, among other things, is to 'recognise, protect and conserve green wedge land for its agricultural, environmental, historic, landscape, recreational and tourism opportunities, and mineral and stone resources' and 'encourage sustainable farming activities'.
  - A permit is required to subdivide land. Depending on land use the zone may require permits for use or to construct a building or construct or carry out works.
- Clause 36.04 Transport Zone (Hume and Brimbank planning schemes)
  - The purpose of this zone, amongst other things, is to 'identify transport land use and land required for transport services and facilities' and 'provide for the use and development of land that complements, or is consistent with, the transport system or public land reservation'.
  - Pursuant to clause 36.04-1 (Table of uses), a permit is not required for a use listed in clause 62.01, which includes *'the use of land for a road except within the urban floodway zone and a public conservation and resource zone'*. In addition, clause 62.02-2 (Buildings and works not requiring a permit unless specially required by the planning scheme) includes roadworks. A permit is required to subdivide land.
- Clause 36.03 Public Conservation and Resource Zone (Hume and Brimbank planning schemes)
  - The purpose of this zone, among other things, is to 'protect and conserve the natural environment and natural processes for their historic, scientific, landscape, habitat or cultural values', and 'provide facilities which assist in public education and interpretation of the natural environment with minimal degradation of the natural environment or natural processes'.
- A permit is required to subdivide land. Depending on land use, the zone may require permits for use or to construct a building or construct or carry out works. Clause 35.06 Rural Conservation Zone (Brimbank Planning Scheme)
  - The purpose of this zone, among other things, is to 'protect and enhance the natural environment and natural processes for their historic, archaeological and scientific interest, landscape, faunal habitat and cultural values' and 'encourage development and use of land which is consistent with sustainable land management and land capability practices, and which takes into account the conservation values and environmental sensitivity of the locality'.
  - A permit is required to subdivide land. Depending on land use the zone may require permits for use or to construct a building or construct or carry out works.

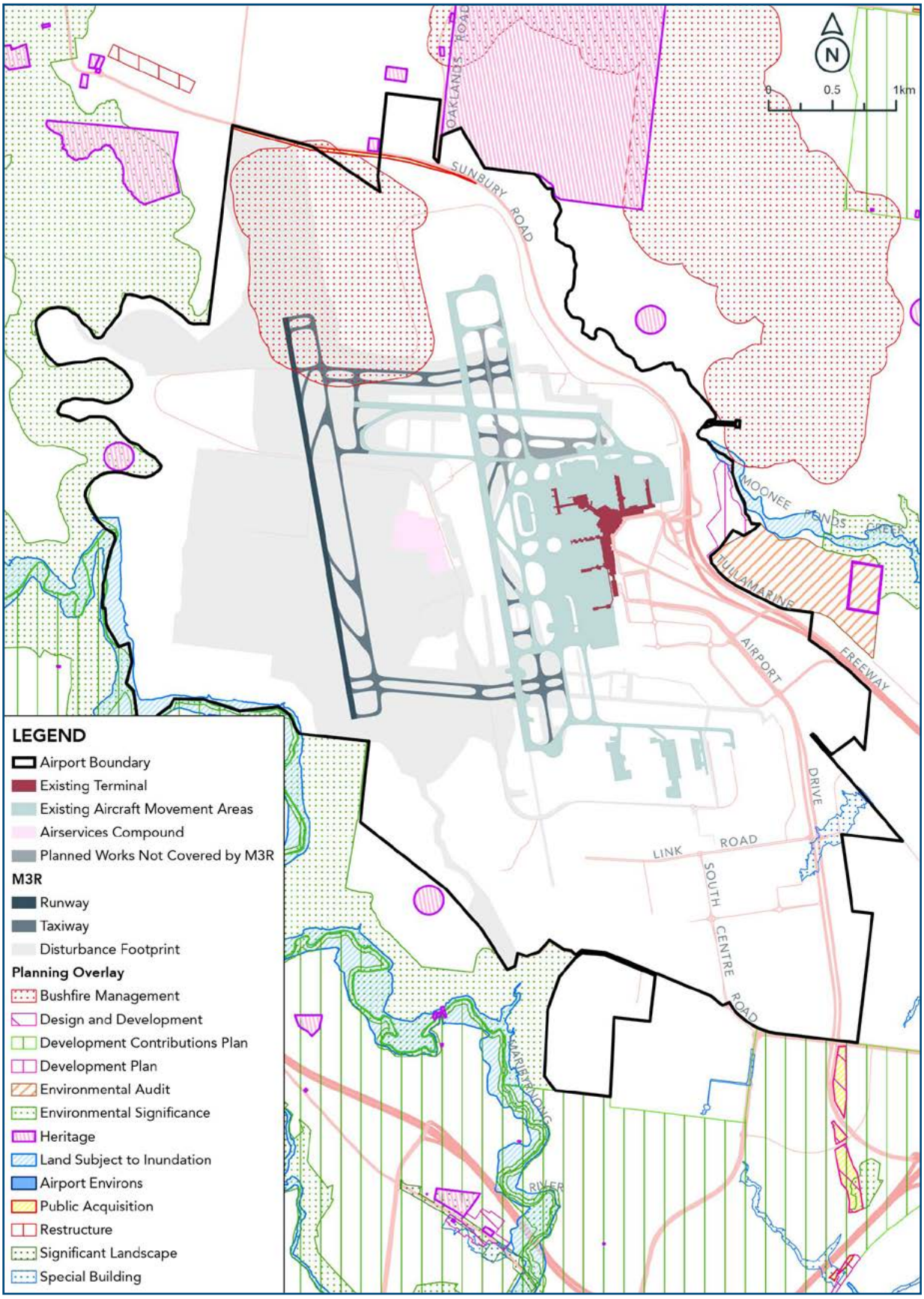
Overlays

A range of overlays apply to land surrounding the Melbourne Airport boundary. These are indicated in Figure B2.7.

The following overlays are located both on and in the immediate vicinity of the airport but do not directly impact the development footprint:

- Clause 42.01 Environmental Significance Overlay (Hume and Brimbank planning schemes)
  - This clause seeks 'to identify areas where the development of land may be affected by environmental constraints' and 'to ensure that development is compatible with identified environmental values'.
  - This overlay may require a planning permit if native vegetation removal is required or to construct a building or construct or carry out works.
- Clause 44.04 Land subject to inundation overlay (Hume and Brimbank planning schemes)
  - This clause seeks to ensure that 'development maintains the free passage and temporary storage of floodwaters, minimises flood damage, is compatible with the flood hazard and local drainage conditions and will not cause any significant rise in flood level or flow velocity'.
  - This overlay would require a planning permit for construction of a building or to construct a building or construct or carry out works and the approval of the relevant floodplain management authority as a section 55 Referral Authority. If a local floodplain development plan has been prepared for the area and has been incorporated into this scheme, an application must be consistent with the plan.
- Clause 43.01 Heritage overlay (Hume and Brimbank planning schemes)
  - Heritage overlays seek to 'ensure that development does not adversely affect the significance of heritage places' and to 'conserve and enhance those elements which contribute to the significance of heritage places'. Full details of the impact of M3R on cultural or European heritage are described in Chapter B6: Indigenous Cultural Heritage and Chapter B7: European Heritage.
  - A permit is required within the heritage overlay to demolish or remove a building or to construct a building or construct or carry out works.

Figure B2.7
Overlay plan (excluding MAEO)



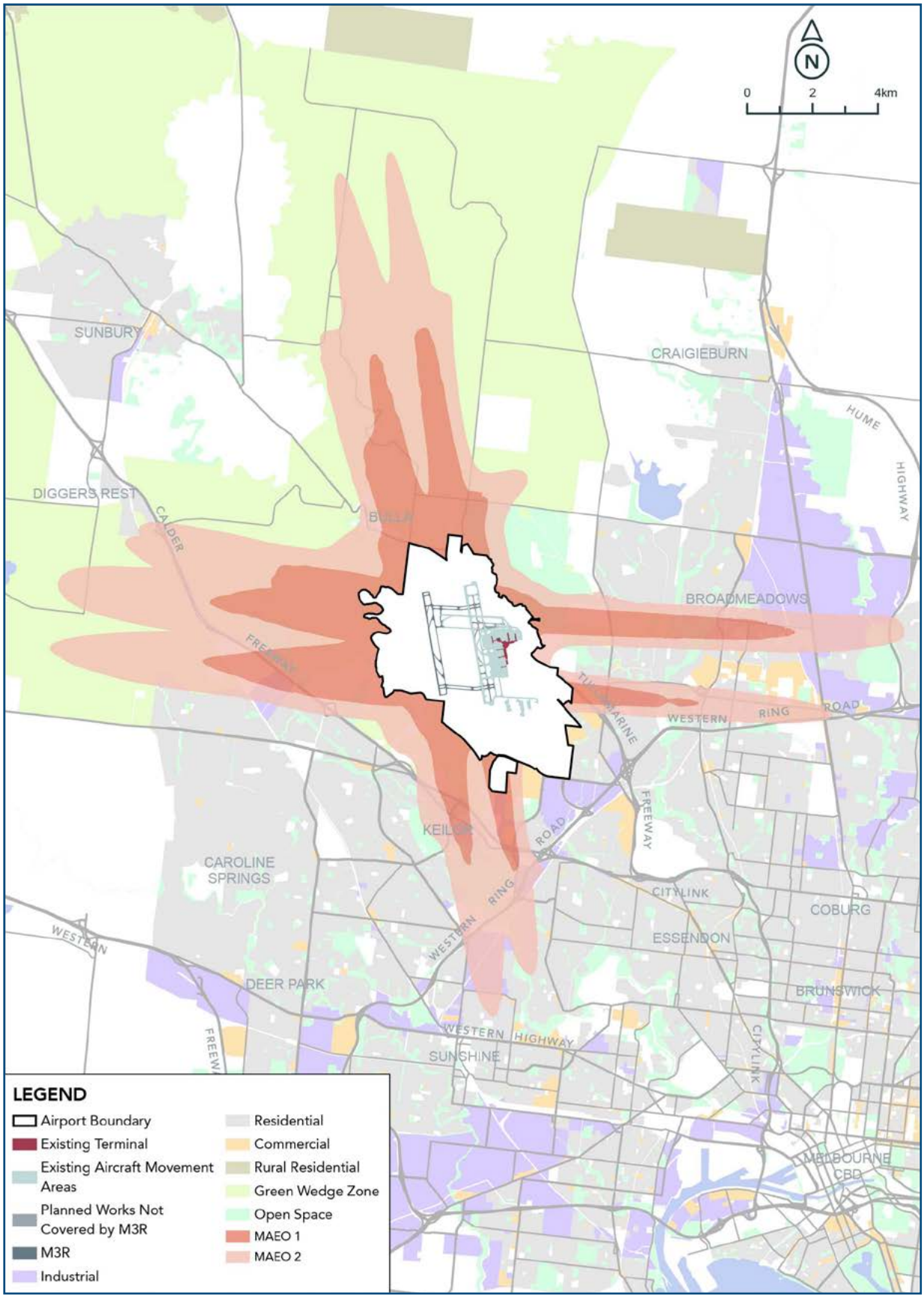
- Clause 44.06 Bushfire Management Overlay (BMO) (Hume Planning Scheme)
  - The BMO seeks to 'ensure that development of land prioritises the protection of human life and strengthens community resilience to bushfire; to identify areas where the bushfire hazard warrants bushfire protection measures to be implemented; and to ensure development is only permitted where the risk to life and property from bushfire can be reduced to an acceptable level'.
  - The overlay would require a planning permit to subdivide land, and to construct a building or construct or carry out works associated with particular uses.
- Clause 45.08 Melbourne Airport Environs Overlay (MAEO) (Hume, Brimbank, Melton, Moonee Valley and Whittlesea planning schemes)
  - The MAEO (refer to **Figure B2.8**) is a planning tool to manage the use and development of land within close proximity to Melbourne Airport. The overlay seeks to minimise the number of people exposed to aircraft noise through setting density limits, enforcing acoustic requirements for building and it can restrict certain land uses. The MAEO is currently based on the 2018 ANEF contours and AS2021-2015: Acoustics – Aircraft noise intrusion – Building siting and construction. Municipalities surrounding the airport apply the provisions of the MAEO to noise sensitive land uses within close proximity of the airport.
  - The purpose of the MAEO is, among other things:
    - 'To ensure that land use and development are compatible with the operation of Melbourne Airport in accordance with the relevant airport strategy or master plan and with safe air navigation for aircraft approaching and departing the airfield.
    - To assist in shielding people from the impact of aircraft noise by requiring appropriate noise attenuation measures in dwellings and other noise sensitive buildings
    - To provide for appropriate levels of noise attenuation depending on the level of forecasted noise exposure.'
  - The overlay introduces a range of controls for buildings and works which must be constructed so as to comply with any noise attenuation measures required by AS 2021- 2015, Acoustics - Aircraft noise intrusion - Building siting and construction. The classification of land into Schedule 1 and Schedule 2 is determined by the predicted level of noise exposure according to the ANEF.
  - Land that is or will be subject to high levels of aircraft noise based on the 25 ANEF contour (or greater) is classified under Schedule 1 to provide the greatest level of control of the use and development of the land. MAEO1 prohibits the development of noise-sensitive land uses, such as accommodation (excluding dwellings), child care centres, education centres and hospitals. It requires a planning permit for other land uses that may be sensitive to aircraft noise. The overlay prohibits the subdivision of land that would increase the number of dwellings for which the land could be used. Uses such as industry are not affected by this overlay.
  - Land that is or will be subject to moderate levels of aircraft noise based on the 20 to 25 ANEF contour is classified under Schedule 2. MAEO2 does not prohibit sensitive uses but does require a planning permit for such uses. It also specifies a lot size minimum for subdivisions.

B2.3.3.4 Particular and general provisions

The following particular and general planning provisions, applicable to all councils neighbouring the airport, are also of relevance to development of M3R.

- Clause 52.15 Heliport and helicopter landing site
  - Clause 52.15 of the Victoria Planning Provisions seeks to ensure the amenity impacts of a heliport and a helicopter landing site on surrounding areas is considered. A permit is required to use or develop any land for a heliport or a helicopter landing site even if it is ancillary to another use on the land unless specifically exempt via the table of exemptions for use.
- Clause 52.17 Native vegetation
  - Clause 52.17 of the Victoria Planning Provisions is relevant to M3R insofar as native vegetation may be impacted outside the airport site. The purpose of the clause is to ensure that there is no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation. A permit is required to remove, destroy or lop native vegetation unless exempt in accordance with the schedule to the clause or is listed in a native vegetation precinct plan. An impact on Commonwealth land is exempt from the Victoria Planning Provisions, including the requirement to obtain a permit for the removal of native vegetation and provide appropriate offsets in accordance with the Biodiversity Assessment Guidelines.
- Clause 52.29 Land adjacent to the principal road network
  - Clause 52.29 of the Victoria Planning Provisions seeks to ensure appropriate access to the Principal Road Network or land planned to form part of the Principal Road Network and requires a planning permit to create or alter access to a road in a Transport Zone 2 (TRZ2). The creation of a new access way or the alteration of an existing access way will require a planning permit and the approval of Transport for Victoria as a section 55 Referral Authority.

Figure B2.8
Melbourne Airport Environs Overlay (MAEO)



- Clause 63.01 Extent of existing use rights
  - An existing use right is established in relation to use of land under this scheme if any of the following apply:
    - 'The use was lawfully carried out immediately before the approval date
    - A permit for the use had been granted immediately before the approval date and the use commences before the permit expires
    - A permit for the use has been granted under clause 63.08 (alternative use) and the use commences before the permit expires
    - Proof of continuous use for 15 years is established under clause 63.11 (proof of continuous use)
    - The use is a lawful continuation by a utility service provider or other private body of a use previously carried on by a Minister, government department or public authority, even where the continuation of the use is no longer for a public purpose'.

B2.3.4
Airport strategies and plans

B2.3.4.1
Melbourne Airport Strategy 1990

A key step in the history of runway options development at Melbourne Airport was the preparation of the Melbourne Airport Strategy (MAS). The MAS and associated Environmental Impact Statement (EIS) were prepared jointly by the Federal Airports Corporation and the Victorian Government, and endorsed by the Commonwealth and Victorian governments in 1990. The MAS was designed to provide a foundation for the ongoing long-term development of Melbourne Airport and, in accordance with the former *Environment Protection (Impact of Proposals) Act 1974* (Cth), provided an assessment of environmental issues identified in the MAS. The EIS involved extensive community and industry consultation.

The MAS (which was prepared based on the best available information at the time) provided a broad framework for orderly airport development, road and rail access, and external land use control to protect the airport's 24-hour, curfew-free operation. It established the historic context for M3R, and encompassed a number of separate studies including a Runway Strategy, Landside Strategy, Land Use Strategy, Surface Access Strategy and Economic Benefits Study.

Importantly, the EIS included provision for the future development of a four-runway layout, which has been reflected in all Melbourne Airport master plans since 1990. This layout included wide-spaced parallel north-south and east-west runways to optimise hourly and annual capacities and operational flexibility. M3R's parallel north-south runway clearly facilitates the implementation of part of the four-runway system envisaged within the MAS in 1990, which was subject to the EIS approved by the Commonwealth Government. Further information on the development of runway options under the MAS is described in **Chapter A3: Options and Alternatives**.

It is noted that the Airports Act was enacted following the approval of the MAS and requires Commonwealth-regulated airports, including Melbourne Airport, to prepare a Master Plan every five years to establish the strategic direction of the airport. As such, the MAS/EIS has been superseded by the current Melbourne Airport Master Plan and is not a binding document under the Airports Act. It is acknowledged that the MAS is a policy guideline within PPF clause 18.02-7R, alongside the Master Plan and NASF.

For clarity, the relevant strategic document foreshadowing the development of Melbourne Airport at any point in time is the current Melbourne Airport Master Plan.

B2.3.4.2
Melbourne Airport Land Use Study 1992

The Melbourne Airport Land Use Study established the context for the protection of the airport from future encroachment from sensitive uses. The study made a number of recommendations in relation to the introduction of planning controls to limit the development of noise-sensitive land uses in certain areas around the airport.

This included areas within which noise-attenuation features will be required in construction, and areas of land suitable for airport-related commercial and industrial development.

The recommendations of the study subsequently led to the introduction of land use planning controls for land surrounding the airport. This formed the basis of the first Airport Environs Overlay introduced in 1996. The study also led to the introduction of a Public Acquisition Overlay applying to areas identified in the MAS EIS for future runway development, including some of the land now subject to this MDP (which has since been acquired).

B2.3.4.3
Melbourne Airport Master Plan 2022

The Airports Act requires that Melbourne Airport develop a new Master Plan every five years. The 2022 Master Plan was prepared in accordance with the five-year planning cycle in section 76 of the Airports Act and was approved by the Commonwealth Minister for Infrastructure, Transport, Regional Development and Local Government on 14 November 2022.

Melbourne Airport's 2022 Master Plan outlines the vision and strategic intent for Melbourne Airport's future development over the next 20 years. The Master Plan has regard to state and local planning requirements. This applies most readily at the 'strategic level' for both state interests and council planning intent.

The proposed north-south runway (16R/34L) is clearly identified as an element of the 2027 Development Concept Plan for the airport in the 2022 Master Plan. The Long-Term Development Concept (refer to Figure B2.9) includes the four runways as well as a full build-out of the airport site. M3R is also a key element of the Master Plan's Airside Development Plan (Part C9 of the Master Plan).

M3R is therefore consistent with the 2022 Master Plan and its short, medium and long-term development scenarios.

The 2022 Master Plan also contains an ANEF which was endorsed for technical accuracy by Airservices Australia on 10 January 2022. This long-range ANEF comprises five ANECs prepared for the major operational stages of the airport's development, including three ANECs for the operation of three runways incorporating parallel north-south runways (ANECs 3A, 3B and 3C). Compared to the 2018 ANEF, the area captured by the 2022 ANEF contours, 20 and above, decreased by approximately 24 per cent, shrinking by approximately 37 square kilometres to 117.9 square kilometres.

B2.3.4.4
Melbourne Airport Master Plan 2022: Airport Land Use Plan

The 2022 Master Plan contains an Airport Land Use Plan. In accordance with the zoning provisions outlined in the Airport Land Use Plan, any activities listed in sections 89 and 89A of the Airports Act that are classified as a major airport development or a sensitive development require an MDP to be prepared which is subject to approval by the Commonwealth Minister for Infrastructure, Transport, Regional Development and Local Government.

The Airport Land Use Plan for Melbourne Airport designates three land use precincts, each with a different focus or function:

- Aviation Precinct
- Landside Main Precinct
- Landside Business Precinct.

The Master Plan also contains a Zoning Plan (Figure B2.10). M3R's development footprint is contained within the Special Use Zone Schedule 1 (Aviation Precinct).

The application of the Special Use Zone to the Aviation Precinct aims to reflect and accommodate the critical role and specific nature of this area. Under the VPP, the proposed use falls under the definition of 'Airport' which is a permitted use in the Special Use Zone 1. M3R is therefore consistent with the Master Plan and with the applicable zones.

The M3R works are contained within the Aviation Precinct. The role of the Aviation Precinct is to:

- safe, secure and efficient airfield activities including aircraft take-off, landing, taxiing, handling and parking
- aircraft navigation aids, Aviation Rescue Fire Fighting Services and other facilities essential to aircraft operations
- the operation, use and development of land for passenger and baggage processing, thereby enabling the terminal facilities to operate safely, securely, efficiently and cost-effectively
- best-practice facilities for airlines and passengers, including efficient terminal facilities with sufficient commercial areas and utilities infrastructure
- integrated terminals with commercial, office and retail uses
- the flexible expansion of passenger terminal facilities to meet forecast demand
- 24-hours-a-day, seven-days-a-week aircraft operations.

Aviation fuel storage facilities at Melbourne Airport must meet increased fuel demands and ensure the airport retains sufficient on-site storage. The requirements for expansion of this infrastructure and associated land are shown in the 2022 Master Plan's development concept plans, classified as aviation support.

The Airports Act requires a Master Plan to describe the extent to which the proposals contained in the Plan are consistent with planning schemes in force under state law. The application of the Special Use Zone to the operational areas of the airport is consistent with the Planning Policy Framework and Victoria Planning Provisions. This is further outlined under Sections B2.3.2.11 and B2.3.3 of this chapter.

B2.3.4.5
Melbourne Airport Environment Strategy 2022

Environmental management at Melbourne Airport is carried out in accordance with Melbourne Airport's approved Environment Strategy.

The Environment Strategy provides a platform to review previous actions and provides guidance for new actions required for continuous improvement and positive environmental outcomes. It includes elements of APAM's Environment, Social and Governance (ESG) Strategy (which is discussed in Chapter A7 of this MDP).

The strategy contains objectives, targets and environmental action plans that aim to assist with achieving the Melbourne Airport Environment and Sustainability Policy goal and therefore meet the requirements of the Airports Act. The Melbourne Airport Environment and Sustainability Policy goal is to "be an environment and sustainability leader for transport and logistics in the Asia-Pacific". Proactive communication and interaction with business partners and other stakeholders is required to implement defined sustainability standards and frameworks that respond to the global challenge of climate change and allow continuous commitment to the Airport Carbon Accreditation Scheme.

Melbourne Airport also has in place an Environment Management System, which is certified to the international standard ISO14001. The Environment Strategy highlights areas within the Melbourne Airport site which are considered to have environmental significance status and have been designated as conservation and recreation areas. M3R will occur within an area clearly designated for runways within the Environmental and Heritage Values 2042 Development Footprint plan (reflecting the ultimate development vision for environmental management at the airport) contained within the Environment Strategy.

The airport perimeter in the vicinity of the works is identified for conservation and recreation and the area adjacent to the Grey Box Woodland is identified as an historic site which may also contain Indigenous features. Detailed consideration of the airport environs and European and cultural heritage is described in subsequent chapters of Part B of this MDP.

Environmental management of M3R construction and operational impacts will be undertaken in accordance with the Melbourne Airport Environment Strategy and Environmental Management System. Specifically, M3R construction impacts will be managed through development and implementation of a Construction Environmental Management Plan (CEMP).

B2.3.4.6
Ground Transport Plan 2022

The 2022 Master Plan incorporates the Ground Transport Plan for Melbourne Airport. The Ground Transport Plan sets out the actions required to address the forecast increases in passenger, employee and commercial vehicle travel to Melbourne Airport. In particular, the plan continues the development of a long-term solution to address congestion in the peak periods and details opportunities to increase the use of mass transit and to manage travel demand through infrastructure and non-infrastructure solutions.

The Ground Transport Plan focuses on Melbourne Airport's strategy for moving people and freight at the airport, and access to and from the airport based on the aviation- and non-aviation developments identified in the 2022 Master Plan.

B2.3.4.7
Australian Noise Exposure Forecast

The Airports Act requires that a Master Plan includes an ANEF to determine likely noise exposure around the airport. ANEFs are the official forecasts of future noise-exposure patterns around an airport and constitute the contours on which land use planning authorities base their controls. (The system was developed as a land use planning tool aimed at controlling encroachment on airports by noise-sensitive buildings.)

Three types of aircraft noise charts are produced using the ANEF system: the Australian Noise Exposure Index (ANEI), Concept (ANEC) and Forecast (ANEF). The ANEI contour map presents historic aircraft noise levels over a certain time period (usually one year). The ANEC chart is a map showing forecast contours of aircraft noise exposure around the airport, based on indicative data on aircraft types, aircraft operations and flight paths. The ANEF chart provides cumulative noise effects for a given year of operations, with contours representing an average annual day (i.e. a measure of the total noise exposure over a 12-month period divided by 365 days).

The 2022 Master Plan contains Melbourne Airport's Long Range ANEF (as shown in **Figure B2.11**) which was endorsed for technical accuracy by Airservices on 10 January 2022. The ANEF contours represent the airport's forecast impact, based on information available at the time. The 2022 Master Plan also contains an ANEI for 2019.

As outlined in **Section B2.6.2.3**, land that is or will be subject to high levels of aircraft noise based on the 25 ANEF contour is classified under MAEO Schedule 1, which generally applies to the airport and immediate surrounds. Land that is or will be subject to moderate levels of aircraft noise based on the 20-25 ANEF contour is classified under MAEO Schedule 2. It has, however, been recognised that aircraft noise is not confined to areas inside the 20 ANEF noise contour, and that many complaints relating to aircraft noise originate from beyond this contour line.

There are limitations of the ANEF system that relate to the ability to describe aircraft noise. Number-above noise contours (or 'N contours') are considered a useful additional information tool for airport operators, particularly in assisting communities to better understand potential noise impacts. In Victoria, the State Government has agreed to consider N contours when considering planning scheme amendments and other strategic planning proposals.

NASF Guideline A recommends using N contours to supplement the ANEF contours. The N contour system is a complementary aircraft noise metric which produces contours showing the potential number of aircraft noise events above 60dB(A), 65dB(A) or 70dB(A) and represents these through corresponding N60, N65 and N70 diagrams. The Master Plan 2022 includes N contours. Further information relating to noise is described in **Chapter C3: Aircraft Noise Modelling Methodology** and **Chapter C4: Aircraft Noise and Vibration**.

Figure B2.9
Melbourne Airport Master Plan 2022 – Long Term Development Concept Plan for Melbourne Airport

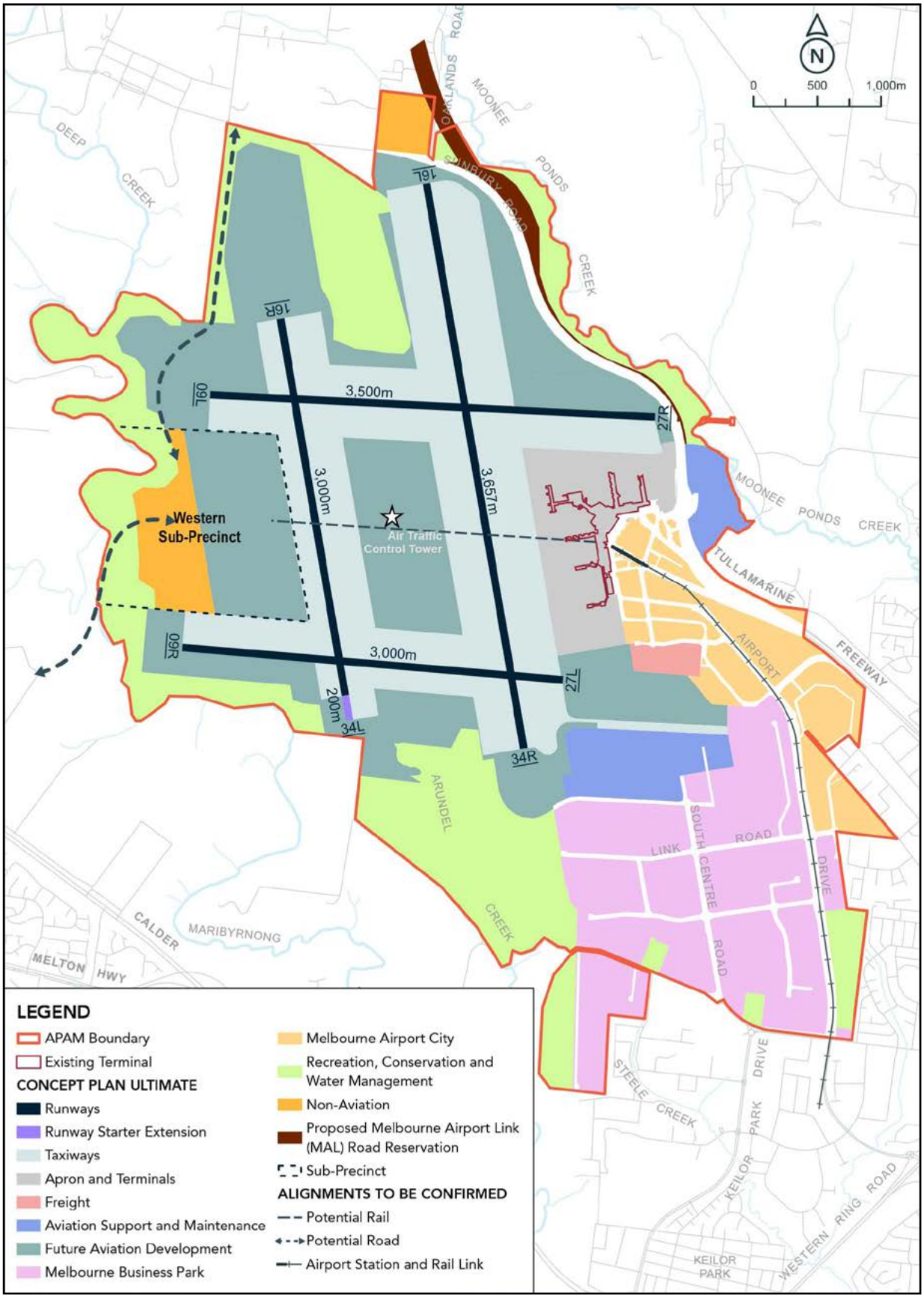


Figure B2.10
Melbourne Airport Master Plan 2022 – Zoning Plan

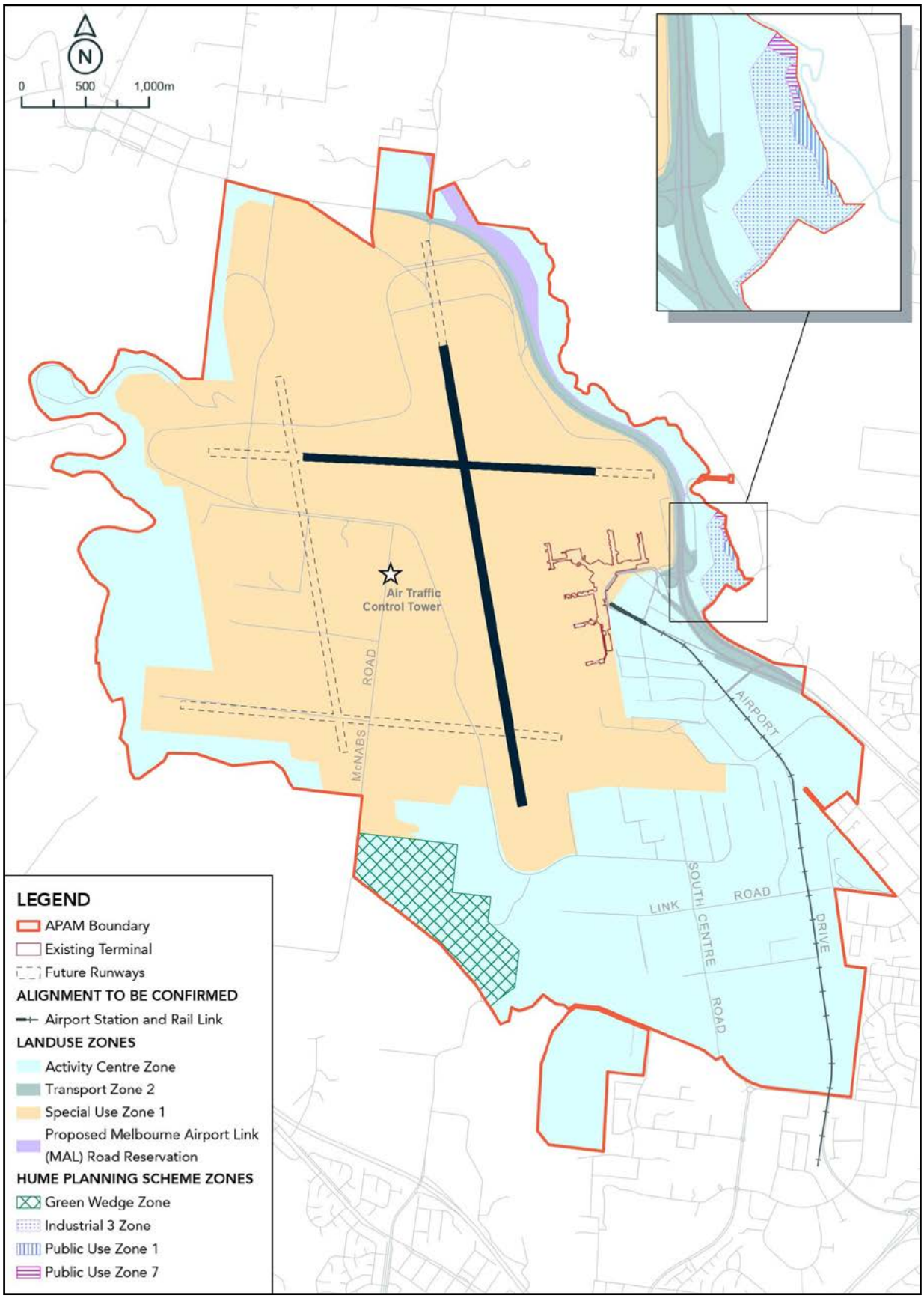
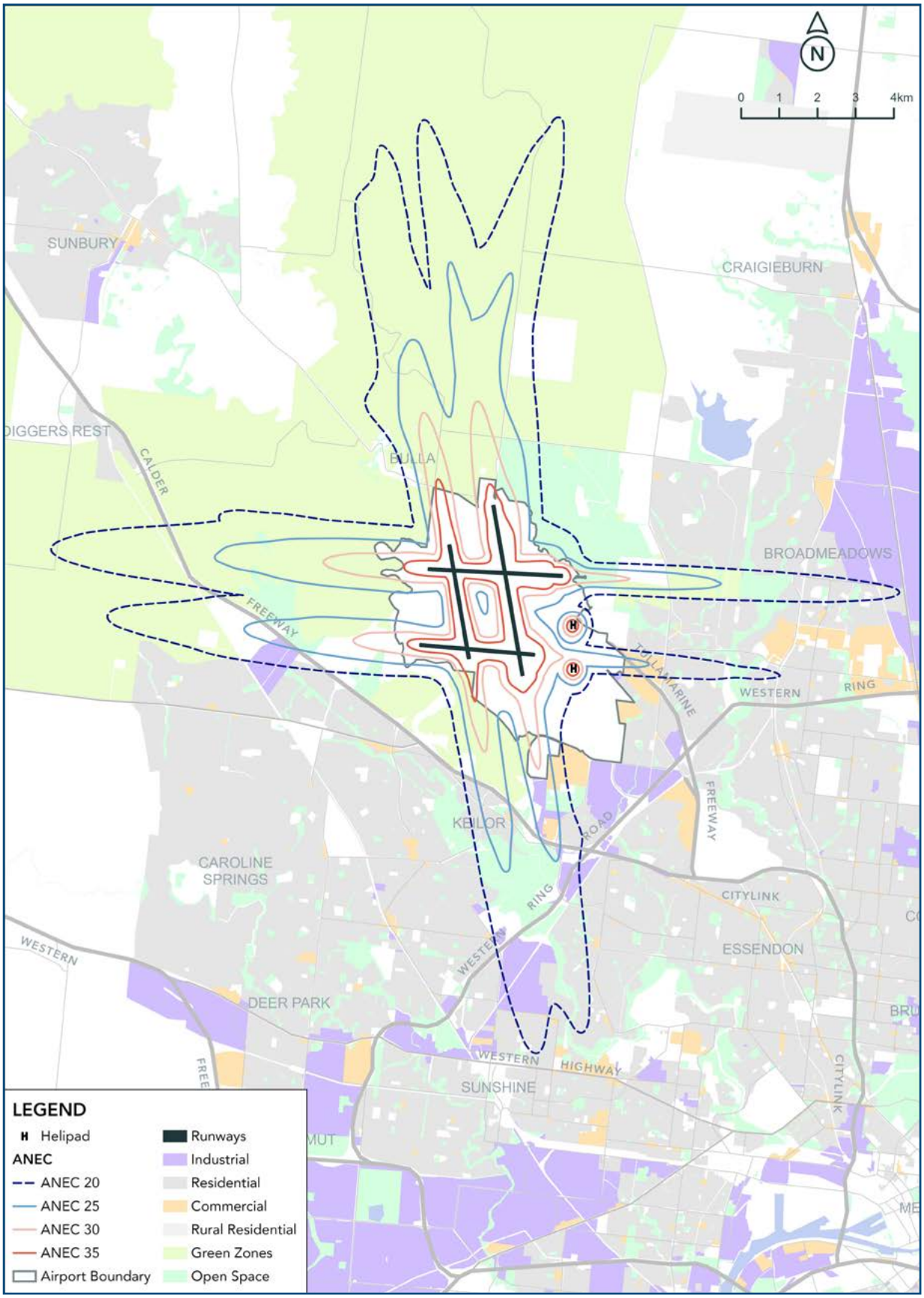


Figure B2.11
Master Plan 2022 Long Range ANEF for Melbourne Airport



Source: APAM, 2018

B2.4
DESCRIPTION OF SIGNIFICANCE CRITERIA

The impact assessment has involved the identification and evaluation of potential interactions between M3R components and activities and sensitive assets, values and uses in order to identify potential land use and planning impacts.

Potential receptors were established from the existing conditions assessment by identifying assets, values or uses that are protected by legislation and policy, important to the local community (or wider geographic area) or likely to be impacted by M3R. The receptors and the causes and outcomes of potential impacts were considered, which were then assessed in terms of likelihood and consequence to determine the magnitude of impact that could occur.

- Severity criteria - considers impact based on intensity, scale and duration
- Likelihood assessment - denotes the likelihood of the impact occurring and associates a risk rating.

To assist in the assessment of potential impacts identified under **Section B2.6.2** of this chapter and to ensure consistency between topics, project-specific severity criteria have been developed in relation to land use and planning impacts. These are described in **Table B2.2**. Duration impact criteria and likelihood criteria are described in **Chapter A8: Assessment and Approvals Process**.

B2.5
EXISTING CONDITIONS

B2.5.1
Study area

Land at Melbourne Airport is primarily utilised for aviation purposes, which comprise passenger and freight flight movements. Within the airport site are airside and landside facilities, including runways, aprons and terminal buildings. The airport also contains a range of complementary land uses, including hotels, car parks, public transport facilities, car rentals and commercial, retail and industrial activities. The Melbourne Airport Business Park extends from the Tullamarine Freeway and Mercer Drive in the north to Annandale Road and Sharps Road in the south, and contains a mixture of aviation and non-aviation-related development.

The development footprint is generally bounded by the existing north-south runway to the east, Deep Creek and the Maribyrnong River to the west and south-west, and Sunbury Road to the north.

Table B2.2
Severity criteria

Impact severity	Description
Major	Land use changes inconsistent with nationally significant planning policies and strategic plans. Permanently affects capacity to provide land for nationally significant residential or economic growth. Permanently affects ability for existing land use to continue in accordance with nationally significant planning policies/strategic plans. Major adverse change to current amenity, lifestyle and everyday community activities.
High	Land use changes significantly inconsistent with regionally/state significant planning policies, strategic plans and relevant development area structure plans with a major impact on the capacity to provide land for state significant residential or economic growth. Permanently affects ability for existing land use to continue in accordance with regional/state planning policies/strategic plans. Considerable adverse change to current amenity, lifestyle and everyday community activities.
Moderate	Land use changes somewhat inconsistent with local planning policies, strategic plans and relevant development area structure plans with a moderate impact on the capacity to provide land for locally significant residential or economic growth. Permanently affects ability for existing land use to continue in accordance with local planning policies/strategic plans. Noticeable adverse change to current amenity, lifestyle and everyday community activities - but with scope for mitigation.
Minor	Land use changes broadly consistent with planning policies, strategic plans and relevant development area structure plans with a limited impact on capacity to provide land for residential or economic growth. Temporary effect on ability for existing land use to continue in accordance with planning policies/strategic plans. There may be localised or limited noticeable change to current amenity, lifestyle or everyday community activities.
Negligible	Land use changes entirely consistent with planning policies, strategic plans and relevant development area structure plans. No effect on ability for existing land use to continue in accordance with planning policies/strategic plans. Minimal to no change to the existing situation.
Beneficial	Land use changes are likely to have beneficial impacts by implementing relevant planning policies, strategic plans and relevant development area structure plans.

The development footprint and wider study area is a highly modified urban fringe environment, which has been subject to significant disturbance. Historically, large areas of the M3R study area have been used for grazing, both prior to the construction of the airport in the 1960s and more recently in the areas to the west of McNabs Road and south of the existing east-west runway. This area is characterised by low grasses and weed species with limited larger vegetation species along historic fence lines, property boundaries and roads, and along the river and creek corridors. Broader areas of grass-dominated vegetation occur between the established airport infrastructure which includes runways, taxiways, HIALS, management roads and various buildings and other structures. The Grey Box Woodland on the northern part of the study area is well established and recognised by the Master Plan as having ecological and heritage significance. A range of site photographs are provided in **Figure B2.12, Figure B2.13** and **Figure B2.14**, showing the general characteristics of the site.

Topographically, Melbourne Airport and the M3R project area are located on a relatively flat plateau, with some steep undulation associated with Deep Creek, Maribyrnong River and Arundel Creek to the west of the existing north-south runway. (Arundel Creek is a tributary of the Maribyrnong River.)

Figure B2.12
View north/north-west along McNabs Road from the south end of the site

Figure B2.13
View north-east from McNabs Road at the south end of the site

Figure B2.14
View south/south-west from Sunbury Road at the north end of the site

To the south and west of M3R, Jacksons Creek, Deep Creek and the Maribyrnong River dissect this plateau landscape with steep banks descending approximately 70 metres below the plateau in parts. To the south of the airport, the southern banks of the Maribyrnong River have been modified through historic agricultural land uses and a widened river valley has been created.

B2.5.2
Land use

The majority of the proposed works and ancillary activities associated with M3R will occur within the existing Melbourne Airport boundary. This section describes existing and planned future land use conditions of the surrounding areas outside the airport boundary:

- Residential and community facilities
- Industrial, commercial and retail (including extractive industry) development
- General agriculture and farming
- Public open space and recreation.

Melbourne Airport is predominantly surrounded by non-urban or green wedge land, particularly to the north and west, which helps separate the airport and its flight paths from the encroachment of incompatible activities. However, there is established urban development located to the east and south of the airport, comprising a mixture of industrial and residential development. The township of Bulla is nearby, to the north-west.

The impact of M3R on land use will primarily be in corridors extending in a northerly and southerly direction based on the proposed new north-south runway.

B2.5.2.1
Northerly direction

To the north of the M3R project area, land use largely comprises the small township of Bulla (to the north-west), and rural-residential or rural-living land uses in the Green Wedge Zone. To the north of Somerton Road, the land use changes to larger, open farming parcels of land, also in the Green Wedge Zone. Woodlands Historic Park is located to the north-east.

B2.5.2.2
Southerly direction

To the south of the M3R project area, land use largely comprises farming, rural-residential or rural-living land uses in the Green Wedge Zone.

The Maribyrnong River traverses across the southern area in a south-easterly direction. Sydenham Park and the Keilor Public Golf Course are located to the south-west of the Maribyrnong River.

Over the Maribyrnong River to the south, but north of the Calder Freeway, is Overnewton Anglican Community College. Urban areas are located to the south of the Calder Freeway, including the suburbs of Keilor, Keilor Lodge, Keilor Park and Taylors Lakes.

B2.5.3
Land tenure and ownership

When it was opened in 1970, Melbourne Airport occupied what was formerly agricultural land. In 1997, when Commonwealth airports were privatised, APAM became the airport-lessee company for Melbourne Airport for 50 years with a 49-year extension option under its lease with the Commonwealth. In 2013, the Melbourne Airport site was approximately 2,457 hectares.

Land acquisition has occurred to accommodate the airport's expansion and increased the area of the site to approximately 2,741 hectares.

The MAS and subsequent master plans identified that the airport will ultimately have a four-runway system. Previous plans identified that additional land west of McNabs Road would be required to accommodate the two future runways and further development. By 2013, the majority of the 26 properties identified for acquisition in the MAS had been acquired by negotiation. Final acquisition of freehold land has now taken place, with tenure of all on-airport land associated with M3R transferred to the Commonwealth and leased to APAM under the Airports Act. In addition, a number of roads including Mansfield Road, McNabs Road (part) and Barbiston Road have been closed and integrated into the APAM head lease.

B2.6
ASSESSMENT OF POTENTIAL IMPACTS

Impact assessment is a MDP requirement under section 91 of the Airports Act. Notably:

- 91(1)(ga)(iii) identifies that a MDP must set out the details of a major airport development, and the likely effects of the proposed developments that are set out in the MDP on the local and regional economy and community - including an analysis of how the proposed development fits within the local planning schemes for commercial and retail development in the adjacent area
- 91(4)(a) requires a MDP to address the extent (if any) of the consistency with planning schemes in force under a law of the state in which the airport is located
- 91(4)(b) in instances where the MDP is inconsistent with those planning schemes, the MDP must provide justification for the inconsistencies.

B2.6.1
Statutory and policy consistency

Section B2.3 provided an overview of relevant land use and planning legislation and policy requirements for the MDP. Table B2.3 to Table B2.6 describe the consistency of this MDP with respect to the requirements of each instrument.

The assessment of environmental and community impacts is dealt with in the impact assessment chapters of this MDP. These assessments have informed the assessment of statutory and policy consistency below.

Each impact assessment chapter contains a 'Statutory and Policy Requirements' section which discusses relevant Commonwealth, state and local government legislation and policy directly related to the particular assessment. The individual assessments also discuss consistency with those requirements where relevant.

Part E of this MDP (Management Framework) details the management structures and processes to be implemented, and summarises the M3R impacts and commitments made in the MDP to mitigate these impacts in order to meet relevant legislative and policy requirements.

B2.6.1.1
Commonwealth legislation and policy

Melbourne Airport applies NASF guidelines for the assessment of on-airport development and as the basis for responses to off-airport development proposals. Further details of NASF are provided in Section B2.3.1.6 of this chapter.

Table B2.3
Statutory and policy consistency - Commonwealth

Legislation/policy	Commentary
Airports Act 1996 (Cth)	In accordance with the Airports Act, a MDP has been prepared for M3R which is consistent with the lease for the Melbourne Airport site between APAM and the Commonwealth and the approved 2022 Master Plan. M3R is consistent with the Airport Lease because M3R: • Is for a lawful purpose and is not in breach of legislation (under clause 3.1(a)(iv) of the Airport Lease) • Maintains the environment of the airport in accordance with clause 6.2 of the Airport Lease • Complies with all legislation relating to the 'airport site' (under the Airports Regulations 1997 (Cth) (Airports Regulations)) and its structures or uses or occupation (under clause 7.1 of the Airport Lease) • Must comply with all licences and approvals required for M3R (including a permit under Part 13 of the Airport (Environmental Projection) Regulations 1997 (Cth)) (under clause 7.2 of the Airport Lease) • Does not grant any sub-lease or licence prohibited under legislation (under clause 10 of the Airport Lease) • Has regard to actual and anticipated growth in and pattern of traffic demand for the airport site (under clause 12.1(a) of the Airport Lease) • Will be to the quality standards reasonably expected of an airport in Australia and will have regard to good business practice (under clauses 12.1(b) and (c) of the Airport Lease).
Airports (Protection of Airspace) Regulations 1996	Persons wishing to undertake activities that will result in an intrusion of protected airspace are required to apply to the relevant airport-operator company. If the proposed activity is short-term (i.e. three months or less), the airport-operator company may approve the application. However, if the proposed activity is long-term, the airport-operator company co-ordinates assessments of the proposal and forwards these and the application to DITRDCA for final assessment and approval. All construction works associated with M3R will be assessed for potential airspace impacts in consultation with Airservices Australia and CASA. This will primarily occur through the detailed design, construction planning and secondary approvals stages of M3R. Airservices Australia will be consulted with regard to any impact on the performance of precision/non-precision navigational aids, High Frequency/Very High Frequency (HF/VHF) communications, Advanced-Surface Movement Guidance and Control Systems (A-SMGCS), radar, Precision Runway Monitor (PRM), Automatic Dependent Surveillance Broadcast (ADS-B), Wide Area Multilateration (WAM) or satellite/links to ensure that works will not affect any sector or circling altitude, nor any instrument approach or departure procedure at Melbourne Airport.
Environment Protection and Biodiversity Conservation Act 1999 (Cth)	Potential impacts to significant ecological values are described in **Chapter B5: Ecology**. Particular attention was given to the potential for significant impacts to MNES and to the environment as a whole on Commonwealth land, as defined in relevant EPBC Act Significant Impact Guidelines. The design of M3R incorporates a number of measures aimed at avoidance and reduction of potential impacts on ecological values and an offset strategy is described in **Chapter E3: Offset Strategy** in accordance with the EPBC Act Environmental Offsets Policy (DSEWPaC, 2012).
Native Title Act 1993 (Cth)	It is considered that native title rights have been extinguished across the development footprint as the land is made up of freehold titles that were previously used as farmland prior to the development of the Melbourne Airport which is now wholly under Commonwealth ownership. Land adjacent to the development footprint contains unreserved and reserved Crown land, primarily off-airport land along the bed and banks of rivers and creeks, road reserves and parkland. Any works in these areas may require Native Title notification in accordance with the provisions of the Act.
Australian Standard 2021:2015	Airport operations will inevitably create unavoidable aircraft noise. **Chapter C4: Aircraft Noise and Vibration** sets out the noise and vibration assessment of M3R. Amendments to the MAEO will ultimately be required to minimise future noise-sensitive uses from being located in noise-affected areas and to manage the impacts of future encroachment of noise-sensitive uses on the airport.
National Airports Safeguarding Framework (NASF)	NASF has been given effect and is listed in clause 18.02-7S of the PPF as a policy guideline. M3R is consistent with the NASF guidelines, which are more specifically addressed in **Table B2.4** which describes the compliance/consistency of this MDP against the requirements of the NASF guidelines. Melbourne Airport has extensive policies and procedures in place to ensure that on-airport development addresses all of the NASF requirements, as outlined in **Section B2.3.4** and further supported through other specialist chapters of this MDP. In addition, section 5.11 of the Master Plan outlines the development approval process which must be followed at Melbourne Airport, which includes a three-step approval process: • Planning and Design Approval or MDP approval • Building Activity Consent • Building Permit from the ABC in consultation with the AEO. Melbourne Airport has a set of planning and design guidelines for on-airport developments that must be considered and addressed to obtain Planning and Design Approval. The guidelines require proponents to consider matters such as building heights, acoustic treatments, safety and security, use of non-reflective materials, illumination levels, landscaping, signage and environment. Potential impacts of on-airport commercial and industrial developments on neighbouring properties must also be considered, including issues such as privacy, noise levels and building setbacks.

Table B2.4
National Airports Safeguarding Framework

NASF guidelines	Comment/response
Guideline A: Measures for Managing Impacts of Aircraft Noise	Measures for managing the impacts of aircraft noise are discussed under **Section B2.3.1.5** and **Section B2.3.4.7** of this chapter, and explained in more detail within **Chapter B9: Ground-Based Noise and Vibration**, **Chapter C2: Airspace Architecture and Capacity**, **Chapter C3: Aircraft Noise Modelling Methodology** and **Chapter C4: Aircraft Noise and Vibration**.
Guideline B: Managing the Risk of Building Generated Windshear and Turbulence at Airports	Measures for managing the risk of building generated windshear and turbulence is generally associated with building works. Consideration of these risks is described in **Chapter C5: Airspace Hazards and Risks**.
Guideline C: Managing the Risk of Wildlife Strikes in the Vicinity of Airports	An assessment of the potential for aircraft collisions with significant fauna species, and recommend plantings which are not bird attracting are described in **Chapter B5: Ecology**. Any areas of landscaping associated with M3R will include non-bird attracting plant species which are to be used in accordance with Melbourne Airport's Planting Guidelines. Further details are provided within **Chapter C5: Airspace Hazards and Risks**.
Guideline D: Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation	Wind turbine farms are not considered a significant issue for Melbourne Airport due to the location of the airport on the urban fringe where these facilities are unlikely to be developed. They are usually developed in rural and regional areas. In any event, there is a planning control relating to wind turbine farms in all Victorian Planning Schemes (clause 52.32) which requires consideration of nearby airports as part of the planning permit process. Further details are provided within **Chapter C5: Airspace Hazards and Risks**.
Guideline E: Managing the Risk of Distractions to Pilots from Lighting in the Vicinity of Airports	The type, form and location of external lighting treatments during the construction and operational phases of M3R will be designed and baffled to comply with the relevant standards. External lighting will need to be designed to not emit upward waste light in accordance with the relevant standards. Further details are described in **Chapter C5: Airspace Hazards and Risks**.
Guideline F: Managing the Risk of Intrusions into the Protected Airspace of Airports	As noted in the Master Plan, Melbourne Airport's airspace, based on the ultimate four-runway layout, has been declared Prescribed Airspace by the Commonwealth Government. The airport's Prescribed Airspace, being based on the ultimate four-runway layout, therefore broadly incorporates the airspace associated with the operation of M3R. As stated in the Master Plan, updated prescribed airspace is being prepared to ensure that the airspace required for the ultimate four-runway system (including M3R) continues to be adequately protected whilst taking account of changes which may have occurred since the four-runway airspace was originally prescribed. This takes account of any existing structures, terrain and other potential obstacles. M3R involves the introduction of new flight paths for approaches and departures on the new north-south runway and changes to the existing flight paths to accommodate new flight paths. As a result of the construction of M3R, including the runway infrastructure: • A reconfiguration of the Melbourne airspace is required. Existing Standard Instrument Departure (SIDs) and Standard Terminal Arrival Routes (STARs) have been maintained where possible. However, the standards for near parallel runway operations will need a number of changes to existing SIDs and STARs. Other changes have been considered in order to minimise or reduce the impacts of aircraft noise on residential areas. • Changes to the airspace architecture design and flight paths around the airport are required. Investigations into the probable airspace requirements have been undertaken including engagement with the operator of Essendon Fields Airport, Airservices Australia and CASA including how the impacts of M3R will be most appropriately managed to enable safe and effective operations in the future. Proposed airspace changes will not be formally approved until a time closer to the opening of the changed infrastructure, and hence details of the airspace procedures are indicative and conceptual at this stage. • Melbourne Airport is aware of the Keilor and Districts Model Aircraft Society that operates in Keilor North. This land use may not be compatible with the proposed runway and, under the applicable regulations, the club will need approval from relevant Government agencies to continue operating once M3R is operational. The Prescribed Airspace Regulations provide DITRDCA (or the airport operator) with the ability to assess and approve applications to carry out controlled activities, and to impose conditions on an approval. These controlled activity provisions are the primary measure for managing the risk of intrusions into the airspace. Controlled activity approvals need to be obtained from Airservices Australia during construction if intrusions into controlled airspace occur. Construction and associated approvals will be in accordance with Airservices Australia and CASA requirements. Prior to the construction phase commencing, a 'Notice to Airmen' (NOTAM) will be issued by Melbourne Airport advising the temporary erection of obstacle(s) near airfields (e.g. cranes). Controlled activity approvals are issued by the DITRDCA following assessment advice from Airservices Australia and CASA. Airservices Australia will work with Melbourne Airport in assessing construction activities for potential intrusion into prescribed airspace and where required, Airservices Australia will the issue relevant instrument flight procedure and/or other relevant NOTAMs. These matters are described in detail within **Chapter C2: Airspace Architecture and Capacity** and **Chapter C5: Airspace Hazards and Risks**.
Guideline G: Protecting Aviation Facilities – Communication, Navigation and Surveillance (CNS)	All construction works associated with M3R will be assessed in consultation with Airservices Australia and CASA. Airservices Australia is consulted with regard to any impact on the performance of precision/non- precision navigational aids, High Frequency/Very High Frequency (HF/VHF) communications, Advanced- Surface Movement Guidance and Control Systems (A-SMGCS), radar, Precision Runway Monitor (PRM), Automatic Dependent Surveillance Broadcast (ADS-B), Wide Area Multilateration (WAM) or satellite/ links to ensure that works will not affect any sector or circling altitude, nor any instrument approach or departure procedure at Melbourne Airport.

NASF guidelines (cont.)	Comment/response (cont.)
Guideline H: Protecting Strategically Important Helicopter Landing Sites	As outlined in **Section B2.3.3.4** of this chapter, the Victoria Planning Provisions already incorporate clause 52.15 (Heliport and Helicopter Landing Site) which seeks to ensure the amenity impacts of a heliport and a helicopter landing site on surrounding areas is considered. A permit is required to use or develop any land for a heliport or a helicopter landing site unless specifically exempted by the provisions of the clause.
Guideline I: Managing the Risk in Public Safety Areas (PSAs) at the End of Runways	The impacts of estimated changes in individual risk levels on future development have been assessed with reference to NASF Guideline I. This is addressed in **Chapter C5: Airspace Hazards and Risks**. The land uses allowed under the zoning provisions of the Hume Planning Scheme are broadly compatible with the public safety principles set out in the guideline. The resultant restrictions on future land uses due to M3R are therefore expected to be very limited.

B2.6.1.2
Airport strategies and plans

Table B2.5
Statutory and policy consistency – Melbourne Airport

Legislation/policy	Comment
Melbourne Airport Strategy 1990	This strategy provides an historic context for M3R and encompasses a number of separate studies and impact assessment that supports M3R. M3R is consistent with the MAS 1990. Importantly, it was supported by an EIS that included provision for the future development of a four-runway layout that has been reflected in all Melbourne Airport Master Plans to date. M3R's new runway clearly facilitates the implementation of part of the four-runway system envisaged within the MAS in 1990, which was subject to the EIS approved jointly by the Victorian and Commonwealth governments.
Melbourne Airport Land Use Study 1992	This study contains a number of recommendations about introduction of planning controls to limit the development of noise-sensitive land uses. A review of land use planning controls has been undertaken as part of M3R MDP with key recommendations outlined in **Section B2.7** of this chapter.
2022 Master Plan	The proposed north-south runway is clearly identified as an element of the 2027, 2042 and Long-Term Development Concept Plans for the airport. M3R is located within the following Master Plan precinct and zone: • Aviation Precinct - Special Use Zone 1 As a runway project, M3R is entirely consistent with the purposes of of the Aviation Precinct and Special Use Zone 1. Provision for expansion of the airport's aviation fuel storage infrastructure and associated land is included in the 2022 Master Plan's development concept plans. The proposed development is therefore consistent with the 2022 Master Plan and its 2027, 2042 and long-term development scenarios.
Melbourne Airport Environment Strategy 2022	The M3R development footprint is within the Development Footprint shown in the Melbourne Airport Environment Strategy 2022. The Environment Strategy recognises that proposed Airport expansions will result in the disruption of known (or as yet undiscovered) areas of *cultural* and/or environmental value. More specifically, for major development projects such as M3R, thorough investigations and management programs for environmental and cultural impact are required prior to approvals being granted. Detailed consideration of the airport environs and European and cultural heritage are described within subsequent chapters of the MDP.
Ground Transport Plan 2022	The Ground Transport Plan does not apply specifically to M3R. However, the forecast growth and additional traffic that will be facilitated by M3R is accommodated within the Ground Transport Plan 2022. **Chapter B8: Surface Transport** provides a detailed assessment of surface transport at the airport.
Australian Noise Exposure Forecast	**Chapter C4: Aircraft Noise and Vibration** explains that ANEF contours are expected to change as a result of M3R and will ultimately require an amendment to the existing MAEO to ensure that land use planning appropriately acknowledges these changes and limits sensitive land uses that may restrict the operation of the airport.

B2.6.1.3
State legislation and policy and local planning schemes

Table B2.6
Statutory and policy consistency - Victorian and local government

Legislation/policy	Comment
Planning and Environment Act 1987 (Vic)	The MDP recognises that the P&E Act establishes the framework for planning in Victoria. Although the P&E Act does not apply to Commonwealth land, this MDP demonstrates that M3R is consistent with the objectives of the P&E Act through the fair, orderly, economic and sustainable use and development of land, a key objective of the Act.
Environment Effects Act 1978	As M3R is being constructed on Commonwealth land and is the subject of approvals under Commonwealth legislation, an EES in accordance with the EE Act is not required.
Environment Protection Act 2017	Any off-site works associated with M3R will be required to comply with the provisions of the Act. This applies in particular to activities that may have an impact on air, water, soil and ground-based noise. SEPPS define the environmental quality objectives (for air, land and groundwater, noise and water) and describe the attainment and management programs that will ensure the necessary environmental quality is maintained and improved. For off-site impacts of M3R, the MDP has taken into consideration the requirements of the relevant SEPPs, and M3R is generally consistent with those requirements, as detailed in the relevant environmental impact assessment chapters. Further details of the requirements and M3R's consistency are described within **Chapters B3: Soils, Groundwater and Waste, B4: Surface Water and Erosion, B9: Ground-Based Noise and Vibration and B10: Air Quality**.
Water Act 1989	Approval is required to connect to the stormwater system (including open waterways). It is expected that stormwater outfalls from the new runway will extend into the Maribyrnong River corridor. Approval to work on any new or modified stormwater connections to Melbourne Water assets will necessitate approvals from Melbourne Water. M3R will comply with these requirements (refer to **Chapter B3: Soils, Groundwater and Waste** and **Chapter B4: Surface Water and Erosion**).
Aboriginal Heritage Act 2006 (Vic)	Although the AH Act does not apply to Commonwealth land, Melbourne Airport has sought to meet standards of state heritage assessment process through the preparation of a voluntary CHMP under the Act (refer to **Chapter B6: Indigenous Cultural Heritage**).
Heritage Act 2017 (Vic)	Heritage Victoria does not have jurisdiction on Commonwealth land and therefore the provisions of the Heritage Act 2017 do not apply to the development footprint. Although the study area is exempt from the requirements of the Heritage Act, consultation has been undertaken with Heritage Victoria for the heritage places assessed as part of M3R development and planning. Further details are provided in **Chapter B7: European Heritage**.
Flora and Fauna Guarantee Act 1988 (Vic)	Under this Act, there is no legislative requirement to provide offsets for state-significant ecological values. **Chapter B5: Ecology** describes the potential impacts to ecological communities and identifies mitigation measures and offset requirements in accordance with the EPBC Act and/or FFG Act.
Metropolitan Planning Strategy: Plan Melbourne (2017-2050)	The continued development of the airport is consistent with its role as a state-significant transport gateway for Victoria. Plan Melbourne acknowledges that "Melbourne must protect its curfew-free airport and support its expansion".
Growth Corridor Plans 2012	The airport is located to the north-east of the Western Growth Corridor and south-west of the Northern Growth Corridor. The development of these corridors is guided by corridor plans, which recognise and protect the ongoing operation of Melbourne Airport. GCPs are relevant to this MDP as they provide information regarding proposed future development around the airport, particularly future residential development. This is important information in terms of airport safeguarding, noise, health and social impact assessments. These plans have been taken into consideration in the assessment of off-airport impacts. Areas identified in the corridor plans for future residential growth and sensitive uses are generally located outside of the study area and beyond the ANEF contours.
Melbourne Airport Environs Strategy Plan	The MAESP's recommendations took the form of a new overlay control (PSA VC30), the Melbourne Airport Environs Overlay (MAEO). A detailed assessment of the impact of the M3R 2046 Composite ANEC on the existing MAEO is provided in **Section B2.6.2.3**. The differences between the existing MAEO1 and MAEO2 and the M3R 2046 Composite ANEC are shown in **Figure B2.16** and **Figure B2.17** At the time of writing, the MAESP was being reviewed by the Minister for Planning.

Legislation/policy (cont.)	Comment (cont.)
Planning Policy Framework	M3R is highly consistent with key objectives and policies contained within the PPF. Specific policies or guidelines, where relevant, are dealt with in the individual impact assessment chapters of this MDP. Notably, however, M3R will: • Increase the capacity of Melbourne's only international airport, strengthening its role within the state's economic and transport infrastructure and facilitate a more connected Melbourne • Enhance Victoria's competitive advantages • Seek to manage environmental impacts, with investigation of ecological impacts undertaken to ensure that the impacts to ecological systems and biodiversity within the development footprint are adequately mitigated or managed • Protect the future operations of the airport from encroachment from incompatible land uses and ensure appropriate land-use buffers are in place though updates to planning controls. Part E of this MDP (Management Framework) details the management structures and processes to be implemented and summarises the M3R impacts and commitments made in the MDP to mitigate these impacts in order to meet relevant legislative and policy requirements.
Local Planning Policy Framework	The LPPFs for Hume, Brimbank, Melton, Moonee Valley and Whittlesea provide local context and support the PPF. M3R is consistent with relevant objectives and policies contained within the LPPFs of the abovementioned municipalities. Due to its location within the City of Hume, Melbourne Airport has a greater significance within the objectives and policies identified in the Hume LPPF. M3R is consistent with relevant objectives and policies contained within the LPPF, as: • It will enhance the role of the Melbourne Airport as provider of employment and economic activity within the municipality • It will seek to manage environmental impacts, with a thorough investigation of environmental and heritage impacts undertaken to ensure that the impacts within the development footprint are adequately mitigated or managed as required • Proposed mitigation measures including amendments to the MAEO are consistent with local policies that seek to ensure that Melbourne Airport remains curfew-free and prevent development that might prejudice the airport's continuing role as one of Victoria's key economic asset.
Planning Controls	Proposed works that are located on Commonwealth-owned land are exempt from Victorian planning provisions. Land formerly in private ownership west of McNabs Road required for airport expansion has recently been acquired by the Commonwealth. As such, current zoning and overlay maps will need to be amended to reflect the acquired land is now Commonwealth-owned. Potential works associated with M3R on land outside of Commonwealth land are limited to a new connection to land contained within the Transport Zone 2 and potentially works on waterways for stormwater outfalls to the Maribyrnong River.
Particular Provisions	Potential works associated with M3R on land outside of Commonwealth land are limited to a new road connection to Sunbury Road for construction access and potential works on waterways for stormwater outfalls to the Maribyrnong River. A planning permit will be required to 'create or alter access to a Road in a Transport Zone 2' in accordance with the provisions of clause 52.29. Provided the proposed work satisfies Council and Department of Transport and Planning (DTP) requirements, the responsible authority is expected to support the proposed works. Approval to work on any new or modified stormwater connections to Melbourne Water assets will necessitate approvals from Melbourne Water.

B2.6.2
Land use impacts

The 2022 Master Plan contains the airport's Long Range ANEF. The ANEF contours represent the airport's long-range forecast noise impact, taking into account the development stages of the planned four-runway system.

The land-use impacts relating to noise contours considered in this chapter are based on the M3R 2046 Composite ANEC which reflects the proposed parallel north-south runway system. The 2022 Master Plan ANEF includes the M3R 2046 ANECs. Given the recent approval of the 2022 Master Plan, the MAEO may be updated by the Victorian Minister for Planning to apply the 2022 Master Plan ANEF, which will include the M3R 2046 ANECs.

The following sections describe identified land use impacts and associated mitigation and management measures, with an assessment summary in accordance with the significance assessment framework provided in **Table B2.7** at the conclusion of this chapter.

B2.6.2.1
On-airport

As outlined in **Section B2.5.2**, Melbourne Airport contains a mix of existing land uses, which can be broadly categorised as follows:

- Airside land uses – runways, aprons and terminal buildings
- Landside land uses – hotels, carparks, public transport facilities, car rental facilities and commercial, retail and industrial premises

- Natural areas – including temperate Grassland of the Victorian Volcanic Plain, Grey Box Woodland located to the north of the existing east-west runway and Growling Grass Frog habitat around Arundel Creek
- Rural areas – largely cleared former grazing land located to the south of the existing east-west runway and west of McNabs Road, with certain European heritage values, some of which are listed as Heritage Inventory Sites on the Victorian Heritage Register.

The Bushfire Management Overlay (BMO) has been applied to parts of the airport site, however the BMO does not technically apply given it is Commonwealth land.

The proposed new north-south runway and associated expansion of airside area will represent a change from the existing rural land use character of the area west of the existing airfield. While there will be medium level impacts to the existing natural and rural areas, M3R is consistent with the strategic planning intent for these areas as articulated in the MAS and subsequent master plans and is therefore considered a benefit from a land use planning perspective.

B2.6.2.2
Off-airport impacts – infrastructure works

Limited works may be undertaken outside airport land to provide appropriate connections, and interface with existing transportation and utility networks. These works will be subject to consultation and any necessary approvals with relevant authorities.

Sunbury Road construction access

An additional construction access road for vehicles entering the site from the north will be necessary to undertake works within the road corridor to formalise or upgrade an intersection. The access road would not be publicly accessible, and be contained within the airport site. Intersection works at Sunbury Road are likely to be contained within the existing road corridor, and no land use change or impact is expected to occur.

If the construction access is temporary, it may be managed through relevant CEMP or a Traffic Management Plan, which would be prepared in consultation with the relevant roads authority. However, if construction of the access is permanent, a planning permit will be required in accordance with clause 52.29 – Land Adjacent to the Principal Road Network, to create or alter access to a road in a Transport Zone 2. Pursuant to clause 66.03 (referral of permit applications under other state standard provisions) Transport for Victoria is a determining referral authority for this application.

Stormwater outfalls

Site-wide works will include installation of a new stormwater drainage network (including diversions of the existing drainage system, installation of new pipework, manholes, swales, culverts and outfall structures). While the majority of these works will be contained within airport land, stormwater outfalls may extend outside the airport boundary. The majority of M3R infrastructure is expected to drain into the Arundel Creek catchment. Arundel Creek discharges to the Maribyrnong River.

Subject to detailed design investigations, it is possible that new drainage infrastructure outside the airport site may include stormwater outfalls, landscaping and scour protection. This potential infrastructure is not anticipated to have a significant land use impact or represent a change in the nature or function of any external waterway corridor.

The land that might be affected, that is not Commonwealth land, is generally situated within the Green Wedge Zone (GWZ). A stormwater drain (defined as a Minor Utility Installation under clause 74 Land Use Terms of the Planning Scheme) is listed as a Schedule 1 use in the GWZ and therefore does not require a planning permit for use. Furthermore, pursuant to clause 62.02, a permit is not required for building works associated with a minor utility installation, however the works would be required to comply with applicable state level legislation. Approval to work on any new or modified stormwater connections to Melbourne Water assets may necessitate approvals from Melbourne Water.

B2.6.2.3
Off-airport impacts – development controls

The MAEO is a planning tool that manages the use and development of land within Melbourne Airport's ANEF noise contours, as described in **Section B2.3.3.3**. It seeks to apply planning controls within the boundary of the overlay in order to control incompatible land use and development, particularly noise-sensitive land uses. The MAEO applies controls for the use of land and buildings and works that limit densities, require acoustic attenuation for buildings and can restrict certain land uses. Any buildings for which a permit is required under this overlay must be constructed in accordance with any noise attenuation measures required by AS 2021:2015 previously detailed in **Section B2.3.1.5** of this chapter. The application of the MAEO applies to new use of land and buildings and works which require a permit under the overlay. Retrospective attenuation of existing buildings is not required by the MAEO provisions. The MAEO is based on the airport's 2018 ANEF.

As detailed in **Chapter C4: Aircraft Noise and Vibration**, three new ANECs have been prepared for this MDP reflecting three different modes of operation. A composite of these three ANECs, the 'M3R 2046 Composite ANEC', has been prepared for the purpose of this Land Use and Planning Assessment (see **Figure B2.15**). The 2022 Master Plan includes the M3R 2046 ANECs.

However, for the purpose of this assessment, the key comparison is between the M3R Composite ANEC and the current MAEO which imposes land use restrictions.

Given the recent approval of the 2022 Master Plan, the MAEO may be updated by the Victorian Minister for Planning to apply the 2022 Master Plan ANEF, which includes the M3R ANECs.

The differences between the existing MAEO1 and MAEO2 and the M3R 2046 Composite ANEC are shown in **Figure B2.16** and **Figure B2.17.** These plans illustrate those areas contained within M3R ANECs that differ from the existing MAEO boundary. This provides an indication of those areas that may be impacted by M3R in terms of land use restrictions based on the 2046 Composite ANEC. The M3R 2046 Composite ANEC forms only one part of the four-runway ANEF. The M3R ANEC relates to the operation of the parallel north-south runways, and therefore primarily influences the MAEO to the north and south of the airport. It will not affect the extent of the MAEO east and west of the airport.

Note that only those areas inside M3R Composite ANEC but outside the current MAEO are considered to be directly affected. This includes some areas currently subject to MAEO1 that may become subject to MAEO2, or areas currently subject to MAEO2 that may become subject to MAEO1.

MAEO Schedule 1

MAEO Schedule 1 applies to land subject to ANEF 25 or greater that is likely to be subject to high levels of aircraft noise. The overlay places controls on new land use and buildings and works, limiting densities, requiring acoustic attenuation and restricting certain land uses. This overlay restricts development of some noise-sensitive land uses and requires a planning permit for other land uses that may be sensitive to aircraft noise. In addition, the overlay limits any subdivision of land that would increase the number of dwellings for which the land could be used.

The M3R 2046 Composite ANEC area may result in some variations to the existing MAEO1 as shown in **Figure B2.16**.

In some locations north and south of the airport, land currently not affected by the MAEO or that is affected by MAEO2 may become subject to MAEO1 planning controls, resulting in greater restrictions on land use and subdivision. Conversely, there are some locations where the M3R 2046 Composite ANEC 25+ contour has reduced from the existing MAEO1 boundary, potentially reducing restrictions in some areas which may no longer be subject to MAEO1. Such land currently subject to MAEO1 provisions would then be subject to the less restrictive MAEO2 planning controls.

The key areas that may be impacted by increased MAEO1 restrictions on land use and subdivision (as shown in **Figure B2.16**) are located in the suburbs listed below.

- To the north of the airport: parts of Oaklands Junction and a small part of Greenvale (west) would be affected.
- To the south of the airport: small parts of Keilor, Keilor Park and Keilor East (north) would be affected.

MAEO1 prohibits the development of noise-sensitive land uses, such as accommodation (excluding a dwelling), childcare centres, education centres and hospitals. It requires a planning permit for other land uses that may be sensitive to aircraft noise. The overlay allows only one dwelling on a lot and prohibits the subdivision of land that would increase the number of dwellings for which the land could be used. Any development must be constructed to comply with any noise-attenuation measures required by AS2021-2015. Uses such as industry and warehouse are not affected by this overlay.

MAEO Schedule 2

This overlay applies to land that is or will be subject to moderate levels of aircraft noise based on the 20-25 ANEF contours and requires a planning permit for sensitive uses. Uses such as industry are not affected by this overlay.

The M3R 2046 Composite ANEC area may result in some variations to the existing MAEO2 as shown in **Figure B2.17**.

In some locations north and south of the airport, land that is not currently affected by MAEO2 may become subject to MAEO2 planning controls, resulting in greater restrictions on land use and subdivision. Conversely, there are some locations where the M3R 2046 Composite ANEC 20-25 contour has reduced from the existing MAEO2 boundary, potentially reducing restrictions in some areas which may no longer be subject to the overlay. Further, some land currently subject to MAEO1 provisions may become subject to the less restrictive MAEO2 planning controls.

The key areas that may be impacted by increased MAEO2 restrictions on land use and subdivision (as shown in **Figure B2.17**) are located in the suburbs listed below.

- To the north of the airport: parts of Oaklands Junction and Yuroke (west) would be affected. For the most part, the land affected to the north is zoned for non-urban purposes (e.g. Green Wedge Zone).
- To the south of the airport: parts of Sunshine North, Avondale Heights, Keilor East, Keilor Park and small section of Kealba would be affected.

MAEO2 does not prohibit sensitive uses but does require a planning permit for such uses. It also specifies a lot size minimum for subdivisions (300 square metres). Any development must be constructed to comply with any noise attenuation measures required by AS2021-2015. Uses such as industry and warehouse are not affected by this overlay.

Figure B2.15
M3R 2046 composite ANEC

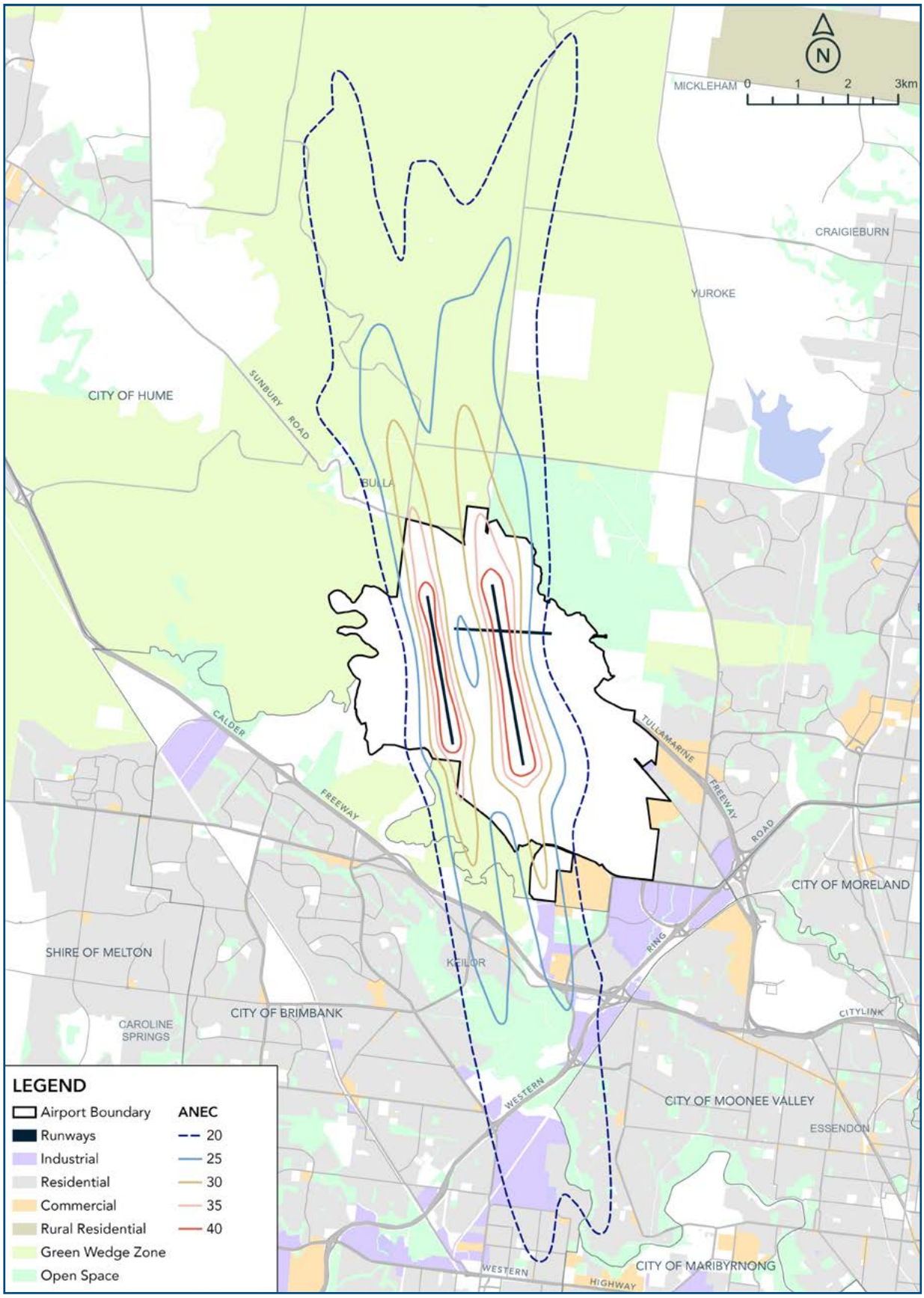


Figure B2.16
Potential impact of M3R 2046 composite ANEC on MAEO1

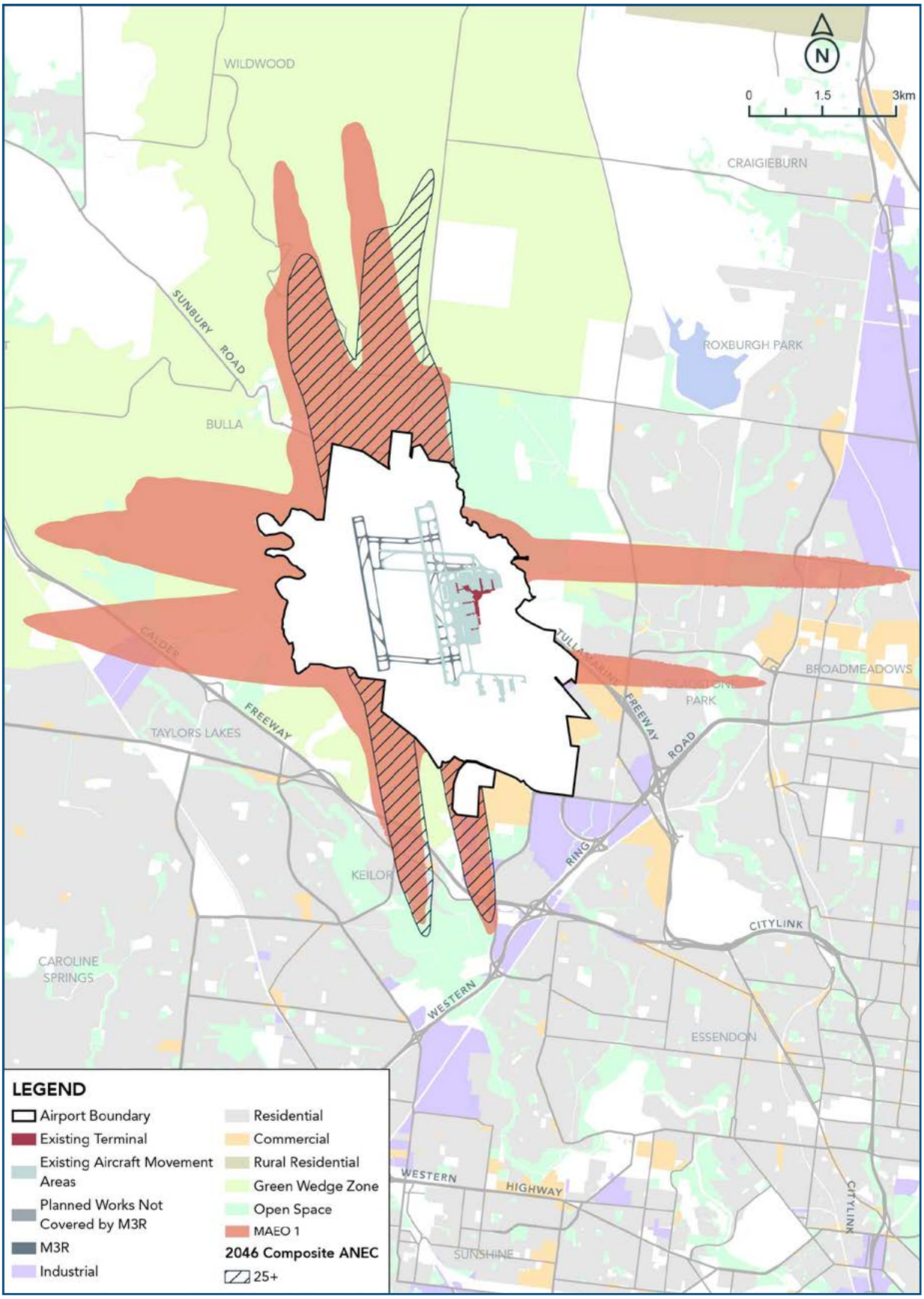
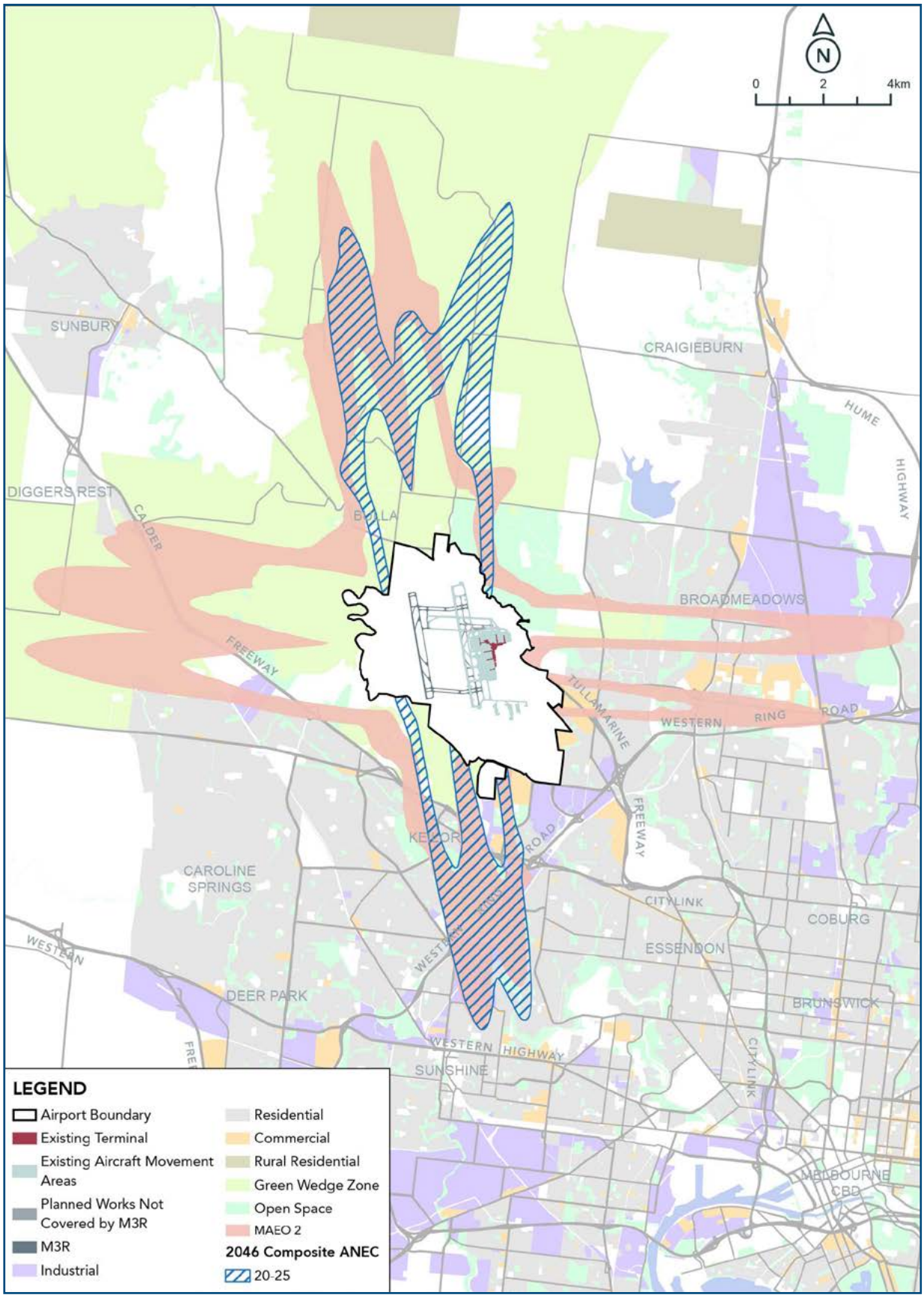


Figure B2.17
Potential impact of M3R 2046 composite ANEC on MAEO2



B2.6.2.4
Off-airport impacts – prescribed airspace

As noted in the Master Plan, Melbourne Airport's airspace, based on the ultimate four-runway layout, has been declared 'Prescribed Airspace' by the Commonwealth Government.

The airport's prescribed airspace, being based on the ultimate four-runway layout, therefore broadly incorporates the airspace associated with the operation of M3R.

As noted in the 2022 Master Plan, APAM is preparing updated airspace surfaces to ensure that the airspace required for the ultimate four-runway system continues to be adequately protected, while taking account of changes which may have occurred since the four-runway airspace was originally prescribed. This process is not expected to affect materially any building height limits, compared with those already in place over the Melbourne metropolitan area. As part of the process of having the future airspace required for M3R and the ultimate four-runway configuration prescribed by DITRDCA, further consultation will be undertaken with all local government areas which may be affected by changes to building height limits as a result of the new prescribed airspace in accordance with Part 12 of the Airports Act.

The regulations relating to prescribed airspace can affect the use and development of land. The 'controlled activity' provisions under the Airports (Protection of Airspace) Regulations 1996 are the primary measure for managing the risk of intrusions into the airport's airspace. The Regulations provide DITRDCA or the airport operator with the ability to assess and approve applications to carry out controlled activities which include:

- Permanent structures, such as buildings, intruding into the protected airspace
- Temporary structures such as cranes intruding into the protected airspace
- Any activities causing intrusions into the protected airspace through glare from artificial light or reflected sunlight, air turbulence from stacks or vents, smoke, dust, steam or other gases or particulate matter.

The regulations differentiate between short-term (less than three months) and long-term controlled activities. Most notably, long-term intrusions of the PANS-OPS surface are prohibited. However, where agreed by all stakeholders that a long-term penetration of the PANS-OPS surfaces is deemed essential, the PANS-OPS surfaces must be raised above the intrusion. This may also have operational penalties for airport operations and could have community impacts, such as redesign of flight paths that may increase noise impacts.

As previously stated, the Keilor and Districts Model Aircraft Society that operates in Keilor North, may not be compatible with the proposed runway and, under the applicable regulations, the club will need approval from relevant Government agencies to continue operating once M3R is operational.

B2.7
AVOIDANCE, MANAGEMENT AND MITIGATION MEASURES

Having regard to the planning and land use impact assessment, the following sections summarise the proposed avoidance, management or mitigation measures required as part of the implementation of MDP. The Planning Policy Framework (PPF) recognises the social and economic importance of Melbourne Airport to the local region and the state. In accordance with this, the planning system adopts a precautionary approach to protecting the operation of the airport in order to prevent the encroachment of urban development.

B2.7.1
Off airport – permit requirements

The following permits may be required as a result of off-airport works associated with M3R (subject to detailed design):

Sunbury Road vehicular connection:

- Proposed works associated a new vehicular connection to Sunbury Road require a planning permit to create or alter access to a road in a Transport Zone 2 in accordance with the provisions of clause 52.29. These are the only works that will be subject to a planning permit application.
- Provided the proposed work satisfies Hume City Council and DTP's requirements, it is considered that the proposed works would be supported by the responsible authority (Hume City Council subject to DTP support).

Native Title:

- Native Title notification may be required for works over unreserved and reserved Crown land, primarily off-airport land along the bed and banks of rivers and creeks, road reserves and parkland.

Stormwater outfalls:

- Stormwater outfalls from the new runway may extend into the Maribyrnong River or other watercourses outside the airport boundary. Approval to work on any new or modified stormwater connections to Melbourne Water assets may necessitate approvals from Melbourne Water.

Utility and asset approvals:

- Approval may be required from relevant utility and asset managers to commence work on any utility installations (such as gas, electricity and water) or undertake excavation near such assets.

Controlled activity approvals:

- Local councils in the vicinity of the airport's protected airspace are required to review all building and development applications they receive for any infringements of protected airspace. These local councils refer proposals to the airport operator if an infringement is likely to occur. The proponent will then need to apply through the airport operator for approval (or DITRDCA in the case of long-term controlled activities). OLS and PANS- OPS surfaces charts are prepared by the airport operator and are available to the public to confirm whether a proposed land use or activity will require controlled activity approval. Early consultation by a proponent with the airport operator and/or regulator is encouraged to ascertain protected airspace requirements before submitting a planning application.

B2.7.2
Airport safeguarding

Melbourne Airport is critical state and national infrastructure. Planning in the vicinity of the airport needs to be carefully managed to ensure encroachment is minimised and the airport's curfew-free status is maintained. The current suite of planning tools (including the PPF clause 18.02-7, Urban Growth Boundary, Green Wedge Zone and MAEO) provide a solid basis for the protection of the long-term operation of the airport including its curfew-free status. These planning provisions do not unreasonably curtail urban growth, recognising the need for a balance between on-airport and off-airport growth.

NASF provides guidance and advice relating to airport safeguarding. Based on NASF, Melbourne Airport will continue to advocate for appropriate land use planning in the vicinity of the airport, using appropriate metrics to identify and protect noise-sensitive areas, and actively discourage inappropriate development in such areas.

There is a need for improved or enhanced safeguarding measures in planning schemes. As such, Melbourne Airport advocates for the NASF recommendations to be considered (particularly use of the N-contour system as a supplement to the ANEF contours) as part of the review of the Melbourne Airport Environs Strategy Plan. In addition, the mitigation of indirect off-site impacts by means other than zoning and overlay controls is supported wherever practicable. These matters are the focus of the Victorian Government's response to the MAEESAC review.

As discussed in **Section B2.6.2.3** of this chapter, this MDP includes a new M3R 2046 Composite ANEC (**Figure B2.15**) which forms part of the new ANEF in the 2022 Master Plan. It should be noted that the impact being considered here is the potential impact of M3R based on the ANEC. The formalisation of this mitigation measure, to update the MAEO based on the 2022 Master Plan ANEF, would require a planning scheme amendment.

It is anticipated that the amendment process will be facilitated by the Victorian Minister for Planning, and affect planning controls that form part of the Brimbank, Hume, Melton, Moonee Valley and Whittlesea planning schemes. Forecast impacts from M3R will then be implemented through the local planning schemes.

It is recognised that aircraft noise is not confined to areas inside the 20 ANEF noise contour and that many complaints relating to aircraft noise originate from beyond this line. Given these limitations, NASF Guideline A recommends using the N-above contour system to supplement the ANEF contours, particularly when considering strategic planning matters. N contours are mapped within the 2022 Master Plan, and this MDP. However, the ANEF and its application through the MAEO remains the primary noise contour for the purposes of statutory planning decisions.

B2.7.3
Zoning maps update

Commonwealth-owned land is exempt from the operation of planning schemes and is not included in any zone or overlay in a planning scheme. It is simply recognised by the designation 'CA' on planning scheme maps. In order to facilitate the delivery of M3R and ongoing future development of the Melbourne Airport, all freehold and APAM owned land within the airport boundary has been acquired and is now Commonwealth land. As a result, current zoning and overlay provisions affecting airport land no longer apply and will need to be removed from Hume Planning Scheme zoning and overlay maps and replaced with the uncoloured 'CA' designation.

B2.7.4
Environmental management

Baseline amenity conditions are an intrinsic requirement for the ongoing functionality of certain sensitive land uses (e.g. residential dwellings, schools, day care centres). Of particular importance are proposed noise, air and vibration emissions during construction and operation of M3R. M3R MDP provides a detailed assessment against applicable regulations and standards for each of these key environmental factors.

The process and procedure for managing construction and operational-related impacts at the airport are set out under the Melbourne Airport Environment Strategy

contained within the approved Master Plan which require the preparation and implementation of a:

- Construction Environmental Management Plan (CEMP): The purpose of a CEMP is to eliminate or significantly reduce the environmental impacts of construction to the satisfaction of Melbourne Airport and the Airport Environment Officer.
- Operational Environmental Management Plan (OEMP): OEMPs are required to be prepared by all operators of significant facilities at Melbourne Airport. The OEMP must be approved and in place prior to the commencement of operations at the site and will be produced/updated each year, and be subject to an annual audit.

Environmental management measures proposed for M3R are described in detail in **Chapter E2: Environmental Management Framework**.

Melbourne Airport will continue to make readily available information about airport operations and future development, including information about M3R. This includes information about aviation-related noise in the vicinity of the airport, which assists people in making more informed decisions about property purchases and rental agreements.

B2.8 CONCLUSION

This chapter has documented the baseline land use planning context with respect to M3R at Melbourne Airport, and has assessed M3R's consistency with Commonwealth, Victorian and local legislative requirements and policies, as well as its potential effects on land use conditions around the airport.

This MDP is consistent with the long-term land use planning objectives for Melbourne Airport outlined in the MAS (and associated EIS) and the 2022 Master Plan.

The majority of works associated with M3R footprint will occur on airport (Commonwealth) land. Limited works may be undertaken outside airport land to provide appropriate connections and interface with existing transportation and utility networks. Those works are outlined in this chapter (and described in detail in other chapters of this MDP). There is potential for indirect off-site impacts on land use as a consequence of noise and air quality, and the resultant potential of increased development constraints, which are primarily addressed through overlay controls. The following measures are proposed to address these potential off-site land use impacts:

- Submit a Planning Permit Application to create or alter access to a road in a Transport Zone 2 if required, in accordance with the provisions of clause 52.29, for the works associated with a new vehicular connection to Sunbury Road.
- Minimise impacts on baseline amenity conditions for sensitive land uses via implementation of CEMP and OEMP in accordance with relevant guidelines and standards, as recommended by technical assessments contained in this MDP.
- Continue with established initiatives including provision of publicly available information about airport operations and development, including noise.
- Undertake Native Title notification in accordance with the provisions of the relevant legislation if works are proposed to be carried out over unreserved and reserved Crown land (primarily off-airport land along the bed and banks of rivers and creeks, road reserves and parkland).
- Prior to commencement of works, obtain approval from relevant utility and asset managers to connect to the stormwater system (including open waterways) or to commence work on any utility installations (such as gas, electricity and water) or undertake excavation near Melbourne Water assets, if required.
- Undertake other complementary, non-statutory planning methods for notifying the community about aircraft noise risk or impact other than zoning and overlay controls wherever practicable. Options are outlined in the MAESP, NASF and Standards Australia's Noise Handbook.
- The Victorian Minister for Planning may amend the MAEO to apply the new ANEF, in consultation with affected councils and property owners. The MAEO will apply planning controls within the boundary of the overlay to protect against incompatible development and land use.
- PSA to amend zoning and overlay maps in the Hume Planning Scheme and replace them with the uncoloured 'CA' designation (thereby removing current zoning and overlay provisions affecting the airport land which no longer apply as a result of land acquisition).

A summary of the impacts identified, and the associated risk level and mitigation measures, is provided in **Table B2.7**. It identifies that for land use and planning there are both adverse and beneficial impacts associated with M3R. A High Adverse impact is associated with the potential for the Melbourne Airport Environs Overlay (MAEO) to be amended to incorporate the 2022 Master Plan ANEF, based on the M3R 2046 ANECs and the greater restrictions to land use and subdivision in newly covered areas. This is considered an indirect and facilitated impact as, although the M3R 2046 Composite ANEC is part of the the new ANEF, the direct requirement for amending the MAEO is derived from approval of the 2022 Master Plan. This impact is reduced to Medium by the requirement for a planning scheme amendment by the Victorian Government, as this will provide a separate consultation and approval process. This process modifies the likelihood of the impact from Almost Certain to Likely.

Table B2.7
Impact assessment summary

Environment aspect & baseline condition	Assessment of original impact					
	Original Impact	Mitigation inherent in design/practice	Significance			
			Duration	Severity	Likelihood	Impact
Construction / Operation						
On-airport – airside land use (runways, aprons and terminal buildings)	Direct – airside land use composition to intensify/change	Design has been undertaken in accordance with airport Master Plan land use framework	Long-term	Beneficial	Almost certain	Beneficial
On-airport – landside land use (hotels, car parks, public transport facilities, car rental facilities and commercial, retail and industrial premises)	Indirect – functionality of landside land use may be restricted by proposed works	Design has been undertaken in accordance with airport Master Plan land use framework	Long-term	Minor	Possible	Low
On-airport – natural areas (some natural areas of native vegetation and habitat not currently used or developed for airport purposes)	Direct – diminishing of functionality a natural land use by virtue of proposed works	Design has evolved to minimise removal. CEMP will set out construction controls to minimise indirect impacts	Long-term	Moderate	Possible	Medium
On-airport – rural areas (largely cleared former grazing land located to the south of the existing east-west runway and west of McNabs Road)	Direct – conversion to airside land use	Design has been undertaken in accordance with airport Master Plan land use framework	Long-term	Beneficial	Almost certain	Beneficial
Off-airport –road corridor land (Sunbury Road dual carriageway)	Direct – physical works within road corridor land for construction access	Design has sought to minimise number of construction access points onto external transport network	Short-term	Minor	Likely	Medium
Off-airport – natural areas (Maribyrnong River and other waterway corridors and fringing vegetation)	Direct – potential loss of natural area for stormwater infrastructure works which may affect overall functionality of corridor as a natural land use	Design has evolved to restrict physical works to necessary stormwater outfalls	Long-term	Minor	Possible	Low
Off airport – impact of development controls on land use (Existing Melbourne Airport Environs Overlay (MAEO) – Schedule 1 and Schedule 2)	Indirect - MAEO may be amended by the Victorian Minister for Planning in accordance with the 2022 Master Plan ANEF, incorporating M3R 2046 Composite ANEC, resulting in greater restrictions to noise-sensitive land use and subdivision in newly covered areas	Airspace design has sought to minimise the coverage and extent of the M3R 2046 Composite ANEC– refer Chapters C2: Airspace Architecture and Capacity and C4: Aircraft Noise and Vibration	Long-term	Moderate	Almost certain	High

Mitigation and/or management measures	Assessment of residual impact				
	Residual Impact	Duration	Significance		
			Severity	Likelihood	Impact
Construction / Operation (cont.)					
No additional mitigation or management measures required – beneficial impact risk	Airside land use composition to intensify/change	Long-term	Beneficial	Almost certain	Beneficial
Implement industry standard safeguarding and management controls	Functionality of landside land use may be restricted by proposed works	Long-term	Minor	Unlikely	Low
Implement industry standard controls as part of CEMP/ TMP to minimise further direct or indirect impacts	Residual area retained will remain functional as a natural land use	Long-term	Moderate	Unlikely	Low
No additional mitigation or management measures required – beneficial impact risk	Land use conversion consistent with Master Plan	Long-term	Beneficial	Almost certain	Beneficial
Implement industry standard TMP and obtain necessary permits	Works within road reserve not affecting function as road corridor land	Short-term	Negligible	Likely	Negligible
CEMP will set out construction controls to minimise impacts. Obtain necessary permits.	Potential loss of natural area for infrastructure works which may affect overall functionality of corridor as a natural land use.	Long-term	Minor	Possible	Low
Public consultation on and approval of the 2022 Master Plan and associated ANEF, and the subsequent Planning Scheme Amendment process to amend the MAEO	Design of future development around the airport would be subject to new planning provisions that control land use via amended MAEO controls reflecting new ANEF	Long-term	Moderate	Likely	Medium

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Chapter B3
Soils, Groundwater and Waste

Summary of key findings:

- There are some areas of the M3R footprint where soil and groundwater have been contaminated as a result of past activities. Assessment of soil and groundwater has been undertaken to identify potentially contaminated areas so they can be managed appropriately during M3R construction.
- The key contamination issue requiring management in the M3R footprint is PFAS (both source and diffuse impacts). A project-specific PFAS management strategy will be prepared. Confirmation of management and remediation options, including detailed feasibility, will be completed as part of detailed design works. A project-specific human health and ecological risk assessment will also be prepared to support the management and remediation options assessment, and PFAS management strategy.
- Minor occurrences of asbestos-containing material, isolated occurrences of metals and hydrocarbons, and other potential impacts from historic landfilling activities have been identified in isolated areas of the project footprint. A Construction Environmental Management Plan (CEMP) will be developed to provide specific details regarding how these impacts will be mitigated and managed in accordance with applicable regulations.
- Waste generated during the construction and operation of M3R will be managed proactively to limit potential environmental impacts. The CEMP will be developed to include specific details on the waste management controls that will be applied to mitigate potential risks to the environment from these wastes.


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CHAPTER B3 CONTENTS

CHAPTER B3 FIGURES

CHAPTER B3 TABLES

B3.1
INTRODUCTION

This chapter describes the existing conditions of soil and groundwater of the study area (**Figure B3.1**), and the potential impacts, as part of Melbourne Airport's Third Runway (M3R) Major Development Plan (MDP) approvals process.

B3.1.1
Objectives

The objectives of the soils, groundwater and waste study were to:

- Contribute to the description of the 'whole of the environment' affected by M3R by assessing the project's land contamination and waste aspects
- Identify at a preliminary level those impacts that could be avoided or mitigated through engineering design, and confirm compliance with relevant legislation
- Identify sources, likely volumes, and quality of wastes generated during the pre-construction phases of M3R, and during its operation.
- An assessment of the potential soil, groundwater and waste impacts during construction, operation and maintenance of the project.

The primary technical document supporting this MDP chapter is the *Environmental Site Assessment* prepared by Senversa (Senversa, 2020). Estimates of waste types and volumes have been sourced from Beca and WT Partnerships.

The following assumptions were made as part of this assessment:

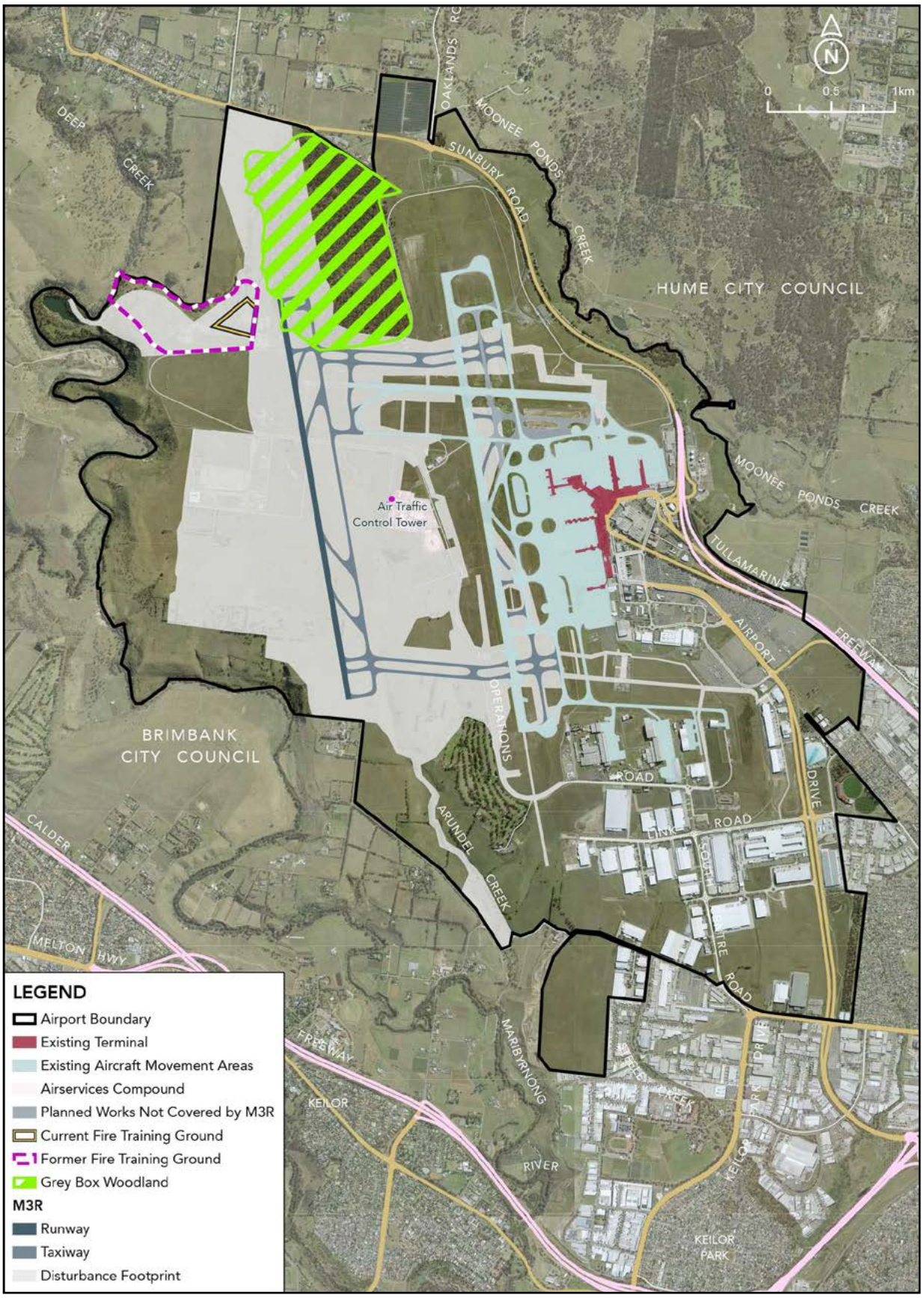
- The broad scope of works includes disturbance of a large volume of soil and rock in the northern part of the runway alignment, and filling in the southern extent of the alignment. An area of cut is also proposed for the underpass under the southern cross-field taxiways
- Disturbance of soil across the remaining project area is likely to be limited to near-surface disturbance. This will include, but not necessarily be limited to, the following:
  - Demolition of existing structures and site clearance works
  - Stripping vegetation and topsoil from cut and fill areas
  - Bulk earthworks associated with cut and fill processes
  - Temporary construction roads and staging zones
  - Construction of the main runway and taxiway pavements
  - Installation of ancillary services supporting the new runway (e.g. electrical services, stormwater drainage, security fencing etc)
- The current project design identifies a fill deficit which is likely to require either importation of fill to complete the works or establishment of an on-site source.

B3.2
METHODOLOGY AND ASSUMPTIONS

The following methodology was undertaken for the assessment of soil, groundwater and waste:

- A review of relevant national, state and local legislation and policy
- A desktop assessment to characterise existing geological conditions, historic and existing land uses, and known potential sources of contamination
- Collation of previous investigation information, and confirmation of data gaps for further investigation
- Site walkovers to visually inspect current site activities and areas of environmental concern
- Site investigation works to further characterise soil, groundwater and wastes
- A qualitative risk assessment to prioritise the impact assessment and development of potential design responses and engineering controls

Figure B3.1
M3R study area boundary



B3.3
STATUTORY AND POLICY REQUIREMENTS

Melbourne Airport is located on Commonwealth land. The *Airports Act 1996* (the Airports Act), the Airports (Environmental Protection) Regulations 1997 (Airport Regulations) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are the key pieces of legislation setting out the regulatory framework for M3R works on airport land and this assessment. Where there is potential to impact on the environment outside the airport site boundary (and on Victorian land), Victorian acts, policies and regulations apply.

Consideration of on-site and off-site impacts in this assessment meets the requirements of the *Significant Impact Guidelines* (DSEWPC, 2013) that the MDP considers the project in the context of the 'whole of the environment' affected by M3R, and recognises that the environmental impact of M3R may extend outside the specific M3R footprint/boundary and the Melbourne Airport site. It also considers the 'specific' and 'general' matters of assessment provided to the airport by the then Department of Environment in relation to the (previously proposed) Runway Development Program (RDP) MDP (EPBC Ref: 2016/7654 March 2016).

In regard to management of contaminated soil, groundwater and wastes within Commonwealth Airport land, the following overarching documents apply:

- *Airports Act 1996* (The Airports Act)
- *Airports (Environment Protection) Regulations 1997* (Airport Regulations)
- *Environment Protection and Biodiversity Conservation Act 1999*
- *Environment and Biodiversity Protection Regulations 2000*
- *National Environment Protection Council Act 1994*
- *Environment Protection Act 2017* (EP Act Vic).

The Airport Regulations include criteria for 'accepted limits' of contamination for soil and water pollution.

The Airport Regulations also refer to Section 14 of the *National Environment Protection Council Act 1994 (Division 2 – Making of national environment protection measures)* whereby monitoring is to be undertaken 'in a way that is not inconsistent with (i) any international convention, treaty or agreement, relating to environment protection to which Australia is a party; or (ii) a provision of national environment protection measures made under section 14 of the National Environment Protection Council Act 1994'.

The EP Act Vic applies in relation to waste management as there is no Commonwealth equivalent for the management of wastes. In addition, wastes generated by M3R may be managed/disposed off-site and therefore state legislation applies.

The following sections outline key regulations and guidelines, noting that supporting guidance documentation is reviewed and updated on a regular basis. Any changes in legislation, regulations and guidance will be considered and incorporated as required.

B3.3.1
Soil and groundwater

Based on the above, it is considered that the following key regulations and guidelines also apply to the assessment of soil and groundwater contamination:

- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality (*ANZG, 2018*)*
- *Australian Drinking Water Guidelines, National Water Quality Management Strategy.* National Health and Medical Research Council & Natural Resource Management Ministerial Council (2011) (Updated October 2017) (NHMRC/NRMMC 2011)
- *Guidelines for Managing Risk in Recreational Waters* National Health and Medical Research Council (2008) (NHMRC 2008)
- *Guide to the Sampling and Investigation of Potentially Contaminated Soil. Part 2: Volatile Substances*, Australian Standards: 4882.2
- *Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil, Part 1: Non-Volatile and Semi-Volatile Compounds*, Australian Standard: AS4482.1-2005
- *National Environmental Protection (Assessment of Site Contamination) Measure*, as *amended 15 May 2013*, National Environmental Protection Council (1999) (NEPM)
- *PFAS National Environmental Management Plan Version 2.0 – January 2020* (PFAS NEMP 2020), National Chemicals Working Group of the Heads of EPAs Australia and New Zealand (HEPA 2020, as amended from time to time)
- *Environmental Reference Standard (Vic)*

The assessment also considers the *Melbourne Airport PFAS Management Framework* (APAM 2022). This provides guidance for re-use and management options of PFAS-impacted soil and water across the Melbourne Airport estate. The framework identifies three management levels for soil re-use (unrestricted re-use, capping at surface, and engineered containment) which are based on PFAS contaminant levels (total concentrations and leachability). This framework has been reviewed by the Commonwealth Department of Infrastructure, Transport, Regional Development, Communications and the Arts (DITRDCA) and is being applied to current construction and maintenance projects across the Melbourne Airport estate.

B3.3.1.1
Adopted assessment criteria for soil and groundwater

Taking into consideration the above and the proposed land use, the following assessment criteria were adopted for soil investigations:

- Airport Regulations Soil Pollution – accepted limits – Table 1 – areas of an airport generally
- Airport Regulations Soil Pollution – accepted limits – Table 2 – areas of environmental significance.
- NEPM Human Health Setting 'D' – Commercial / Industrial
- NEPM Maintenance of Ecosystems – Commercial/ Industrial (including relevant derivations for nickel and zinc)
- PFAS NEMP Human Health – Industrial /Commercial
- PFAS NEMP Ecological indirect exposure – All land uses
- Melbourne Airport PFAS Management Levels.

The following assessment criteria were adopted for groundwater investigations in consideration of both onsite and off-site receptors:

- Airport Regulations – Freshwater
- PFAS NEMP 'Aquatic Ecosystem – Freshwater 95 per cent and 99 per cent species protection' criteria
- PFAS NEMP Health-based guidance values – Drinking water and recreational water
- ANZG 2018 – 'Aquatic Ecosystem – Freshwater 95 per cent species protection' criteria
- ANZG2018 – 'Primary Contact Recreation' and where relevant, guidelines were sourced from NHMRC 2011
- ANZG 2018 – 'Irrigation & Stock watering.

When assessing existing impacts, consideration of all applicable guideline criteria are used as screening levels noting that in general, limits for areas of environmental significance are the lowest protective value and that where human health screening levels are exceeded this indicates an exceedance of all adopted criteria.

When assessing existing impacts in groundwater, consideration of all applicable guideline criteria are used as screening levels with more conservative 99% species protection threshold limits adopted for PFAS compounds based on the potential for bioaccumulation and biomagnification.

B3.3.2
Asbestos

The following additional legislation and guidance are applicable to management of asbestos:

- *Work Health and Safety Act 2011* (Cth)
- Work Health and Safety Regulations 2011 (Cth)
- *Occupational Health and Safety Act 2004* (Vic)
- *Occupational Health and Safety Regulations 2017* (Vic)
- *WorkSafe Guidance Note - Asbestos-contaminated soil, October 2010* (Vic).

B3.3.3
Wastes

The EP Act Vic and supporting regulations and guidelines commenced on 1 July 2021. This new legislation and guidance will be relevant at the time of construction works. This legislation adopts a different approach to environmental issues, focusing on preventing waste and pollution impacts. A cornerstone of the Act is the General Environmental Duty (GED) requiring reasonably practicable steps to be undertaken to eliminate or otherwise reduce the risks of harm to human health and the environment. Based on documentation published or circulated as proposed to date, the overall waste management principles are not expected to change significantly. As supporting guidance documentation is often reviewed and updated on a regular basis, for the purposes of the MDP the available legislation and guidance documentation has been considered.

- *Environment Protection Act 2017* (EP Act Vic)
- *Environment Protection Regulations (Vic)*
- *Guide to classifying industrial waste. Publication 1968. EPA Victoria.*
- *Waste disposal categories – characteristics and thresholds. Publication 1828. EPA Victoria.*

It is noted that the PFAS NEMP also provides guidance on assessment, transport and disposal of PFAS-impacted wastes and will be considered where relevant. For any off-site transport and disposal of wastes the State jurisdictional requirements take precedence.

B3.4
DESCRIPTION OF SIGNIFICANCE CRITERIA

Table B3.1 presents the severity assessment criteria developed to assess impacts from soils, groundwater and wastes in accordance with the M3R Significance Assessment Framework.

Table B3.1
Significance assessment framework for soil, groundwater & waste

Magnitude	Specialist Criteria – Soil and Groundwater	Specialist Criteria - Waste
Major	In situ concentrations of contaminants in impacted media (soil, groundwater, surface water, sediments, and air) exceed adopted human health investigation levels and present an immediate risk to the health of persons accessing the site. Mitigation measures are likely to be extensive or complex, requiring a high level of resources and may involve regulatory intervention.	Waste generated by M3R is entirely disposed to landfill or stored or handled in a way that results in permanent, irreversible or long-term adverse impact to the local or receiving environment. Management or mitigation measures are unlikely to restore the ecological values to the local or receiving environment.
High	The disturbance of in situ contamination with concentrations that exceed adopted human health or ecological investigation levels and potentially present a risk to the health of persons accessing the site, or which result in the mobilisation of the contaminants within the immediate environment sufficient to cause adverse impacts to the local environment and long-term impacts in the receiving environment. Careful management or avoidance can mitigate.	Waste generated is entirely disposed to landfill or stored or handled in a way that results in adverse impact to the local environment or long-term impacts to the receiving environment. Careful management or avoidance can mitigate adverse effects but may require many years to restore the ecological values to the local or receiving environment.
Moderate	The disturbance of soil or groundwater containing contaminants with concentrations that exceed adopted investigation levels for ecological receptors and human health, which results in the mobilisation of the contaminants within the immediate environment, which is sufficient to cause adverse impacts to the local environment and long-term impacts in the receiving environment. Appropriate management measures can mitigate.	More than 80 per cent of waste generated is disposed to landfill. Storage or handling of waste results in adverse impacts to local environment or long-term impacts to the receiving environment that can be managed via implementation of appropriate mitigation measures.
Minor	The disturbance of soil or groundwater containing one or more contaminants with concentrations exceeding screening levels for ecological receptors and highly sensitive human receptors, but are below screening criteria for commercial /industrial land uses, which is sufficient to cause adverse impacts to the local environment and long-term impacts in the receiving environment. Appropriate management measures can mitigate.	More than 80 per cent of wastes are either recycled or treated to allow beneficial re-use, with the exception of prescribed industrial wastes (and hazardous wastes). Storage or handling of waste results in minor adverse impacts to local or receiving environment that can be managed via implementation of appropriate mitigation measures.
Negligible	The disturbance of soil or groundwater containing isolated occurrences of contamination which may result in mobilisation of small amounts of contaminants within the immediate receiving environment. Degradation of the greater receiving environment (being areas outside of the M3R land-based footprint) is unlikely with no measurable degradation to the local receiving environment. Monitoring of potential impact may be an appropriate response rather than implementation of mitigation measures.	All wastes are diverted from landfill and either recycled or treated to allow beneficial re-use.
Beneficial	The disturbance of soil or groundwater and subsequent management during construction leads to a reduction in risks to human health or ecological receptors. This can be achieved by reducing or removing potential pathways such as capping, containing or relocating contamination away from sensitive receptors or implementing other controls such as surface water diversion and erosion controls.	All wastes are diverted from landfill and either recycled or treated to allow beneficial re-use. Implemented management measures result in removal of legacy wastes thereby improving the local or receiving environment.

B3.5 EXISTING CONDITIONS

This section outlines the existing conditions of the study area relating to soil, groundwater and waste.

B3.5.1 Geology – Published

The geological formations outcropping in the site's vicinity is shown in the Sunbury 1:63,360 Geological Map section reproduced in **Figure B3.2**.

The stratigraphic sequence beneath the northern part of the site consists of the Quaternary-aged Newer Volcanics Formation directly overlying the Devonian-aged Bulla Granodiorite. The elevation of the upper surface of the Bulla Granodiorite appears to be highly variable and, consequently, the thickness of the overlying Newer Volcanics is likely to be variable across the site.

The stratigraphic sequence beneath the southern part of the site generally comprises the following formations, from youngest to oldest:

- Quaternary-aged Newer Volcanics, consisting of clay-rich basaltic soils overlying highly decomposed basalt rock
- Tertiary-aged Sandringham Sandstone (formerly known as the Brighton Group) consisting of clayey sands and sandy clays
- Tertiary-aged Older Volcanics, consisting of highly to extremely weathered basalt
- Silurian-aged Murrindindi Supergroup comprised of the Deep Creek Formation, Springfield Sandstone and Dargile Formation) occurring as fractured siltstone, mudstone, sandstone, shale and greywacke.

The Quaternary-aged Newer Volcanics Formation is the predominant surface outcrop across the plateau forming the majority of the site area. The sequence of underlying Tertiary-aged formations outcrop along the deeply incised river and creek valleys around the site. The Maribyrnong River and Monee Ponds Creek valleys are located west and east of the site respectively, and Arundel Creek valley, a tributary of the Maribyrnong River, separates the new north-south runway (16R/34L) from the existing airport terminal facilities.

The Bulla Granodiorite and Murrindindi Supergroup form the bedrock of the region and outcrop in topographic highs in the northern part of the site (the Grey Box Woodland), north-east and north-west of the site.

Figure B3.2 presents the published geological information for M3R.

B3.5.2 Geology – Observed

Surface soils across the site generally consist of variably weathered basalt of the Newer Volcanics. In the south, this is underlain by the Sandringham Sandstone (clay and sand), Older Volcanics (clay and basalt rock) and siltstone bedrock of the Murrindindi Supergroup.

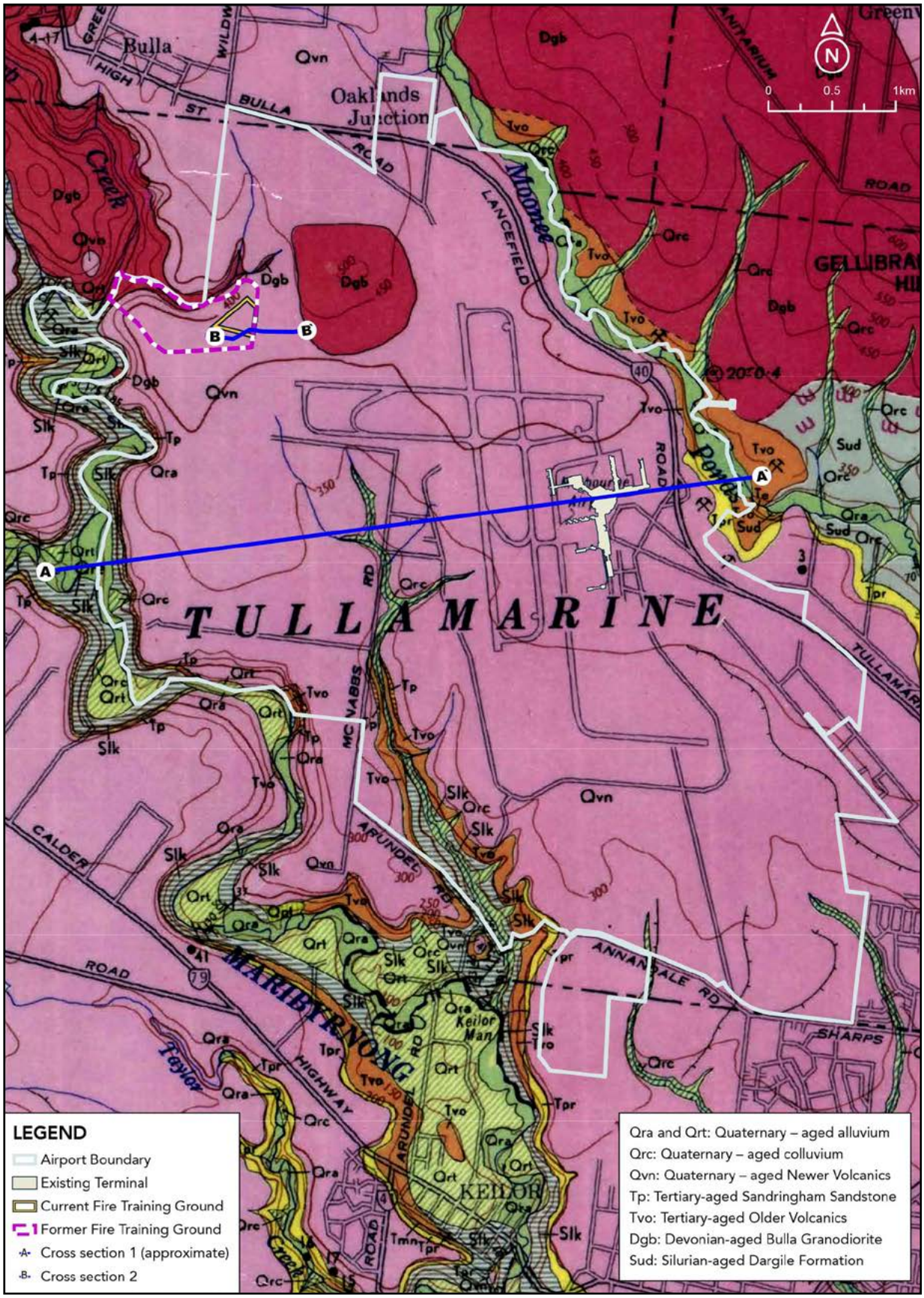
In the area of the Grey Box Woodland to the north of the site, Bulla Granodiorite (ranging from residual sand and clay soils to fresh rock) was encountered. It was found to extend to the west outside the Grey Box Woodland directly below the Newer Volcanics basalt in some investigation locations. Weathering of the Bulla Granodiorite was highly variable, with slightly weathered to fresh granodiorite encountered towards the east of the Grey Box Woodland from depths of ten centimeteres below ground level (bgl). Towards the western side of the Grey Box Woodland, extremely weathered granodiorite (recovered as sandy clay and clayey sand) was encountered from surface to the target depth of 15 metres bgl.

Shallow fill soils were encountered across the current Fire Training Ground (FTG) to a maximum thickness of 1.8 metres. Deeper filling was encountered in the area west of the current FTG, up to six metres bgl thick. This typically comprised reworked siltstone material, and localised and sporadic inert waste materials observed in the shallow fill zones.

Figure B3.3 (cross-section B-B') presents the interpreted vertical surface geology encountered during drilling in the northern part of the proposed runway's alignment.

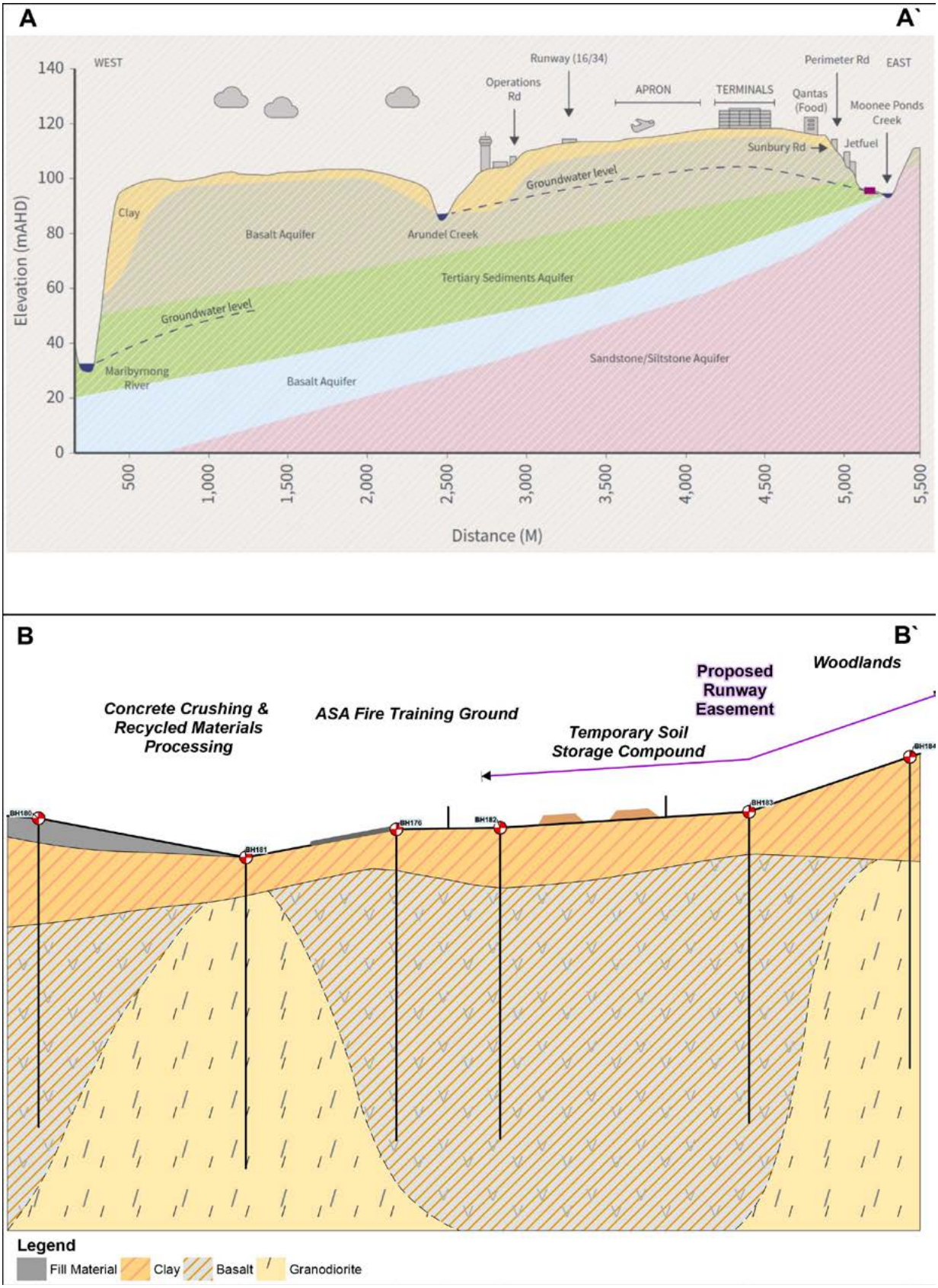
Drilling works in the southern portion of the site (in the location of the proposed underpass beneath the proposed cross-field taxiway) showed that the Newer Volcanic basalt rock will likely be penetrated at depths of approximately 0.25 to two metres bgl; and Sandringham Sandstone at thirteen to fourteen metres bgl. **Figure B3.3** (cross-section A-A') provides a simplified interpretation of the vertical sequence of geological formations encountered during investigations in the southern part of the proposed runway alignment.

Figure B3.2
Map of published geology



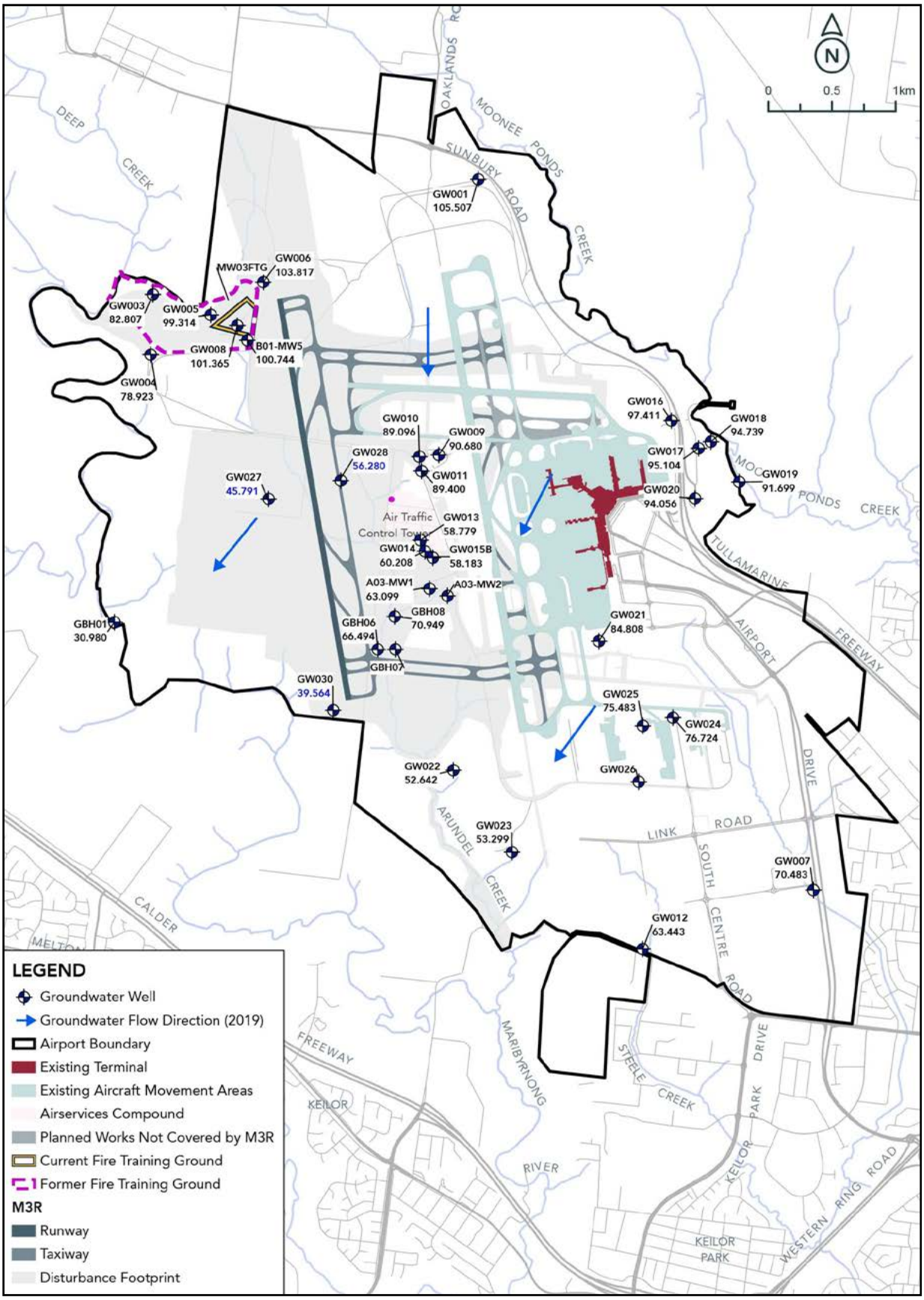
Source: Geological Survey of Victoria, 1973. Sunbury 1:63,360 Geological Map Sheet.

Figure B3.3
Geological cross sections A-A' and B-B'



Source: A-A' from Melbourne Airport Master Plan, 2018.
B-B' from Senversa, 2020.

Figure B3.4
Groundwater monitoring well network and groundwater elevations



Source: Senversa, 2020.

B3.5.3
Hydrogeology

Regional groundwater flow is generally south towards Port Phillip Bay. However, groundwater beneath the project area is heavily influenced by the presence of incised river/creek valleys (the dominant flow direction being south-west across the site towards Deep Creek and Maribyrnong River).

The uppermost water table occurs in the Newer Volcanics to the north and east of the site, and is reported to also occur in the Sandringham Sandstone and Older Volcanics in wells located in the centre, south and west of the project area. In some elevated areas and close to surrounding watercourses, groundwater is not present in the Sandringham Sandstone and Older Volcanics.

Groundwater does occur at depth in the fractures and jointing in the deeper Murrindindi Supergroup and Bulla Granodiorite. However, aquifers in the bedrock formations are likely to be hydraulically isolated from overlying water tables by clay-rich weathering of these units' upper layers.

Figure B3.4 shows the Melbourne Airport monitoring well network and groundwater elevations from gauging undertaken in 2019. Groundwater depths across the project area generally range from approximately eighteen to fourty-eight metres below ground level. Shallower groundwater depths are noted within incised valleys such as Arundel Creek, where groundwater seeps have also been observed. Perched groundwater is also expected to occur but project works will generally take place above the water table.

B3.5.4
Current and Historical Land Use

Figure B3.5 and Figure B3.6 present Areas of Environmental Concern (AEC). These have been identified by assessing current and historic land uses and activities, and their potential to have caused soil or groundwater contamination. A summary of AECs is presented in Table B3.2 and their key features are summarised below:

The majority of the project area is located within the landside area of the Melbourne Airport estate. The following current site uses have been observed:

- Current Fire Training Ground (FTG) (AEC 13) leased to Airservices Australia for firefighting activities (no training is currently occurring at this site)
- Agricultural (grazing) land in non-operational areas of the airport estate
- Concrete crushing and recycled materials processing area (AEC 16)
- Construction laydown areas and compounds for current project activities (AEC 15 and 25)
- Operational areas of the airport (existing east-west runway (09/27), existing north-south runway (16L/34R) and associated infrastructure including navigation, communications infrastructure, taxiways etc
- Melbourne Airport Golf Course (AEC 37)
- Temporary PFAS soil stockpiling and storage area (AEC 40)
- Other temporary PFAS soil stockpiling (AEC 22 and 31).

The following provides a summary of historic land use:

- Prior to development of land for the airport in the late 1960s, the Melbourne Airport site was predominantly used for grazing and crops. A number of former homesteads, dams and ancillary features were observed from 1951 to 1969.
- The east-west runway (09/27) was constructed commencing circa 1966. Material for the runway was sourced from a quarry at the western end of the Melbourne Airport Estate abutting Deep Creek, which comprised siltstone from the Murrindindi Supergroup. The Deep Creek tributary was also dammed as part of runway construction in the late 1960s. In circa 1982, historic aerial imagery suggests the dam walls were no longer intact.
- Evidence of fire training activities in the northern part of the project area was observed from 1975 onwards, with a much broader area of use than the current lease area (AEC 11 extent on Figure B3.5 provides broad area of use; AEC 29 and 30 on Figure B3.6 detail observed areas of activity from aerial photographs).
- Significant ground disturbance and soil filling have been observed, associated with the construction of the current east-west runaway and former fire training ground - plus the existing concrete crushing and recycling area, where large amounts of stockpiled soil, rock and materials have been received and processed.
- The northern area previously included a construction laydown for the original runway development adjacent to the current compound (AEC 21). Activities at the current compound (AEC 15) have had multiple site users and various activities predominately associated with existing runway upgrade and maintenance works. They include storage of new and used construction materials, equipment, soil and wastes. The activities of this compound extend north outside its boundary, where an area of land was used for managing waste streams from asphalt works (settling ponds for solid/liquid separation). More recently, this area has been used to stockpile PFAS contaminated soils excavated from the Joint User Hydrant Infrastructure (JUHI) tank expansion project (outside current project area).
- Two former communications towers (AEC 17 and 18) were located in the northern part of the project area and have been demolished. The towers included storage of fuel (both above and below ground).
- Land uses and site activity in the southern extent included a former landfill and incinerator site (AEC 1 and 2), former residential and agricultural activities (AEC 3 to 7), filling activities (AEC 5) on the northern and southern boundaries of the golf course, and the longer term use of the current construction compound/laydown area (AEC 25) west of the aviation maintenance areas (AEC 38).

Table B3.2
Areas of Environmental Concern

AEC	Details	AEC	Details
1	Former landfill	21	Former construction/laydown area associated with original airport development
2	Former incinerator site	22	Stockpiled materials (2018-2019)
3	Demolished and dilapidated buildings	23	Radar and diesel above ground storage tank
4	Waste dumps	24	Above ground storage tank and former underground storage tank
5	Disturbed ground and infilled land	25	Construction compuound/laydown area
6	Vehicle maintenance	26	Residential property – historically agricultural, currently storing equipment associated with carnival/show ground equipment/rides
7	Activities associated with former hobby farms, horse agistment and kennels	27	Temporary construction compounds/infrastructure (various locations)
8	Runway and fill beneath runway	28	Infilled dams
9	Settlement ponds (runway/asphalt works waste management)	29	Former Fire Training Ground infrastructure and props
10	Disused quarry	30	Burn scars visible in 1982 aerial image around former Fire Training Ground infrastructure
11	Former Fire Training Ground	31	Airservices Australia stockpiled PFAS contaminated soil
12	Evaporation pond	32	Current Fire Training Ground infrastructure – operational (kerosene, generator and holding tanks for wastewater)
13	Current Fire Training Ground	33	Melbourne Airport Fire Station
14	Aboveground storage tank and fuel line to current Fire Training Ground (kerosene)	34	Learning academy
15	Construction (multiple users/uses) laydown, stockpiling, asphalt batching, equipment storage	35	Smoke Hut and former training areas to south of Smoke Hut.
16	Concrete crushing & recycled materials processing	36	Satellite Fire Station
17	Former communications tower complex west of the Grey Box Woodland.	37	Melbourne Airport golf course
18	Former communications tower complex within the Grey Box Woodland	38	Aviation maintenance areas (various users/tenants)
19	Former Bulla Road	39	Joint User Hydrant Installation
20	Former Oaklands Road	40	Temporary PFAS soil stockpile/storage area

Many of these areas of concern have been investigated at least partially in previous assessments. The assessment undertaken by Senversa (Senversa, 2020) qualitatively assessed the risks associated with these areas of concern and identified potential contaminants of concern. The key areas of concern located within the project area are the current and former FTG (AECs 13 and 11, respectively) and associated infrastructure including, but not limited to, the evaporation pond (AEC 12) relating to the historic use of Aqueous Film Forming Foams (AFFF) containing per- and poly-fluoroalkyl substances (PFAS). AECs 11 to 13 are located within and/or adjacent to the proposed main area of works (which will include bulk excavation of material in the northern part of the 16R/34L alignment).

Impacts associated with PFAS contamination have been further delineated and are identified as being a key issue that requires management as part of project works.

The presence of asbestos in near surface soils is a common issue for construction projects that have had historical buildings and infrastructure. The presence of asbestos-containing wastes has been noted in isolated areas of waste material within the project area, and observed in fill at some soil sampling locations.

Landfills and areas of filling have been identified within the project area. One of the AECs appears to be a former landfill (AEC 1) containing material generally consistent with construction and demolition waste rather than putrescible waste or hazardous chemicals. Other areas of filling appear to predominantly involve use of displaced soils from other parts of the site.

The main contaminants associated with the other AECs in the project area predominantly include metals and petroleum hydrocarbon contaminants. These are generally limited to shallow soil and considered to present a moderate to low level of risk. Concentrations of some metals in soil are reflective of naturally occurring background levels in the soils at the site. Soils containing elevated levels of metals and petroleum hydrocarbons associated with historic use are considered relatively easy to manage in the context of the earthworks associated with the project.

Additional information on the categorisation of AECs and management responses is provided in Section B3.5.5 of this chapter.

B3.5.5
Contaminants of Potential Concern

B3.5.5.1
PFAS

At airports, Aqueous Film Forming Foams (AFFF) containing per- and poly-fluoroalkyl substances (PFAS) were historically used because they are very effective at putting out liquid fuel fires. At Melbourne Airport, AFFF has been stored in aircraft hangers for deluge systems; and used extensively in training for and responding to firefighting emergencies involving liquid fuels. Potential source areas in the project area include the following Airservices Australia and their predecessors' facilities as presented on Figure B3.8:

- Current and former fire training grounds (FTGs) (AEC 11 and 13)
- The Melbourne Airport Fire Station (AEC 33)
- The Smoke Hut (AEC 35).

Diffuse PFAS impacts are widespread across the project area and a number of secondary sources of PFAS contamination have also been identified (refer to Figure B3.8). However, these are predominantly associated with surface water drainage, groundwater contamination and water re-use impacts (e.g. Melbourne Airport golf course – AEC 37).

The key PFAS compounds of concern within the Airport Estate are perfluorooctane sulfonate (PFOS) and perfluorohexane sulfonate (PFHxS). Although other PFAS compounds have been detected above laboratory limits of reporting (LOR), PFOS and PFHxS are considered suitable indicators of overall PFAS impacts and the primary drivers of risk because they:

- Have as high or higher toxicity than other PFAS for which toxicological studies have been conducted
- Have screening and toxicity reference values published by Australian agencies for use in screening level and detailed quantitative health risk assessments
- Comprise the majority (predominantly greater than two-thirds) of total analysed PFAS compounds at Australian sites where PFAS-containing fire-fighting foams have been used.

It is noted that screening levels are also available for perfluorooctanoic acid (PFOA). However, PFOA has not been demonstrated to be a risk driver at Australian sites. This is due to its lower toxicity than PFOS and PFHxS, and its occurrence at lower concentrations in environmental media.

Table B3.3 summarises PFAS impacts across the project area.

Estate-wide human health risk assessments have been commissioned by APAM as part of broader estate management. They identified that on-site and off-site risks are considered low and acceptable. For the purposes of this MDP, assessment of project risks from PFAS will need to consider the current risk profile, and how PFAS will be managed to ensure the risk profile does not increase and/or can be improved as part of project works.

B3.5.5.2
Other Contaminants - Soil

Other non-PFAS contaminants of concern in soil within the project area include metals, petroleum hydrocarbons, asbestos and herbicides/pesticides. Historic landfilling on-site also presents a potential range of contaminant issues. Table B3.4 summarises the current understanding of these contaminants in soils within the project area.

B3.5.5.3
Other Contaminants – Groundwater

Groundwater monitoring at the wells shown in Figure B3.9 is undertaken on an annual basis for a broad range of analytes. In addition to PFAS impacts reported in groundwater, the following contaminants have been reported at levels above the adopted guidelines:

- Widespread total nitrogen, copper and zinc
- Isolated occurrences of arsenic, cadmium, chromium, cobalt, lead, manganese, nickel, selenium and nitrate
- Isolated occurrences of petroleum hydrocarbons associated with historic and current use areas (current FTG, maintenance area and JUHI).

Nitrogen and nitrate concentrations are considered representative of regional background concentrations. Metal concentrations are also generally considered representative of regional background concentrations, although some isolated impacts of mercury, chromium (total and VI) and manganese are above regional levels but considered stable.

Table B3.3
Summary of PFAS impacts across the project area

Matrix	Summary of PFAS presence across project area
Soil	Extensive PFAS investigation works have been undertaken across the Melbourne Airport estate, including approximately 690 sample locations within the project area (refer to **Figure B3.7**). This has shown that: • PFAS concentrations (as indicated by sum of PFOS and PFHxS) have been reported above laboratory LOR in most soil samples, however concentrations in most locations are below 0.01 mg/kg (**Figure B3.8**). Areas with relatively high concentrations (>0.01 mg/kg) have been identified where PFAS-containing foams are known or inferred to have been used in the past, including the vicinity of the former and current FTG, smoke hut, fire stations, maintenance hangars, Melbourne Airport golf course (due to irrigation from Arundel Creek), and the historic remote training area near Deep Creek Tributary discharge point. PFOA concentrations are generally non-detect and no exceedances of the health-based criteria have been reported. PFOA only reports above LOR where significant concentrations of PFAS (sum PFOS and PFHxS) have been reported. • PFAS concentrations exceeding health-based screening levels for commercial/industrial workers of >20 mg/kg have only been reported in the vicinity of the current and former fire training grounds. The key source areas for the project area are the current and former FTG. • PFAS concentrations exceeding 50 mg/kg have been reported within the vicinity of the current and former FTG. Concentrations above 50 mg/kg are considered unsuitable for re-use. The volume of soil impacted at these concentrations and above has been estimated conservatively to be in the order of 18,000 M^3. • PFAS (total concentrations) has been well delineated at the near-surface (0 m to 0.2 m below ground level (bgl) across the project area, including key source areas. Vertical delineation is limited across most of the project area, although targeted sampling along the runway alignment and in proposed areas of deep cutting has been investigated. Vertical delineation beneath the key source area (current FTG and surrounds) has also been undertaken. • PFAS leachability rather than total concentrations is considered to the be key driver for management of soils within the project area. Due to limited PFAS leachability data across the broader project area, the potential for increased leachability due to pre-placement treatment (liming) and issues with reliance of laboratory results, maximum leachability concentrations have been estimated from total concentration data. This is considered to be a conservative approach and results indicate that all three Melbourne Airport PFAS management levels are present within the project area. In addition, areas that exceed the highest management level have been reported in the vicinity of known primary and secondary source areas (current and former FTG, Main Fire Station, Smoke Hut, Melbourne Airport golf course and maintenance area) as well as sediment within drainage lines down gradient of the current FTG and other Airservices Australia leaseholds. In summary, the soil data collected to date (both project specific and broader estate) is considered comprehensive and the understanding of PFAS impacts for the purpose of the MDP is considered sufficient. Further investigations are likely to be required as part of management requirements and remediation options assessments.
Groundwater	The current APAM groundwater monitoring well network consists of 36 wells located across the airport estate (**Figure B3.9**). Annual monitoring for PFAS has been occurring since 2017. Three of the wells (GW027, GW028 and GW030) were installed as part of project specific works to obtain specific information on groundwater quality beneath proposed fill areas. Additional wells are also located within the airport estate that are controlled by tenants and target source specific issues. The results of groundwater monitoring undertaken by Melbourne Airport indicate the following: • PFAS concentrations (as indicated by sum of PFOS and PFHxS) have been detected in a number of groundwater wells across the network. • Inferred groundwater flow direction is to the west, southwest and south, towards the Maribyrnong River and Arundel Creek. • The majority of monitoring wells at the airport are screened within the upper aquifer across much of the site (Newer Volcanics and Sandringham Sandstone). However, some wells (GW013, GW014, GW015B, A03-MW1 and A03-MW2) appear to be screened in a lower Silurian Siltstone aquifer which may have limited connection to the shallower regional water tables. • PFAS concentrations are reported above adopted screening levels in multiple monitoring wells, with highest concentrations around Airservices Australia infrastructure including the current FTG and Main Fire Station. PFOA has also been detected but only in wells where sum of PFOS and PFHxS are reported above adopted screening levels. PFOA concentrations only report above adopted screening levels in wells with significant concentrations of sum of PFOS and PFHxS. • PFAS concentrations exceed adopted screening levels at the down-gradient (southwest) site boundary but appear to be stable with the exception of GW003 which shows an increasing trend. The groundwater monitoring network and PFAS data collected to date is considered suitable for providing an understanding of groundwater quality beneath identified PFAS source areas and across the broader project area.

B3.5.6
Other soil characteristics and impacts

B3.5.6.1
Acid Sulfate Soil

Acid sulfate soil is the common name given to soils (and rock) containing metal sulphide materials that have the potential to generate sulphuric acid when exposed to oxygen which could occur during construction (e.g. dewatering or excavation activities).

An online review of the *Atlas of Australian Acid Sulfate Soils* (CSIRO, 2013) was undertaken and the M3R project area is not identified as an area of known or potential acid sulfate soils. The surface geology and geological units likely to be encountered during M3R construction activities within the study area are primarily the Tertiary-aged Newer Volcanics unit and Bulla Granodiorite. These are not recognised potential acid sulfate soil generating soil types/rock types in Victoria. The geological units at the site that have the potential to be acid sulfate generating include the Tertiary-aged Sandringham Sandstone sediments and Silurian siltstone and

Table B3.4
Summary of non-PFAS contamination impacts across project area

Contaminant group or area	Summary of non-PFAS contaminants across project area
Metals	Metals have been identified as a contaminant of potential concern both as naturally elevated occurrence in geological units as well as at most areas where there has been any historical site use. The data indicates that the project area comprises low-level metals impacts below the Airport Regulations Soil Pollution – accepted limits 'areas of an airport generally' (Schedule 3). Some exceedances of adopted ecological investigation levels are noted as follows: Elevated concentrations of nickel, copper and total chromium in soil have been reported across the project area and are considered to be a reflection of naturally occurring levels in the basaltic clay soils. Isolated elevated concentrations of arsenic and zinc have also been reported but are considered to be representative of a small soil volume and poses a low risk to the M3R project.
Petroleum Hydrocarbons	Hydrocarbons have been identified as a contaminant of potential concern where there has been historical site use. The bulk of these areas have been assessed and show that the project area has isolated occurrences of low-level hydrocarbon impacts below the Airport Regulations Soil Pollution – accepted limits 'areas of an airport generally' (Schedule 3) except for within the current FTG and an isolated occurrence in a cleared area of the Grey Box Woodland. Impacts within the current FTG also exceed adopted human health investigation levels. These locations correspond to areas where high concentrations of PFAS also occur.
Asbestos	Asbestos was identified as a primary contaminant of potential concern as part of previous assessment (RDP) and confirmed to be a contaminant that required further management. Impacts identified from previous assessments have included a former landfill and incinerator site, former residential properties and associated building rubble and waste piles (**Figure B3.10**). Additional areas of historical use have been identified in the current project area and are currently identified as suspected to contain asbestos until the presence/absence of asbestos is confirmed.
Herbicides and Pesticides	The use of herbicides and pesticides for weed control and insect management has been identified as a contaminant of potential concern, particularly near the current runway, aprons and taxiways. Previous assessment work in these areas have identified low-level concentrations below Airport Regulations Soil Pollution – accepted limits 'areas of an airport generally' (Schedule 3). Isolated impacts have been limited to areas directly adjacent to hardstand or roadways (apron, taxiway, service road) as well as within the Melbourne Airport golf course.

Historic Landfilling Activities	A range of landfilling activities have been identified within the project area and fall into three broad categories:
	• A former unlicensed landfill (AEC 1) and associated incinerator site (AEC 2) which is understood to be at least 7.5 m deep and known to contain inert waste, clay, concrete, bricks, crushed rock, rubber tyres and green waste.
	• Backfilled dams from former agricultural practices.
	• Fill (soil) associated with existing runway development including historic access routes (AEC 5) from the former quarry (AEC 10).
	• In addition to the contaminants of potential concern listed above, the following contaminants can be associated with landfilling:
	  ◦ Other chemicals that are likely to have had an historic use and may have been disposed of inappropriately (for example solvents and degreasers).
	  ◦ Contaminants generated from the practice of landfilling and decomposition of putrescible wastes including nutrients (nitrogen and sulphate compounds) and methane.
	  ◦ Inert waste streams that may require management if any disturbance of these areas is proposed.
	Previous investigations have been undertaken in key filled areas and confirmed that in general landfilling on site has predominantly involved either disposal of inert waste streams and/or have been filled with site sourced soil. The size and number of filled areas, in particular former dams, means that not all areas of historic filling have been assessed in detail. The level of investigation to date is considered adequate for the purposes of assessing environmental impacts for the MDP.

sandstone (rock) of the Murrindindi Supergroup. Other project data within the estate has investigated these two units and confirmed very low to negligible potential for acid generation in both units.

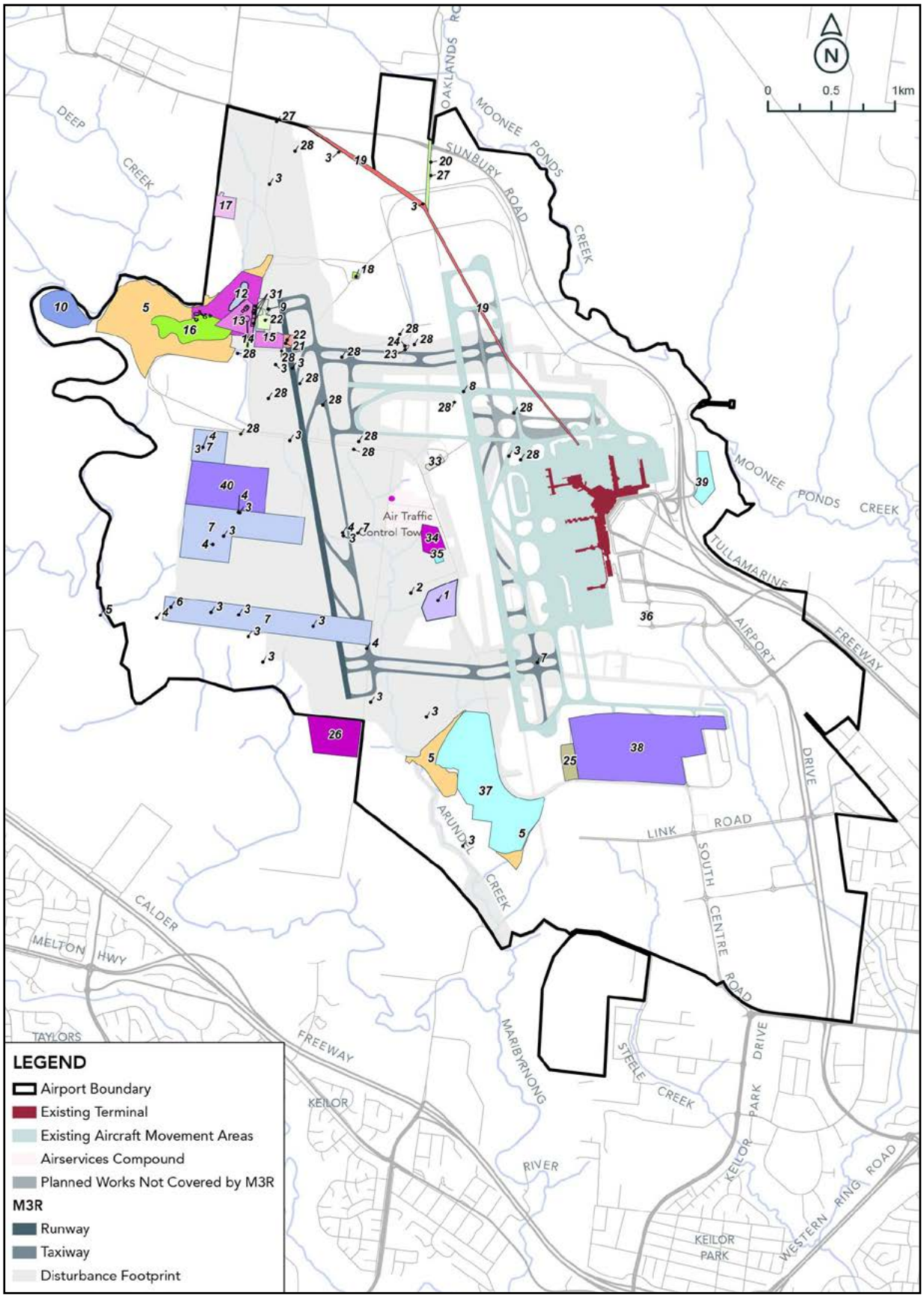
Both of these geological units occur well below the design levels and are unlikely to result in disturbance of soils or rock that would trigger the need to investigate acid forming potential and development of an acid sulfate soil/rock management plan.

B3.5.6.2
Odour, Gas and Vapours

Excavation and other construction activities could release underground gas and vapours impacting human health and the environment. Excavation of soils during construction may also expose volatile contamination, and create a pathway for gas and vapours to migrate from below the ground surface into buildings and other enclosed spaces. Potential sources of vapour have previously been identified and investigated. They included field investigations of former areas of landfilling which may have included putrescible wastes within the project area. All identified areas of concern have been confirmed to not present a risk from gas or vapours.

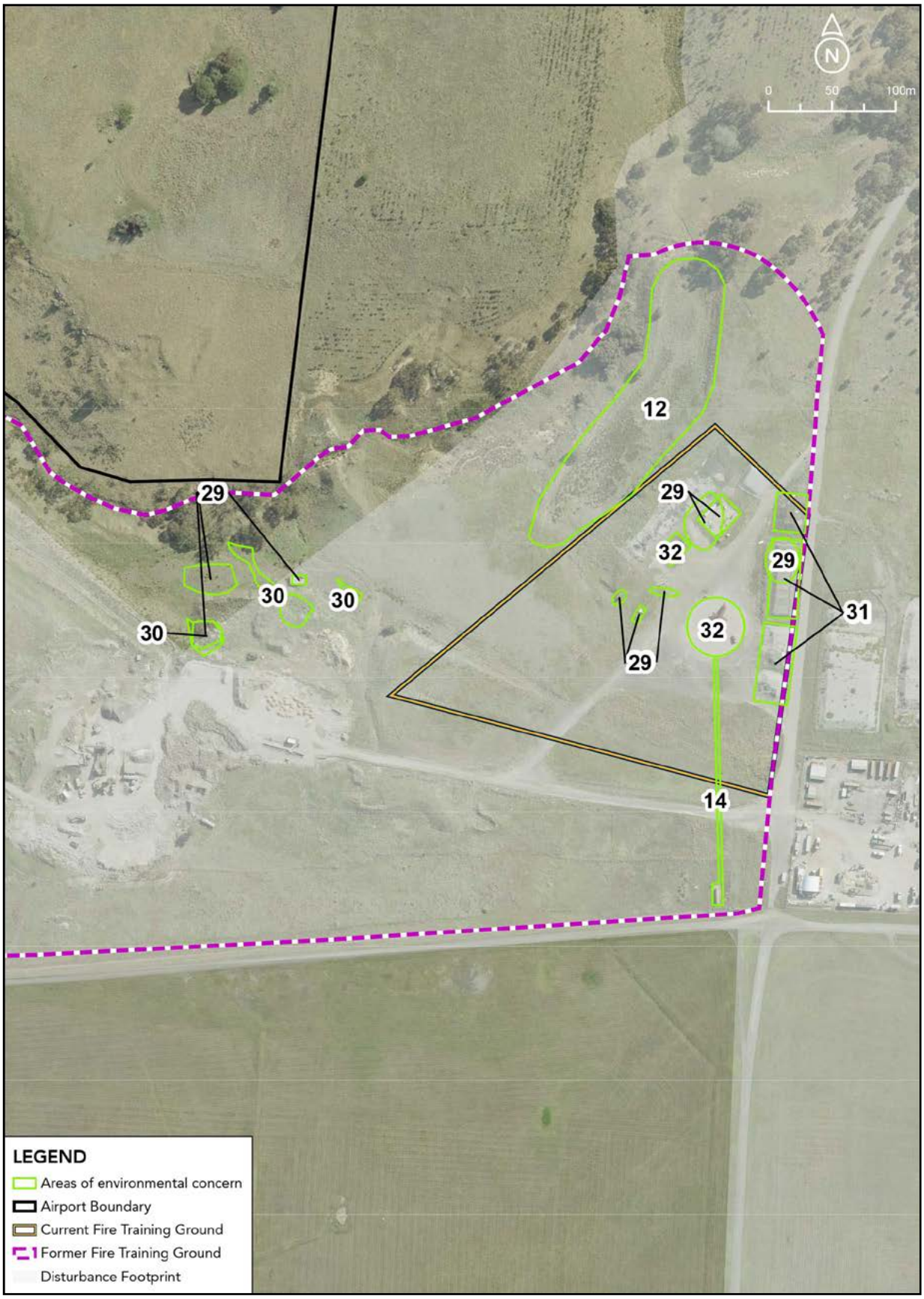
The risk from odour or vapours from point source contamination that may be encountered is already considered in managing impacts from non-PFAS contaminants (e.g. point source hydrocarbon impacts).

Figure B3.5
Areas of environmental concern (refer to Table B3.2 for legend key for AECs)



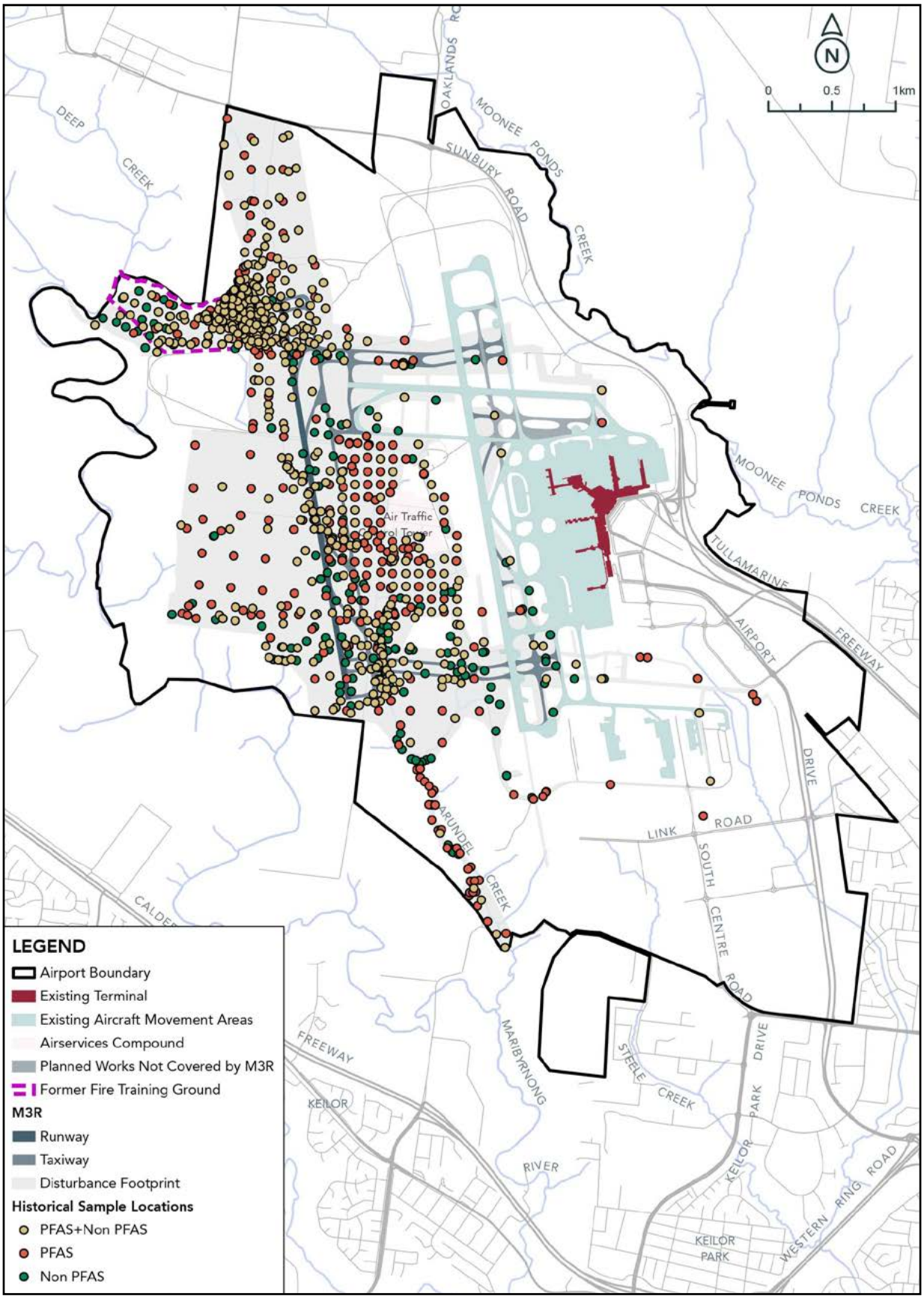
Source: Senversa, 2020.

Figure B3.6
Areas of Environmental Concern – current and former fire training grounds



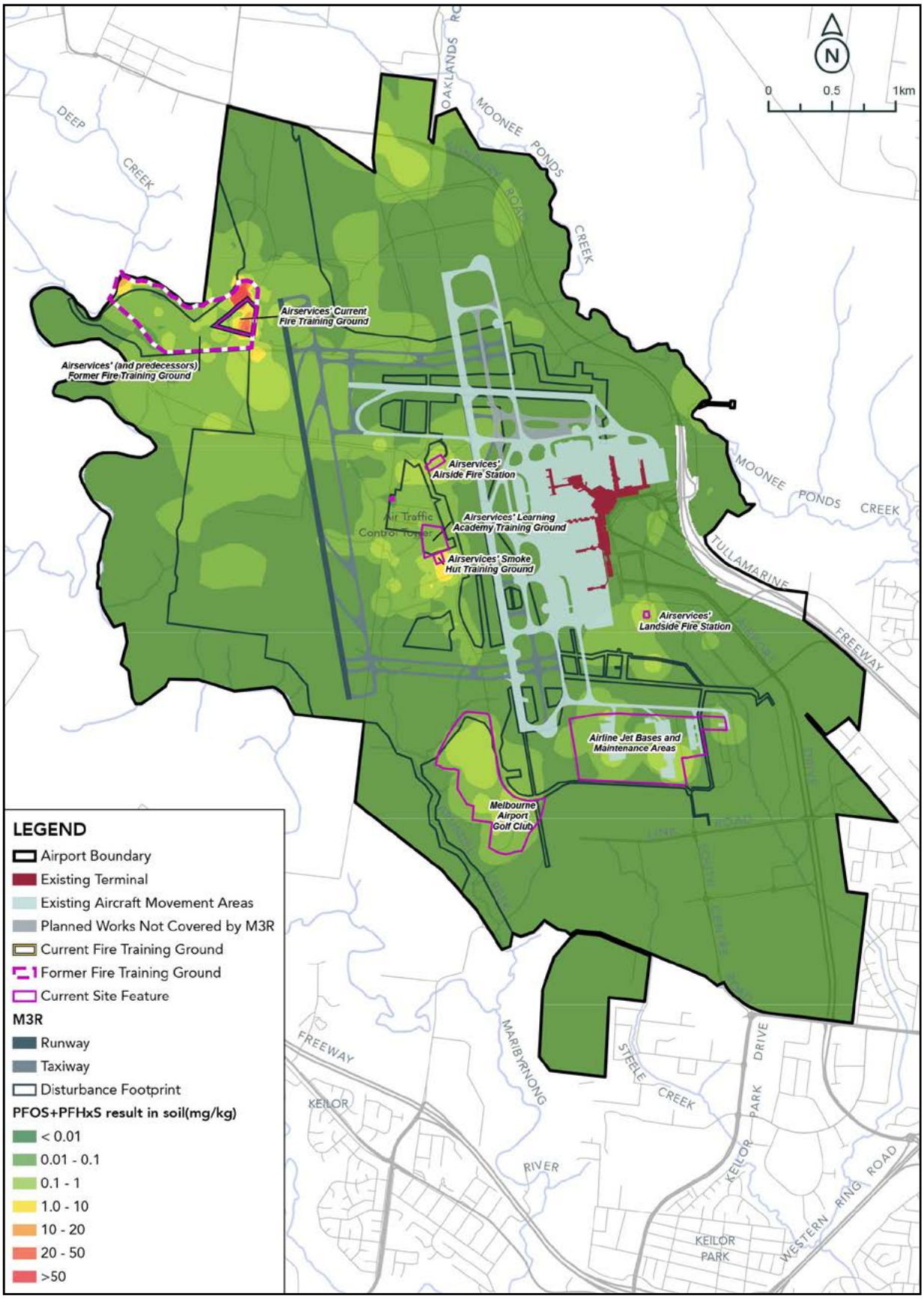
Source: Senversa, 2020.

Figure B3.7
Summary of soil sampling investigaiton locations



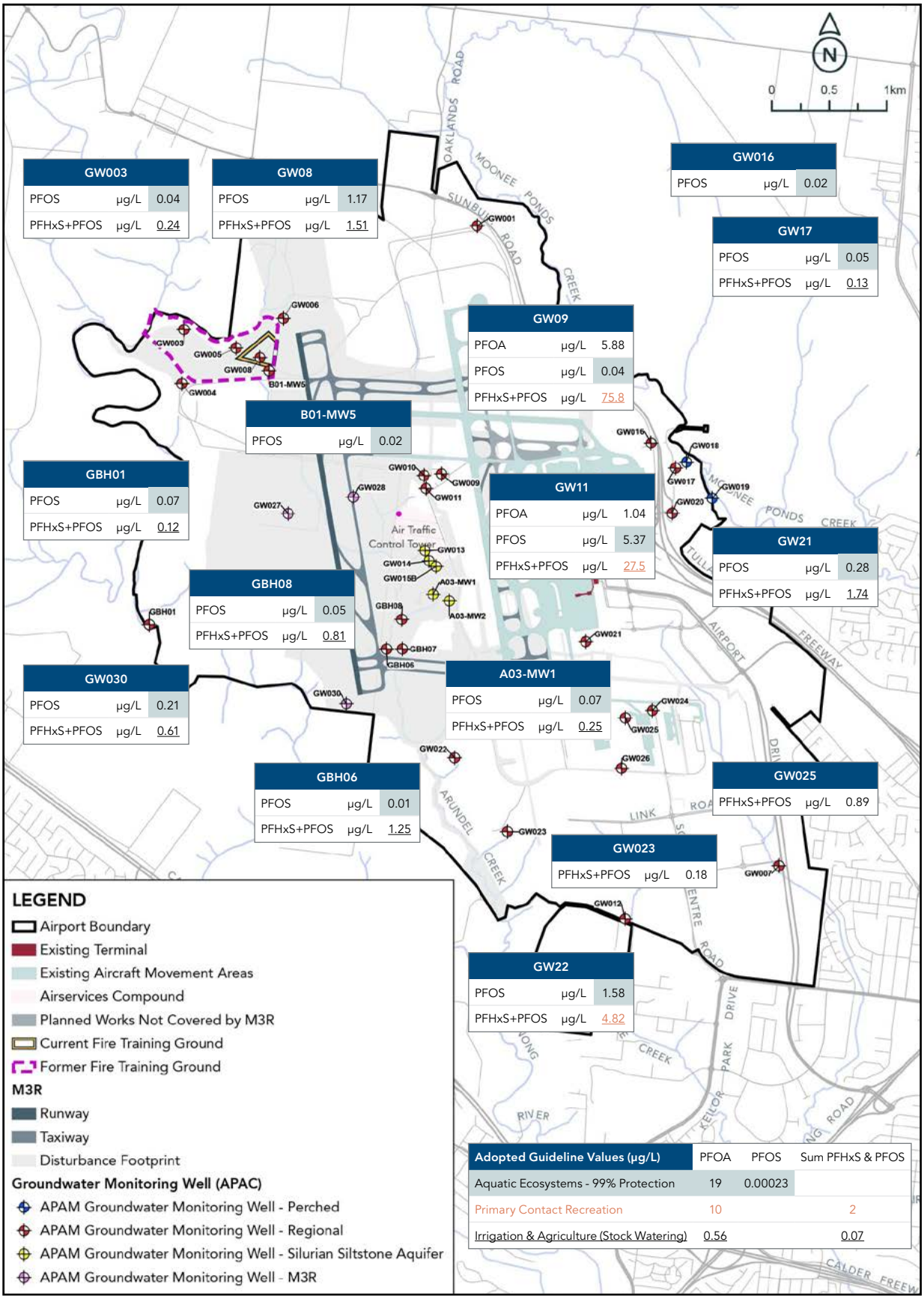
Source: Data sourced from APAM Geographic Information System (GIS) Database.

Figure B3.8
Concentration map of PFOS+PFHxS total concentratons in soil (near surface)



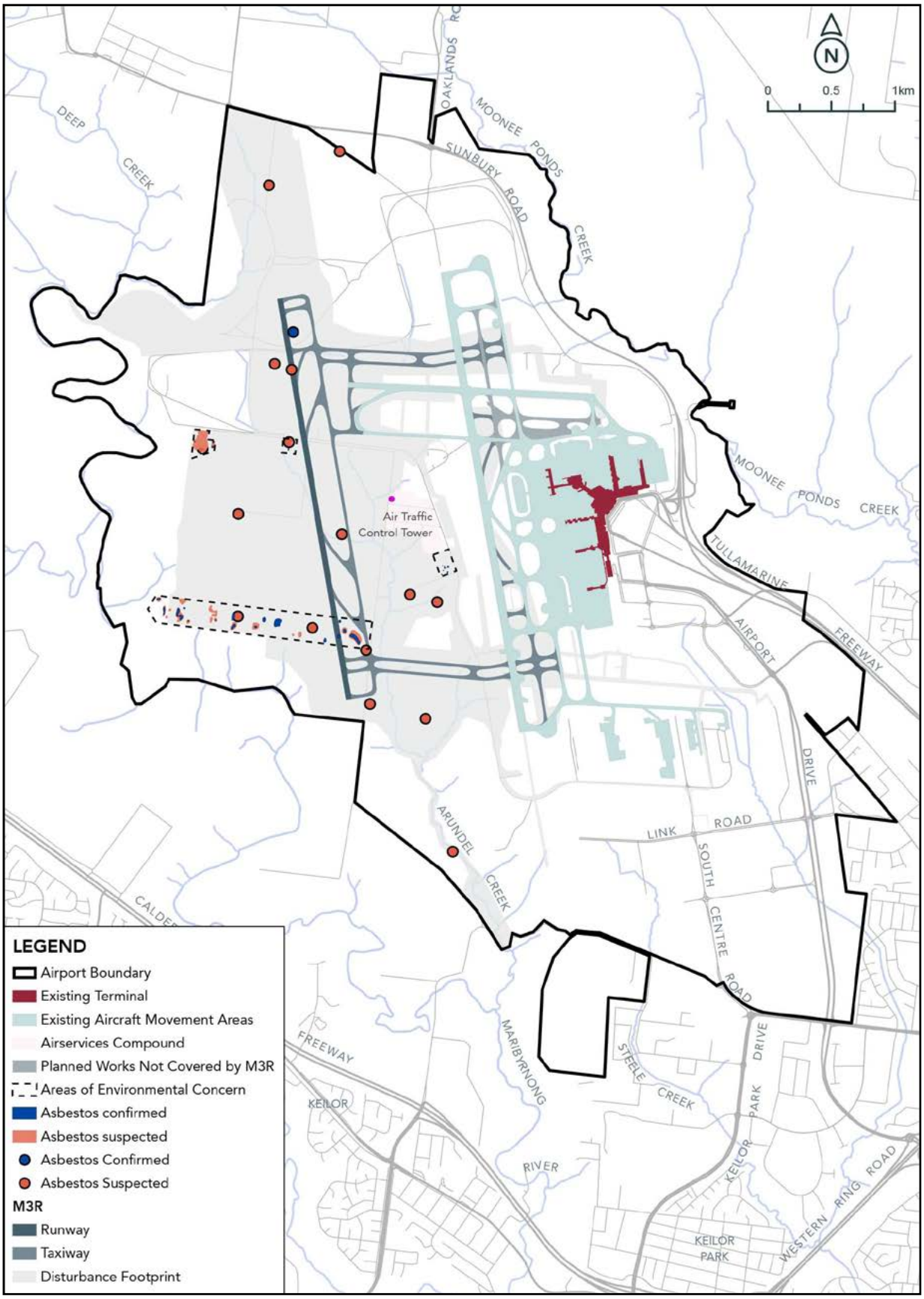
Source: Data collation from Senversa, 2020.

Figure B3.9
Groundwater exceedances



Source: Data sourced from Senversa 2020

Figure B3.10
Asbestos occurrences (suspected and confirmed)



Source: Data sourced from Senversa, 2020 and Coffey, 2017.

B3.5.7
Conceptual Site Model

Table B3.5 presents a summary of the potential sources of contamination, the identified receptors that may be exposed to contamination, and the pathways by which sources of contamination may reach receptors.

B3.5.8
Wastes

The key potential wastes to be generated by M3R across the lifespan of the project, and estimated quantities, are presented in Table B3.6.

Table B3.5
Conceptual site model

Source	Contamination	Pathway	Potential Receptor(s)	Potential Linkage
Firefighting foam	PFAS contamination in shallow soil, sediments and groundwater. PFAS contamination of existing infrastructure (e.g. pavements).	Dermal contact, dust inhalation, ingestion, uptake by plants and organisms, leaching to surface water and groundwater and discharging off-site into waterways, transport of impacted soils via water run-off	Construction/ maintenance workers, land-based and aquatic based ecosystems, surface water users	Without appropriate management of PFAS impacted soil and groundwater there is potential for unacceptable exposure and/ or exacerbation and increased risk profile to on and off-site receptors.
Fill and natural soils	Metals contamination both natural and anthropogenic impacts.	Uptake by plants and organisms, leaching to surface water and groundwater and discharging off-site into waterways, transport of impacted soils via water run-off	Land-based and aquatic based ecosystems, surface water users	Naturally elevated concentrations are not considered to present a risk due to low leachability potential. Isolated impacts of elevated metals from past land use are small volume and unlikely to present a significant risk.
Fuel and chemical storage and use	Hydrocarbon contamination in shallow soil	Vapour inhalation, dermal contact, dust inhalation, ingestion.	Construction/ maintenance workers	The only potentially complete exposure pathways is for site workers, and construction/maintenance workers, via dermal contact, dust inhalation and ingestion.
Building waste	Asbestos in shallow soil	Inhalation of dust.	Construction/ maintenance workers	Bonded asbestos containing material has been identified in several areas across the site. Disturbance of asbestos may cause fibres to be released and become airborne.
Historic landfilling activities	In addition to PFAS, metals, hydrocarbons and asbestos, other contaminants such as solvents, degreasers (buried waste), nutrients and gases (generated from buried wastes) may be present either in filled areas or impacts in surrounding soil and groundwater.	If areas of historic landfilling are exposed during works the following possible pathways may exist: dermal contact, dust inhalation, vapour inhalation, ingestion, uptake by plants and organisms, leaching to surface water and groundwater and discharging off-site into waterways, transport of impacted soils via water run-off	Construction/ maintenance workers, land-based and aquatic based ecosystems, surface water users	Pathways are generally only complete if areas are disturbed or exposed during works. Main areas of concern where wastes are known or expected to be buried are located in the broader project area and not specifically in areas identified for disturbance/excavation as part of construction works.

Table B3.6
Potential waste types, sources and volumes

Waste Type	Presence/waste generation activity	Estimated volumes (tonnes, t)	Comments
Pre-construction to opening day			
Demolition waste	Pavements, former structures and buildings, fencing, lighting, redundant underground services, stormwater structures, stockpiled or buried wastes.	400,000 to 600,000	Greater than 80% of demolition is expected to be recycled.
Green waste generated from surface scraping and removal of trees	Pre-construction removal of surface vegetation (grass and weeds) and topsoil, removal of trees and other native vegetation.	Surface vegetation: 1,300,000 to 2,050,000 Trees: 770,000 m^2 to 1,800,000 m^2	Storage of green waste from surface vegetation (grass) has potential to spread noxious species that require management. Native trees and vegetation will be mulched for on-site re-use.
Excavated PFAS contaminated soil and sediments	Bulk excavation works. Drainage diversions and upgrades.	7,500,000 to 8,200,000	Estimate based on total volume of topsoil and clay to be excavated and total construction footprint. Assumes deeper rock and geological units are generally not contaminated noting exceptions under source areas. Due to the project's anticipated fill deficit there is a high potential for re-use of excavated soils.
Asbestos in soil	Isolated areas associated with former use/ buildings/waste piles.	9,600 to 14,400	Removal of asbestos and remediation of soils where asbestos is suspected/confirmed to maximise on-site re-use potential. Estimated that 80% of total volume will be suitable for re-use.
Asphalt plant (on-site)	Wastes associated with asphalt batching (e.g. off-spec, cleaning and maintenance of plant).	1,200 to 1,800	Greater than 80% of waste asphalt is expected to be recycled.
Concrete plant (on-site)	Wastes associated with concrete batching (e.g. off-spec, cleaning and maintenance of plant).	1,800 to 2,700	Greater than 80% of waste concrete is expected to be recycled.
Wastes associated with maintenance of plant and equipment during construction	Vehicle maintenance (e.g. replacement of tyres, fluids, spares, batteries, etc).	150	Majority of tyres and maintenance waste goes to landfill.
Concrete formwork*	Waste generated from undertaking concrete formwork on site where pre-cast options are not available.	15 to 25	All wooden concrete formwork is generally disposed to landfill.
Concrete reinforcing*	Offcuts from reinforcing material.	20 to 30	Majority of waste reinforcing is recycled.
Wash water	As part of general cleaning of equipment during construction.	360	Majority of wash water disposed to ground and may lead to short term impacts to ecological receptors.
Other construction wastes	Packaging, pallets, offcuts.	360	Some waste streams can be recycled. Majority of other construction wastes are disposed to landfill.
Site office waste (paper, recycling, etc)	General waste generated from office style activities including putrescibles.	90	Some office waste can be recycled by segregation of wastes and diversion from landfill.
Site office – Sewage	Wastes generated from provision of facilities (hygiene, toilets and lunch room water supply and wastewater).	500 to 800 (sewer) 45 to 65 (potable)	Appropriate disposal either via approved sewer connections or disposal off site by licenced contractor to appropriate disposal facility.
Operational (based on 20 years of operation and maintenance)			
Runway lighting	Waste globes and fittings associated with high intensity approach lighting system and general runway lighting.	0.04 to 0.1	Likely to all be disposed to landfill or licenced facility.
Rubber	Rubber removed from runway landing areas.	1,100 to 1,700	80% recycled.
Concrete	Waste concrete from repairs.	400 to 600	Greater than 80% of waste concrete is expected to be recycled and/or re-used on site.
Asphalt	Waste asphalt from repairs.	400 to 600	Greater than 80% of waste asphalt is expected to be recycled and/or re-used on site

** If precast concrete is used for all concrete requirements and no pour in place concrete is used, then waste formwork would reduce to approximately zero waste, and reinforcing steel would reduce to less than five tonnes for the construction program duration.*

B3.6
ASSESSMENT OF POTENTIAL IMPACTS

Table B3.7 below presents the impact assessment for soils, groundwater and wastes.

Table B3.7
Impact Assessment

Environment aspect & baseline condition	Assessment of original impact					
	Original Impact	Mitigation inherent in design/practice	Significance			
			Duration	Severity	Likelihood	Impact
Construction						
Disturbance/removal of PFAS contaminated soils and sediment	The majority of project site contains PFAS impacted soils and sediments above ecological investigation levels. The project works are likely to require excavation of key source areas which also contain impacts above human health investigation levels (e.g. the current and former FTGs). Mismanagement of excavated soils and exposed surfaces may increase risks to both onsite and off-site receptors	The project presents an opportunity to "remediate" key source areas and further mitigate long term impacts associated with residual PFAS in soils	Long Term	High	Likely	High
Disturbance/removal of existing contaminated soils containing asbestos-containing material	Direct impact to on-site construction workers – non-cumulative.	Nil	Short term	High	Likely	High
Disturbance/removal of existing non-PFAS contaminated soils uncovered as part of demolition works	There is likely to be point source impacts associated with redundant infrastructure that is required to be removed. Historical areas of landfilling	Nil	Short term	Minor	Likely	Medium
Intersecting perched groundwater	Although groundwater is unlikely to be intersected during project works, there is the potential to intersect perched groundwater systems that may be impacted by PFAS and other contaminants	Projects works have been designed to be above reported groundwater levels.	Short term	Minor	Unlikely	Low
Importation of fill	The project's cut and fill balance in deficit. Importation of fill will be required to achieve design levels. Importation of fill if not managed properly can present a risk to the receiving environment.	There is a high potential for re-use of excavated soils as well as on-site borrow areas. For achieving remaining fill balance, material that meets PFAS NEMP guidance, and EPA guidance for fill material will be required.	Long Term	Moderate	Possible	Medium
Green waste removal	Protected grasslands and other native vegetation exist across project site – improper handling of green waste during removal leads to spread of pest weeds and/or pathogens disrupting native species	Herbicide application reduces volumes of waste, stockpiling generally restricts impact to localised areas. Opportunity to re-use topsoil as part of design works where engineering property requirements of soil are not critical to performance and associated PFAS impacts can be appropriately managed	Medium Term	High	Possible	Medium

Mitigation and/or management measures	Assessment of residual impact					
	Residual Impact	Significance				
		Duration	Severity	Likelihood	Impact	
Construction (cont.)						
Management of PFAS impacted materials in accordance with project specific PFAS management strategy which will outline re-use options for PFAS impacted soils and identify where additional controls may be required. Re-use options and controls will depend on soil contamination levels and will include options for unrestricted re-use and re-use in particular settings such as placement at depth or under constructed pavements. Engineered containment, onsite treatment or off-site disposal may be required for higher levels of contamination	Appropriate management of PFAS impacted soils during construction is feasible and likely to lead a significant reduction in risk to human health and the surrounding environment associated with existing impacts	Long Term	Moderate	Unlikely	Low	
Removal of asbestos-containing material under controlled conditions and disposed of to landfill.	Direct impact to construction workers.	Temporary	Minor	Rare	Negligible	
Inspection and where necessary validation of any excavations beneath and surrounding former infrastructure (pits, tanks, pipelines). Where possible avoidance of known landfill areas	Direct impact to construction workers.	Temporary	Minor	Rare	Negligible	
If groundwater is encountered and is required to be extracted as part of works, existing water treatment facilities are available to treat water to remove contaminants of concern	Water can preferentially be treated rather than disposed of off-site to licenced facility	Temporary	Negligible	Rare	Negligible	
Management of importation of fill in accordance with Construction Environmental Management Plan (CEMP) to ensure it meets EPA guidance for fill material and does not present a risk to the receiving environment. Early identification of fill source sites, confirming fill materiall categorisation and appropriate tracking and monitoring of incoming material to confirm compliance will be key elements to mitigating risks	Appropriate re-use of excess high-quality fill generated from other major infrastructure projects with negligible impact to receiving environment.	Long Term	Minor	Unlikely	Low	
Management of weeds in accordance with Construction Environmental Management Plan (CEMP)	Possible release of weeds at clearance site	Short Term	Moderate	Unlikely	Low	

Assessment of original impact (cont.)						
Environment aspect & baseline condition (cont.)	Original Impact	Mitigation inherent in design/practice	Significance			
			Duration	Severity	Likelihood	Impact
Construction (cont.)						
Waste management – construction and demolition waste	Wastes generated from demolition works and construction works (e.g. concrete formwork)	A number of waste streams (solids and liquids) will be generated as part of construction works but many can be considered suitable for re-use/recycling which diverts waste from landfill Demolition wastes may be impacted by PFAS and require higher level of management. Onsite management of PFAS impacted demolition waste via existing facilities	Short Term	High	Possible	Medium
Operation						
Waste management - rubber and tyre waste - pavement maintenance - lighting	Waste generated from use and maintenance of runway, wear and tear of aeroplane tyres, replacement and maintenance of navigation and other lighting requirements. Off-site impact as waste disposed to landfill	Recycling opportunities from waste generated from operational and maintenance falls under Melbourne Airport's Environmental Management Plan which aims to reduce overall impacts from waste generation	Long Term	High	Possible	Medium

B3.7 AVOIDANCE, MANAGEMENT AND MITIGATION MEASURES

B3.7.1 Soils

The contamination assessment has identified two key soil contamination issues that, without avoidance, management or mitigation measures, will potentially present an increased risk of impacts to relevant receptors as a consequence of M3R works. They are as follows:

- PFAS in soils and sediments
- Asbestos in shallow soils.

The risks for both these issues require further management or mitigation.

B3.7.1.1 PFAS

PFAS management is a minimum requirement for any construction works being conducted at Melbourne Airport where disturbance of soil and groundwater is anticipated. The *Melbourne Airport PFAS Management Framework* (APAM 2022) was developed to deliver consistent environmental management practices for the potential environmental risks posed by PFAS impacted material on construction and maintenance projects at Melbourne Airport. The framework outlines the minimum environmental management requirements to be included in any project-specific CEMP. PFAS impacts and potential risks during construction are well understood; and APAM has a number of existing and effective management controls in place – both as part of wider estate management and as part of project specific works. These include the controls currently being implemented under other current construction projects with MDP approvals.

As PFAS impacts are widespread across the project area, a project-specific PFAS Management Strategy is proposed to be developed to provide a framework for how PFAS is to be managed to in order maximise re-use potential, and protect human health and the environment.

In general, PFAS impacts are observed in soils at near-surface and do not extend to depths beyond fifty centimetres bgl. The only areas where PFAS may extend to greater depths are below and adjacent to identified source zones.

The current design indicates that deep excavation near identified source zones (e.g. the current and former FTGs) is proposed. This is likely to disturb soil with high concentrations of PFAS contamination that will require specific management. As the project design identifies a fill deficit, there is an opportunity as part of cut-and-fill works to mitigate future impacts from PFAS impacted soil as part of an engineered design.

The PFAS Management Strategy will be supported by a project-specific human health and ecological risk assessment to confirm that the risks during works, and longer-term risks, are considered low and acceptable. Confirmation of management and remediation options, including further site investigations and detailed feasibility, is required to be completed as part of detailed design works. These further investigations are primarily to confirm the specific management measures and appropriate placement locations that can be integrated into the

Mitigation and/or management measures (cont.)	Assessment of residual impact (cont.)					
	Residual Impact	Significance				
		Duration	Severity	Likelihood	Impact
Construction (cont.)					
Management of wastes in accordance with CEMP to maximise re-use/recycling opportunity Onsite management and recycling and re-use of PFAS-impacted demolition wastes	Reduction of waste generation, or reduction required to be disposed of to off-site licenced landfill/facility	Temporary	Minor	Possible	Low
Operation (cont.)					
Manage wastes in accordance with Melbourne Airport Waste Management Strategy to maximise re-use/recycling opportunities.	Reduction in waste generation and waste going to landfill	Long Term	Minor	Rare	Negligible

design and construction phases. An integrated approach during detailed engineered design will be required to confirm that any proposed controls appropriately mitigate risks. Construction environmental management plans will be required to be aligned with the framework to be outlined in the PFAS Management Strategy.

All estate-wide and project specific investigations are conducted in accordance with the requirements of the NEPM and the PFAS NEMP.

B3.7.1.2 Asbestos

Suspected and confirmed asbestos-containing material was identified in shallow soils (or on the ground surface) at a number of discrete locations across the broader project area. These occurrences are linked to the presence of historic site use, where demolition of former buildings or structures constructed with asbestos containing materials and/or waste dumping has led to relatively small volumes of potentially hazardous material being left on-site.

The preferred management measure for controlling exposure to asbestos-containing material is removal, as the asbestos containing material is currently present on the surface of the site and not all suspected areas for the study area have been confirmed or investigated in detail. Whilst further investigations will assist in better characterising risk and provide a more accurate understanding of the scope of works required, it is likely that some removal of asbestos-containing material will be required. If all asbestos cannot be removed prior to commencement of construction activities, hazardous materials management measures will need to be incorporated into Construction Environmental Management Plans (CEMPs).

As part of the early phases of works, impacted areas will be confirmed and appropriate administrative controls (e.g. restricting access) put in place until asbestos removal is done. Removal of asbestos and remediation of affected areas is expected to be undertaken, with asbestos clearance certificates to be provided by an Occupational Hygienist to allow stockpiled soils and remediated areas to be ready for construction works and soil re-use. Requirements for appropriate personal protective equipment will be implemented, depending on the nature of activities to be undertaken.

B3.7.2 Groundwater

Although groundwater is unlikely to be intersected during project works, there is the potential to intersect perched groundwater systems that may be impacted by PFAS and other contaminants. The expected volumes and potential to intersect groundwater are considered low, but if encountered will require management.

If groundwater is encountered and required to be extracted as part of works, existing water treatment facilities (both on-site and off-site) are available to treat water to remove contaminants of concern. This is the preferred option, rather than seeking permits for trade waste or disposing off site to a licenced facility for treatment/disposal.

Any transport, treatment and disposal of PFAS-impacted groundwater will be in accordance with the PFAS NEMP. For any off-site transport and disposal of wastes the State jurisdictional requirements take precedence.

B3.7.3
Waste

M3R has the potential to produce a large quantity of waste including, but not limited to, excavated soil and water, demolition, operational and decommissioning wastes that would present a significant environmental impact if disposed of to landfills.

As offsite waste transport and disposal would fall under Victorian legislation, the principles of the waste hierarchy apply. *The Melbourne Airport Environment Strategy 2018* also aligns with this hierarchy for its on-site waste management principles.

In accordance with waste hierarchy, the options for management of wastes (from most preferred to least preferred) are:

- Avoidance
- Re-use
- Recycling
- Recovery of energy
- Treatment
- Containment
- Disposal.

The primary management measure for the various waste streams for M3R is to avoid creating wastes in the first instance. Where waste generation cannot be avoided, the priority is to look to either re-use or recycle the wastes, with various procedures and targets set for segregating wastes for re-use or recycling. With the exception of hazardous or prescribed industrial wastes (including asbestos and other contaminated soils/ materials) the primary objective is to divert wastes from landfill (disposal) and therefore mitigate potential longer-term impacts to the environment.

Mitigation and management measures will be developed in the CEMP for waste streams that may potentially result in either medium, high or extreme impacts on the environment.

Table B3.8 presents a summary of mitigation and management measures proposed for M3R, and the expected timeframes for delivery.

Table B3.8
Mitigation and management measures

Environmental Aspect	Mitigation or management measure	Timing
Excavated PFAS-contaminated soil and sediments from bulk excavation works, drainage diversions and upgrades	Due to the project's fill deficit there is a high potential for re-use of excavated soils. Re-use potential dependent on contaminant levels. On-site containment may be considered for higher levels of contamination from source areas. Some discrete areas of material may require thermal destruction off-site.	A PFAS Management Strategy will be developed and implemented prior to construction activities. Confirmation of management and remediation options including detailed feasibility to be completed as part of detailed design works. A project-specific human health and ecological risk assessment will also be required to support the management and remediation options assessment and PFAS Management Strategy.
Asbestos in soil	Removal of any asbestos-containing waste and remediation of soils where asbestos is suspected/confirmed to maximise on-site re-use potential. Higher disposal costs for any impacted soils may occur due to presence of PFAS.	Further investigations proposed prior to the start of construction. All asbestos excavation to be implemented prior to any disturbance of identified areas. Treatment to occur either prior to or during construction.

Environmental Aspect (cont.)	Mitigation or management measure (cont.)	Timing (cont.)
Green waste generated as a result of earthworks (stripping of surface covering, topsoil and mulching of trees).	The storage and management of green waste has the potential to lead to pest plant species and pathogens being spread across the site if not handled appropriately. To mitigate this risk, a CEMP and weed management plan will be developed which will include measures to reduce the magnitude of potential impact to either minor or negligible, on the basis that the risks of spread of pest plants and pathogens should be eliminated thereby reducing the potential environmental impacts. Temporary storage of green waste will be managed with appropriate measures implemented to limit the spread of seeds or pathogens from storage area. The CEMP and weed management plan will also incorporate any green waste that is re-used onsite as mulch, salvaged habitat or erosion control to verify that any waste re-used is stored appropriately and is suitable for its intended re-use. Due to the presence of PFAS in topsoil that will be included in the green waste volume, it is proposed that all green waste be re-used on site. This may include incorporation into earthen mounds/batters where these materials would be appropriately placed to minimise environmental impacts from both the green waste itself and the associated topsoil.	Plan to be developed prior to the start of construction.
Demolition waste including but not limited to pavements, former structures and buildings, fencing, lighting, redundant underground services and stormwater structures.	Melbourne Airport currently retains, crushes and recycles concrete and pavement for onsite re-use. Potentially PFAS impacted pavements will be prioritised for recycling and on-site re-use. Other wastes, such as brick and steel from former buildings, will be considered for off-site recycling potential. All non-recyclable material will require disposal off-site.	Plan to be developed prior to the start of construction.
Future construction and maintenance wastes	All construction sites produce construction wastes, a proportion of which are sent to landfill. The proposed mitigation measures include the segregation of construction wastes and disposal to appropriate recyclers. Concrete formwork (typically laminated plywood or treated pine timber) is generally disposed to landfill when the product is no longer serviceable. The management measures proposed to limit the waste streams include diverting all reinforcing steel offcuts to recycling, reusable metal formwork is to be used, and waste formwork materials are to be segregated and sent to a recycler. These mitigation measures should result in an overall reduction of the magnitude of the impact to minor on the basis that the overall reduction of waste being disposed to landfill would reduce to less than 10% of the total waste stream. The construction contractor will be required to develop a waste management plan as part of their CEMP.	Plan to be developed prior to the start of construction.
Lighting waste	The waste globes used for runway and high intensity approach lighting are generally self-contained units with limited options for recycling. Diversion of these wastes to an e-recycler may be possible, depending on the units used. These mitigation measures should result in an overall reduction of the magnitude of the impact to minor on the basis that the overall reduction of waste being disposed to landfill would reduce to less than 10% of the total waste stream.	To be regularly reviewed as part of Melbourne Airport's Environment Management Strategy and Environmental Management Plan.
Rubber	Approximately 80% of the rubber removed from the runway is recycled, with the balance disposed to landfill. However, several rubber recycling operators have been recently licensed in Victoria to accept rubber waste for a secondary beneficial re-use. The proposed mitigation measures for rubber include diversion from landfill to a rubber recycler. These mitigation measures should result in an overall reduction of the magnitude of the impact to negligible on the basis that all waste would be diverted to a recycler.	To be regularly reviewed as part of Melbourne Airport's Environment Management Strategy and Environmental Management Plan.

B3.8 CONCLUSION

The assessment identified that the presence of contamination in soils, sediments and groundwater, and the generation of wastes, have the potential to impact the environment as part of construction and operation of M3R if appropriate management or mitigation controls are not implemented.

Where impacts were identified, appropriate mitigation measures are proposed and the residual risks of negative impacts are classified as Low or Negligible.

Without appropriate management and mitigation, the potential for impacts from disturbance of PFAS-impacted soils and sediment is considered High. Based on existing and demonstrated onsite PFAS management practices, and the development of a project specific PFAS management strategy, there is a potential significant beneficial impact anticipated as part of the M3R construction works, as it provides an opportunity to improve on-site management and containment of PFAS-impacted soil and sediment. The project could result in a significant reduction in ongoing impacts to the environment from pre-existing contamination.

The presence of asbestos in near-surface soils is a common issue for construction projects that have had historical buildings and infrastructure. The areas of impact appear to be both limited and isolated and, with appropriate remediation and management of any disturbed soils, the impact from the presence of asbestos wastes is considered Negligible.

Although there are likely to be some additional impacts from non-PFAS contamination identified as part of demolition and construction works, the relatively small volumes and level of impacts expected to be encountered are considered able to be readily managed by general construction activities and plans. They are therefore considered to have Negligible impact on the environment.

The key waste streams identified include those generated during demolition and construction activities, as well as ongoing operational and maintenance of the new assets delivered as part of M3R. There is a high re-use potential for excavated soils due to the project fill deficit. The majority of waste generated from pavement materials (demolition, construction and operational maintenance) is also identified for on-site processing and re-use as a recycled crushed product. For other demolition, construction and operational wastes, there are various levels of opportunity to avoid landfill disposal that can be minimised by appropriate identification and management of generated waste streams.

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CATHAY PACIFIC

Chapter B4
Surface Water and Erosion

Summary of key findings:

- Arundel Creek runs through the airport and some sections of it will be impacted by Melbourne Airport's Third Runway (M3R). A culvert will be constructed to maintain the creek's flows under associated infrastructure.
- Water sensitive urban design measures have been incorporated into M3R's design to improve the quality of water discharging into Arundel Creek and from the airport estate.
- Modelling has demonstrated that the proposed treatment train will effectively remove the increased pollutants generated by the project.
- Infilling of the parts of the Arundel Creek valley and the addition of culverts will result in minor flood level increases on the culvert's upstream side within the airport. However, modelling shows this will not impact land downstream from the airport.
- Mitigation of PFAS impacts in surface water, and appropriate controls, will be outlined in the proposed PFAS Management Strategy. The strategy will incorporate a whole-of-project approach to PFAS management, from source management to mitigation of surface water impacts discharging off-site.
- Mitigation measures will be incorporated into the Construction Environmental Management Plan in order to protect waterways and minimise erosion.

CHAPTER B4 CONTENTS

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CHAPTER B4 FIGURES

CHAPTER B4 TABLES

B4.1
INTRODUCTION

This chapter describes the study area's existing surface water and erosion conditions, applicable legislation and policy requirements, the potential impacts of Melbourne Airport's Third Runway (M3R) and associated assessment methodology. It then identifies specific measures to avoid, manage, mitigate and/or monitor these impacts.

This chapter draws on analysis and findings from the M3R Stormwater Management Strategy completed by BECA in 2020, the Preliminary Erosion and Sediment Control Plan completed by Golders in 2020, and Melbourne Airport's own extensive knowledge and monitoring programs.

For the purposes of this chapter, the study area refers to the M3R development footprint and immediate surrounds that may be impacted by M3R.

B4.2
METHODOLOGY AND ASSUMPTIONS

Assessment of existing and potential surface water, water quality and erosion impacts from M3R was undertaken through site inspections and subsequent desktop assessments. This included the following scope of work:

- Identification of overarching legislative requirements
- Review of available baseline information to characterise the existing conditions of the site with regard to:
  - water quality and flow
  - surface water and flooding
  - stream health
  - erosion potential.
- Describing existing conditions (including geological conditions, climate and topography) within the M3R study area that have the capacity to impact erosion potential of the site
- Development of significance criteria for potential water quality, surface water and erosion impacts taking into consideration severity and likelihood, and providing a way to determine an impact risk
- Qualitative and quantitative assessment of M3R's impacts related to water quality, surface water and erosion, and identification of strategies and actions to mitigate identified impacts
- Documentation of the assessed residual impacts of M3R, and compliance of the mitigated design with legislative and other requirements.

B4.2.1
Site inspection

Inspections of the M3R study area and the wider airport estate have been done to confirm site topography and drainage features. The key locations of focus during the inspections were Arundel Creek and, to a lesser extent, Deep Creek and the Maribyrnong River. The inspections provide the opportunity to verify existing land use and ground conditions, creek conditions, and the general siting and scale of the proposed development.

B4.2.2
Information used for the assessment

The following primary documents and data sources were used for the assessment:

- M3R – Stormwater Management Strategy, BECA 2020
- M3R – Preliminary Erosion and Sediment Control Plan, Golders 2020
- M3R - Concept Design, BECA 2020
- Geotechnical information generated to inform design of M3R
- Rainfall and River Region Catchment input data obtained from:
  - Bureau of Meteorology 2016 Rainfall IFD data
  - Australia Rainfall and Runoff 2019 (ARR, 2019) data
- Melbourne Airport Pluviography 086282 Rainfall data
- Melbourne Airport historic water quality monitoring data
- Melbourne Airport Taxiway Zulu Program and Northern Access Road MDP and design documentation
- Melbourne Airport Flood Modelling Report
- Melbourne Airport Environment Strategy (2018)
- Melbourne Airport water quality monitoring data.

B4.3
STATUTORY AND POLICY REQUIREMENTS

Melbourne Airport is located on Commonwealth land. Commonwealth and Victorian regulatory requirements are applicable to the management of water quality on and off the estate. Management of water quality within Melbourne Airport estate is governed by Commonwealth regulations, and management of waters leaving Melbourne Airport estate is governed by Victorian legislation. The key legislative requirements related to water quality management include the following:

Commonwealth – on airport:

- *Airports Act 1996*
- *Airports (Environment Protection) Regulations 1997.*
- Environment Protection and Biodiversity Conservation Act 1999
- Environment and Biodiversity Protection Regulations 2000
- National Environment Protection Council Act 1994

State Government of Victoria – off airport:

- *Environment Protection Act 2017* (EP Act Vic)
- *Environmental Reference Standard 2021 (Vic)*
- *Water Act 1989 (Vic)*
- *Yarra River Protection (Wilip-gin Birrarung murron) Act 2017.*

B4.3.1
Commonwealth

The Airports Act 1996 establishes a regulatory system for airports providing due regard to the interests of airport users and the general community. These regulations define standards and impose compliance requirements. The environmental requirements include regulations relating to pollution generated at airport sites, impacts on biota and habitat, and impacts on heritage value.

The Airports (Environment Protection) Regulations 1997 aim to improve environmental management practices for activities conducted at airport sites, and to establish a system of regulation and accountability for pollutant-generating airport activities. These regulations aim to minimise adverse effects on waters and promote their beneficial use though management of pollution and promotion of habitat preservation.

Schedule 2 of the regulations, *Water Pollution – accepted limits*, sets out the accepted limit for pollutants in fresh water for a range of substances.

The Airport Regulations also refer to Section 14 of the *National Environment Protection Council Act 1994 (Division 2 – Making of national environment protection measures)* whereby monitoring is to be undertaken 'in a way that is not inconsistent with (i) any international convention, treaty or agreement, relating to environment protection to which Australia is a party; or (ii) a provision of national environment protection measures made under section 14 of the National Environment Protection Council Act 1994'.

Based on the above, it is considered that the following key documentation also applies:

- *National Environmental Protection (Assessment of Site Contamination) Measure*, as *amended 15 May 2013*, National Environmental Protection Council (1999) (NEPM, 1999).
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018)
- *PFAS National Environmental Management Plan Version 2.0 – January 2020* (PFAS NEMP 2020), National Chemicals Working Group of the Heads of EPAs Australia and New Zealand (HEPA, 2020).

B4.3.2
State Government of Victoria

The EP Act Vic creates a legislative framework for the protection of environment in Victoria. The Environment Protection Authority Victoria (EPA) is responsible for administering and enforcing the EP Act Vic to ensure no adverse impacts result to receiving waters by reducing the harmful effects of pollution and waste. The EP Act Vic commenced on 1 July 2021. This legislation adopts a different approach to environmental issues, focusing on preventing waste and pollution impacts. A cornerstone of the EP Act Vic is the General Environmental Duty (GED) which requires reasonably practicable steps to be undertaken to eliminate or otherwise reduce the risks of harm to human health and the environment.

The Environmental Reference Standard (Vic) defines clear and relevant standards, legal rules and statutory obligations to protect and improve the quality of Victoria's waters with regard to the principles of environment protection set out in the EP Act Vic. Melbourne Airport is predominantly located within the Central Foothills and Coastal Plains Segment for rivers and streams. The identified environmental values for this segment are:

- Water dependent ecosystems and species (slightly to moderately modified)
- Water-based recreation including primary and secondary contact and aesthetic enjoyment
- Traditional Owner cultural values
- Agriculture and irrigation
- Fishing and aquaculture
- Industrial and commercial use.

The indicators and objectives for the identified environmental values have been sourced from Environmental Reference Standard (Vic) (where directly referenced) and, where no objective is provided, sourced from other applicable guidelines including:

- *National Environmental Protection (Assessment of Site Contamination) Measure*, as *amended 15 May 2013*, National Environmental Protection Council (1999) (NEPM, 1999)
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018)
- *Australian Drinking Water Guidelines, National Water Quality Management Strategy*. National Health and Medical Research Council & Natural Resource Management Ministerial Council (2011) (incorporating rolling revisions) (NHMRC/NRMMC, 2011)
- *Guidelines for Managing Risk in Recreational Waters* National Health and Medical Research Council (2008) (NHMRC, 2008)
- *PFAS National Environmental Management Plan Version 2.0 – January 2020* (PFAS NEMP 2020), National Chemicals Working Group of the Heads of EPAs Australia and New Zealand (HEPA, 2020).

The Water Act 1989 (Vic) provides the legal framework for managing Victoria's water resources. Some of the Act's main purposes are to ensure water resources are conserved and properly managed for the benefit of all Victorians, and provide for the protection of catchment conditions. Melbourne Water is the relevant statutory authority of the Victorian Government, has delegated responsibilities under the Act, and is responsible for ensuring drainage and waterway management in accordance with it. As this project proposes to make changes to existing waterways, consideration of the Water Act 1989 (Vic) and engagement with Melbourne Water is required as part of the project's development, detailed design and implementation.

The Yarra River Protection (Wilip-gin Birrarung murron) Act 2017 declares the Yarra River and certain public land in its vicinity, for the purpose of protecting it, as a single living and integrated natural entity. Provision is made for the development and implementation of a Yarra Strategic Plan, and protection principles are defined - including ensuring that biodiversity and ecological integrity is maintained.

B4.3.3
Adopted assessment criteria for water quality

Taking into consideration the Commonwealth and Victorian requirements above, the following assessment criteria were adopted for water quality:

- Environmental Reference Standard (Vic) for environmental water quality indicators and objectives for rivers and streams (Central foothills and coastal plains – Uplands)
- Airport Regulations – Freshwater (Airport Regulations)
- PFAS NEMP 'Aquatic Ecosystem – Freshwater 95% and 99% species protection' criteria
- PFAS NEMP Health-based guidance values – Drinking water and recreational water
- ANZG 2018 – 'Aquatic Ecosystem – Freshwater 95% species protection' criteria
- ANZG 2018 – 'Primary Contact Recreation' and where relevant, guidelines were sourced from NHMRC 2011
- ANZG 2018 – 'Irrigation & Stock watering'.

When assessing existing impacts in surface water, consideration of all applicable guideline criteria are used as screening levels with more conservative 99% species protection threshold limits adopted for PFAS compounds based on the potential for bioaccumulation and biomagnification.

Waterways with recreation identified as an environmental value also require aesthetic indicators and objectives to be met, which include being free from:

- Visible materials that may settle to form objectionable deposits
- Floating debris, oil, scum and other matter
- Substances producing objectionable colour, odour, taste or turbidity
- Substances and conditions that produce undesirable aquatic life.

No environmental quality objectives for Traditional Owner cultural values have been specified in Environmental Reference Standard (Vic). Therefore, the objectives for water dependent ecosystems and species, and water-based recreation, have been adopted as default objectives. This is on the assumption that, if these objectives are achieved, then the environmental value of Traditional Owner cultural values will also be protected. In circumstances where these objectives are not attained, Environmental Reference Standard (Vic) identifies that, if the level of any environmental quality indicator or objective is not provided for, contamination must not cause an adverse impact on the environmental values.

B4.4
MELBOURNE AIRPORT POLICY

B4.4.1
Melbourne Airport Environment Strategy (2022)

The Melbourne Airport Environment Strategy forms an integrated component of Melbourne Airport's Master Plan 2022.

The key objectives of the Environment Strategy are to:

- Continually improve environmental management practices
- Ensure Indigenous and non-indigenous cultural heritage sites are protected
- Ensure strong stewardship of the physical environment
- Meet all compliance obligations to maintain the goodwill of regulators, passengers and the community
- Future-proof the environmental value of the airport site.

The aspects applicable to the stormwater management strategy are:

- Stormwater management relating to the drainage network elements
- Climate resilience by completing a climate change assessment (in relation to altered rainfall patterns and run-off regimes) that considers frequent extreme daily rainfall events with an increased potential for flooding
- Management of stormwater quantity due to increases in impervious areas; and management of adverse effects such as bank erosion, weed invasion and degradation of aquatic and terrestrial habitat
- Improving stormwater runoff quality by implementing Water Sensitive Urban Design (WSUD) strategies to meet current best practice targets.

B4.5
DESCRIPTION OF SIGNIFICANCE CRITERIA

Criteria have been developed to determine the significance of the impact from M3R associated with erosion, surface water and flooding impacts, and water quality.

B4.5.1
Erosion potential

The assessment of significance has applied the framework described in **Chapter A8: Assessment and Approvals Process**. For severity, project-specific criteria have been developed for the assessment of potential erosion impacts (including direct, indirect and off-site impacts). These criteria are described in **Table B4.1**.

B4.5.2
Surface water and flooding

The assessment of significance has applied the framework described in **Chapter A8: Assessment and Approvals Process**. For severity, project-specific criteria have been developed for the assessment of potential surface water and flooding impacts (including direct, indirect and off-site impacts). These criteria are described in **Table B4.2**.

B4.5.3
Water quality

The assessment of significance has applied the framework described in **Chapter A8: Assessment and Approvals Process**. For severity, project-specific criteria have been developed for the assessment of potential water quality and frequent flow impacts including direct, indirect and off-site impacts. These criteria are described **Table B4.3**.

Table B4.1
Severity criteria – erosion potential

Impact severity	Description
Major	Permanent degradation of soil conditions that impact construction and operational phases of M3R and/or ongoing erosion that leads to a permanent reduction in water quality in the catchment downstream of the airport.
High	Significant erosion events that have ongoing impacts to the construction phases and/or water quality downstream of the airport and require additional control measures or M3R re-design prior to implementation of operational phases.
Moderate	Erosion during construction phases that leads to temporary land degradation with impacts to water quality such that the scheduled Environmental Reference Standard (Vic) objectives for downstream waters are not achieved.
Minor	Minor erosion event that temporarily impacts water quality but does not prevent Environmental Reference Standard (Vic) objectives from being achieved or impact operational phases due to the use of appropriate mitigation measures.
Negligible	Minimal soil erosion events with no significant sediment release off-site during the construction, and no perceptible impacts on downstream water quality due to the use of effective mitigation measures.
Beneficial	Positive effects on soil conditions through control measures and M3R design strategies that lead to improved water quality downstream during operational phases of M3R.

The criteria focus on operational stages of M3R. They relate to water quality and the potential effect of water quality on the airport's off-site receiving water quality conditions. Impacts on water quality during construction are heavily associated with the potential for increased sediment loads due to stockpiles and excavation works. Mitigation of these impacts is covered under the erosion potential in Section B4.8.1.1.

The methodology for ascribing significance has focused on the severity and duration of impact, noting that the impacts are almost certainly likely to occur once M3R commences operation.

B4.6 EXISTING CONDITIONS

This section presents baseline information regarding surface water and erosion potential to characterise the existing conditions within the M3R study area and/or Melbourne Airport (as required).

B4.6.1 Climate

Average monthly and annual rainfall data was obtained from the Australian Bureau of Meteorology (BoM) Melbourne Airport climate station. Anticipated monthly evaporation within the M3R study area is expected to significantly exceed monthly rainfall, potentially reducing overall run-off volumes. A summary of historically representative monthly rainfall and evaporation data is presented in Table B4.4.

B4.6.2 Flora and fauna

Ecology assessments indicate that the majority of M3R study area has been highly modified by historic agricultural land uses and development of existing airport infrastructure. Vegetation within the M3R study area consists of introduced invasive grasses and weeds and native grasses, which increase the evapotranspiration potential of rainfall. Areas of Natural Temperate Grassland of the Victorian Volcanic Plain and Grey Box Grassy Woodlands are within the study area.

Table B4.2
Severity criteria – surface water and flooding

Impact severity	Description
Major	Risk of flooding that could result in major injury or loss of human life, or major damage to public and private infrastructure both on and off the airport. Repairs to damaged infrastructure that can take several months to repair and impacts businesses and people during that time. Residential and business buildings are unusable until repairs taking several months are undertaken. Road pavements may be washed away preventing access along or across the affected road, impacting commuters and access to businesses and residents. Environmental impacts tend to be permanent, irreversible or otherwise long-term and can occur over large-scale areas both on and of the airport estate.
High	Risk of flooding that can result in minor damage to public and private infrastructure, both on and off the airport estate. Repairs to damaged infrastructure are likely to take less than a month to repair but impact businesses and people during that time. Residential and business buildings are still usable but have minor damage resulting in short term discomfort or changes to operations. Risk of flooding that may stop or severely delay aeronautical operations. Runways, taxiways or airside roads may be flooded to the extent of preventing movements. Ground services and airport operations staff are prevented from accessing areas of the airport estate, preventing them from carrying out their duties. Environmental impacts tend to be permanent or irreversible or otherwise long to medium term, and can occur over large or medium scale areas, including outside the estate.
Moderate	Risk of flooding that can result in minimal damage to public and private infrastructure, both on and off the airport estate. Damage is limited to damaged verges and gardens, and deposit of debris on roads and properties. Risk of flooding that may delay aeronautical operations. Runways, taxiways or airside roads may be limited for use. Staff experience difficulties in carrying out their work. Environmental impacts can range from long term to short term in duration, can occur over medium scale areas or otherwise represent a significant impact at the local scale.
Minor	Flooding is limited to road reserves, may cause minor disruption to pedestrians and reduce vehicle speeds - both on and off the airport estate. Risk of flooding that may cause minor delays to aeronautical operations due to difficulties experienced by staff. Environmental impacts tend to be short term or temporary.
Negligible	Flooding is limited to areas designed to be flooded, or areas where there will be no adverse impacts during larger storms on the airport estate. Environmental impacts would be beneath levels of detection, consistent with seasonal variations, within the normal bounds of variation, or within the margin of forecasting error.
Beneficial	Changes to existing situation as a result of M3R that will lower the risk of flooding both on and off the airport estate.

As described in **Chapter B5: Ecology**, given the size and scale of M3R, complete avoidance of impacts to ecological values is not possible. However, the design for M3R incorporates a number of measures aimed at avoiding and minimising potential impacts. The study area and surrounds support a range of ecological features, including areas of native vegetation, scattered trees, escarpments, wetlands and artificial structures that provide habitat value.

Extensive earthworks are planned within parts of the Arundel Creek valley, with approximately 500 metres to be filled. Therefore over 500 metres of the creek will be realigned and directed through a culvert below an approximately thirty metres high fill embankment with batter slopes of up to 1:2.5. Direct impacts to the creek will include removal of riparian and aquatic habitats, localised increases in water velocity, and possible reduction in downstream water temperature.

The Commonwealth listed Growling Grass Frog has been recorded within this section of Arundel Creek and impacts to its habitat are unavoidable. Further discussion about impacts to the frog's habitat is outlined in **Chapter B5: Ecology**.

B4.6.3 Topography and surface conditions

The topography of the site generally slopes from north to south, its ground level ranging from 145 metres Australian Height Datum (AHD) in the north to 95 metres AHD in the south. At the southern extremity of the study area in the Arundel Creek valley, the ground level falls to approximately 40 metres AHD (**Figure B4.1**). Land adjacent to the Deep Creek/Maribyrnong River systems comprises areas of steep to very steep slopes which are generally outside the development footprint. The

Table B4.3
Severity criteria – water quality

Impact severity	Description
Major	Increasing load and/or concentration of water quality pollutants being discharged from M3R during its construction and operational phase, resulting in permanent changes in receiving waters quality that have the potential to adversely impact sensitive receptors.
High	Increasing load and/or concentration of water quality pollutants being discharged from M3R during its construction and operational phase resulting in permanent and wide-spread adverse impacts upon downstream water quality, and its identified social and environmental values.
Moderate	Increasing load and/or concentration of water quality pollutants being discharged from M3R during its construction and operational phase that do not comply with applicable discharge/water quality objectives, and are likely to lead to longer-term localised adverse impacts upon downstream water quality and its identified social and environmental values.
Minor	Increasing load and/or concentration of water quality pollutants being discharged from M3R during its construction and operational phase that do not comply with applicable discharge/water quality objectives, and are likely to lead to localised or intermittent adverse impacts upon downstream water quality and its identified social and environmental values.
Negligible	Increasing load and/or concentration of water quality pollutants being discharged from M3R during its construction and operational phase that do not comply with applicable discharge/water quality objectives and has no perceptible adverse impacts upon downstream water quality, and its identified social and environmental values.
Beneficial	Improvement in water quality downstream of the airport resulting from the direct effects of construction and operational stage water quality and quantity control measures built as part of M3R.

Table B4.4
Climate summary (1970 – 2016)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean monthly rainfall (mm)												
40.6	41.7	36.8	43.8	39.3	39.6	35.9	44.2	47.2	53.3	61.2	50.5	534.6
Mean number of rainy days												
8.3	6.9	9.0	10.2	12.6	13.4	14.0	15.5	14.1	13.3	11.5	9.5	138.3
Mean monthly evaporation (mm)*												
251.1	198.8	179.8	114.0	77.5	54.0	62.0	83.7	123.0	161.2	180.0	229.4	1715.5

*Source: BOM *Data collected between 1998 and 2017*
Note: Where figures have been rounded, discrepancies may occur between monthly totals and annual sums of components.

current alignment of Arundel Creek is within a gully and intersecting the proposed southern cross-field taxiways. The gully embankment slopes at this location are estimated to be 10 to 25 per cent.

Current surface run-off within the study area follows the surface contours primarily as sheet flow toward swales and waterways. More concentrated gully flows occur in some locations, down the existing embankments of the Deep Creek, Maribyrnong River and Arundel Creek systems.

Visual assessments and geotechnical investigations of the project footprint have indicated several areas of potential instability and erosion risk along the embankment and within the Arundel Creek gully. The areas of concern are small, localised occurrences that can easily mitigated (Section B4.8.1).

B4.6.4
Catchment drainage and surface water features

The Melbourne Airport estate drains to a number of local creeks and rivers. They include Moonee Ponds Creek, Arundel Creek, Maribyrnong River and Steele Creek North. Previous ground surface modifications and artificial stormwater drainage infrastructure have modified the pre-existing natural drainage patterns of the site. Current site drainage catchments are shown in Figure B4.2.

B4.6.4.1
Arundel Creek catchment

Arundel Creek is a sub-catchment of the Maribyrnong River (approximately 13 square kilometres in area) which lies within, and is external to, the airport estate. Arundel Creek is the discharge point for the stormwater generated over approximately half of the current airport area. Stormwater discharges through four outfall structures. Three (referred to as ACO1, ACO2 and ACO3) are located in the valley bottom; while a smaller structure discharges to the head of the small valley marking the north-western boundary of the golf course (see Figure B4.2).

Base flow in the Arundel Creek is largely sustained by the contribution from airport stormwater flows, with discharge via the existing outfall structures. Groundwater discharge to the creek is evident in spring-fed pools at locations along the creek line. Upstream of ACO1, the creek is ephemeral, with local rainfall events causing short-term peak flows.

In terms of land use within the airport estate, the catchment mostly comprises vegetated areas. However, it also includes significant areas of runway and taxiways, aprons, terminal precinct buildings, fire training grounds, aircraft maintenance hangars and workshops, and part of a golf course. Arundel Creek discharges to the lower Maribyrnong River, approximately 700 metres south of the airport boundary.

The great majority of M3R-developed infrastructure will drain into the Arundel Creek catchment.

B4.6.4.2
Maribyrnong River catchment

Lying west of the airport estate is the confluence of Deep Creek and Jacksons Creek. Downstream of this confluence, the waterway is known as the Maribyrnong River.

The majority of the Melbourne Airport site drains to the Maribyrnong River catchment via Arundel Creek. The Maribyrnong River has an overall catchment area of about 1408 square kilometres. The river meanders within a deeply-incised valley, running approximately 70 metres below the edge of the airport plateau. The valley floor is generally between 100 metres and 150 metres wide. The tree-lined river channel is approximately 20 metres wide.

Approximately 17.6 square kilometres (65 per cent) of Melbourne Airport land drains ultimately to the Maribyrnong River. A small portion of the western boundary drains directly to the Maribyrnong River, while further north drains to Deep Creek. The majority of the proposed project development sits within the Arundel Creek catchment, and the project footprint affects the entire Arundel Creek catchment within airport land.

B4.6.4.3
Moonee Ponds Creek catchment

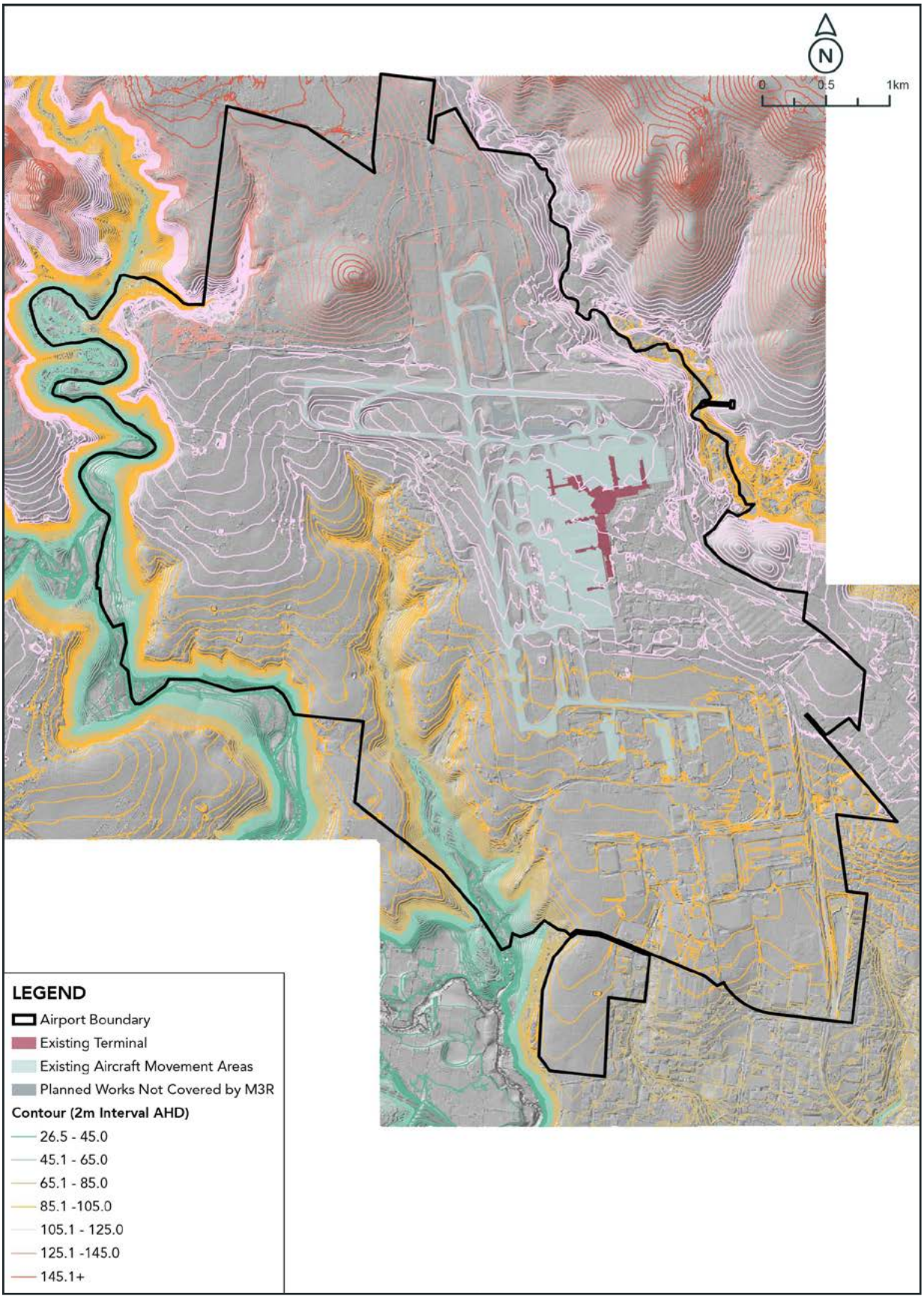
Located along the north-eastern boundary of the airport estate, Moonee Ponds Creek is significantly urbanised, especially downstream of the airport. Although the catchment upstream of the airport is predominantly pasture, this land is being slowly urbanised with expanding residential development in the region. The Moonee Ponds Creek catchment is approximately 145 square kilometres in size. Only a small portion of this catchment resides within the airport estate (approximately 3.6 square kilometres or 2.5 per cent of the catchment).

Within the airport boundary, land use comprised vegetated areas, taxiways, aprons, roads, car parks, terminal precinct buildings, and a fuel storage facility. Moonee Ponds Creek is a tributary to the lower Yarra River.

B4.6.4.4
Steele Creek and Steel Creek North catchment

The Steele Creek and Steel Creek North catchments receive discharges from the southern and eastern regions of Melbourne Airport. The proposed works and operation of M3R will have a negligible impact within the catchment, and therefore not result in any changes to either the flows or flood behaviour.

Figure B4.1
Existing surface digital elevation model and contours



B4.6.5
Subsurface conditions

Geotechnical investigations and laboratory testing have found that ground conditions across the development footprint are generally consistent with the wider region.

The geology of the southern portion of the site broadly consists of a cap of basalt rock. The surface of the basalt has weathered to a residual clay that is encountered at the surface over the majority of the site. The basalt mass consists of seams of variable strength, weathering and fracturing. There is a general trend of increasing strength, reduced fracturing and reduced weathering with depth, but this is not always the case, with zones of more highly weathered and weaker strength material often encountered beneath less weathered and higher strength material. The variability in the basalt layers is likely due to multiple overlying basalt flows creating layers of variable strength and weathered materials.

In some areas, particularly around Arundel Creek, sandy sediments of the Brighton Group formation, exposed areas of weathered Older Volcanics, and colluvial and alluvial deposits are evident. Similarly, investigations near the Maribyrnong River found colluvial materials to depths of 14.5 metres which were likely to have been formed as the Maribyrnong River eroded the area to form its current valley.

The geology of the northern portion of the site comprises Newer Volcanics flows overlying Devonian aged Bulla Granodiorite. In some areas the Bulla Granodiorite outcrops at the surface. The granodiorite has weathered to residual sandy clay, which is typically encountered at the surface where the granodiorite outcrops. The granodiorite is often extremely weathered close to the surface, with a reduction in weathering with depth. In some areas, high strength, slightly weathered granite rock is encountered. Towards the base of the hill an increasing depth of colluvium is expected. There is also a shallow gully located under the north-west extents of the footprint, which may comprise an increased thickness of residual or alluvial soils.

Topsoil encountered within the M3R study area consists of clayey silt, generally described as firm and moist with organic matter including grass roots to ten centimetres below ground level (bgl). The topsoil layer was encountered between 10 and 25 centimetres bgl, with deeper topsoil layers typically near Arundel Creek observed to 70 centimetres bgl."

Refer to Chapter B3: Soils, Groundwater and Waste for further details.

B4.6.6
Erosion potential

The overall erosion potential of soil within the M3R study area has been assessed as low. The soil characteristics (topsoil overlying basaltic clays, typically surfaced by grasses) do not present an erosion risk in their current state. The main areas of erosion concern are within the Arundel Creek gully but considered likely to be localised occurrences.

B4.6.7
Surface water run-off performance modelling approach

To assess the performance of surface water run-off, a TUFLOW computer model was developed to model the hydrology and hydraulics for both existing conditions and the proposed M3R development. It was developed using previous models developed for the Airport, Australian Rainfall and Runoff 2019 guidelines and methodology (ARR, 2019); and existing and proposed infrastructure layouts.

The ARR 2019 methodology involved running a full ensemble of temporal patterns for each storm duration for particular Annual Exceedance Probability (AEP) events through the TUFLOW model. The hydraulic model results were then used to identify critical storm durations, and generation of maximum flood depth and peak flood water level.

B4.6.7.1
Hydrology

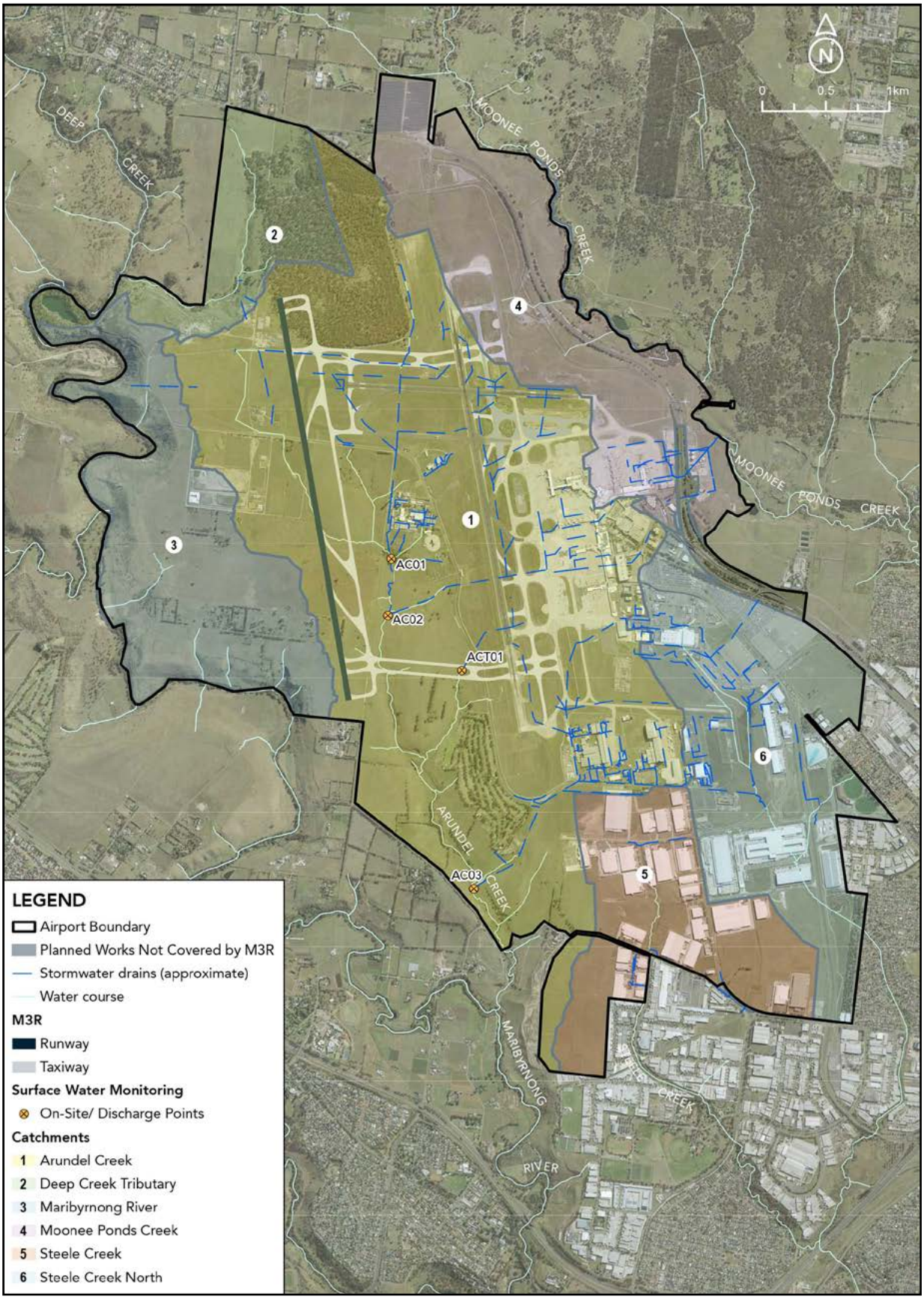
Design rainfall depths were derived from the Bureau of Metrology (BoM) techniques for Intensity-Frequency-Duration (IFD) curves for ARR 2019. They were obtained for the frequent, intermediate and rare AEPs events for each standard design storm (as outlined by BoM and ARR 2019).

The design rainfall depths were temporally distributed for the one per cent AEP for each storm design duration based on the 10 temporal patterns obtained from the ARR 2019 Data Hub.

The one per cent AEP design flood event was selected for the assessment because it is the maximum baseline for protection required for airport airside assets. Further modelling will be undertaken as part of detailed design to consider requirements that satisfy the immunity needs of different airside components.

The one per cent AEP design flood event was modelled for a range of storm durations (10 minutes to 12 hours) to determine the flood impact (flow and level) of the existing conditions and the proposed M3R development.

Figure B4.2
Existing drainage and catchment boundaries



Source: Modelled by Senversa using existing surface elevations sourced from Photomapping Project #5806, Melbourne Airport LiDAR Acquisition (8 March 2017)

B4.6.7.2
Hydraulics

The TUFLOW model was developed to estimate flood level and flood depth within the extent of the airport catchments, and to provide details of the existing condition of outfalls into the Arundel Creek system.

Once a base model representing the existing condition was established, the TUFLOW model was updated with the proposed M3R infrastructure so that the system's performance could be assessed against the existing condition.

The flow rates for the proposed M3R development were compared to the existing conditions in Arundel Creek. Peak flows were extracted for the critical storm duration from the TUFLOW model at reach stations on Arundel Creek (locations shown in Figure B4.3).

Critical storm durations for both the existing conditions and the development scenarios are outlined in Table B4.5.

Table B4.5
Critical storm duration

TUFLOW Scenario	AEP Event	Critical Storm Durations
Existing Condition	1%	20-min, 45 min, 1-hour, 1.5 hours, 2 hours
M3R Development	1%	20-min, 45 min, 1-hour, 1.5 hours, 2 hours

Source: BECA

The peak one per cent AEP event flow rates (corresponding to their critical storm duration and median temporal pattern at each of the reporting locations along Arundel Creek for the existing condition) are presented in Table B4.6.

Figure B4.4 and Figure B4.5 show the representative peak flood levels and maximum depths for the existing condition in the one per cent AEP event. The figures generally indicate controlled and uncontrolled flow paths within the airport, and ponding against runways and roads.

B4.6.7.3
Modelling approach

MUSIC (Model for Urban Stormwater Improvement Conceptualisation) is a continuous simulation software tool used to simulate rainfall, stormwater runoff and pollution. A MUSIC model has been developed to model the baseline conditions and estimate pollutant loadings under the M3R development scenario.

The MUSIC model adopts the Melbourne Water 10-year rainfall templates, in line with the 2018 Melbourne Water MUSIC Guidelines Input Parameters and Modelling Approach for MUSIC Users in Melbourne Water's Service Areas.

Daily potential evapotranspiration values were obtained from the Melbourne Water MUSIC Rainfall Template files - default soil parameters within the MUSIC model have been amended to reflect pervious area properties for Melbourne.

The full 10-year rainfall period has been adopted at the finest timestep resolution, i.e. six minutes, with sub-catchments established based on flow direction from the piped drainage network and overland flow paths.

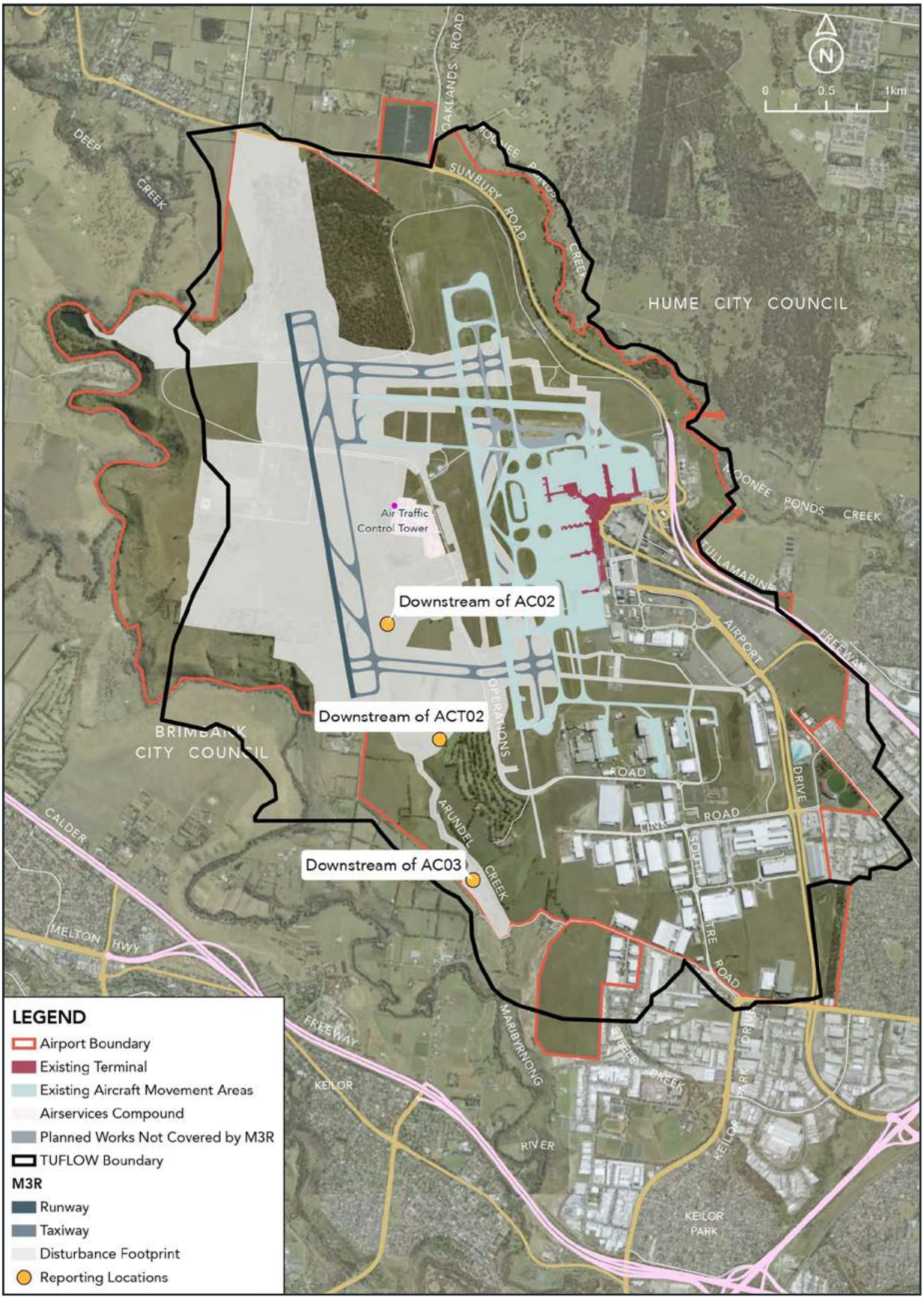
Hydraulic routing has been included along all primary drainage links (to account for travel time in the overland flow and pipe networks), giving the model a better representation of on-ground drainage conditions.

Table B4.6
Peak 1% flows for existing condition along Arundel Creek

Reporting locations	Critical duration	Median temporal pattern	1% AEP peak flows (m^3/s)
Downstream of ACO2	2 Hours	Temporal Pattern 2	36.94
Downstream of ACTO2	2 Hours	Temporal Pattern 2	6.66
Downstream of ACO3	2 Hours	Temporal Pattern 8	66.06

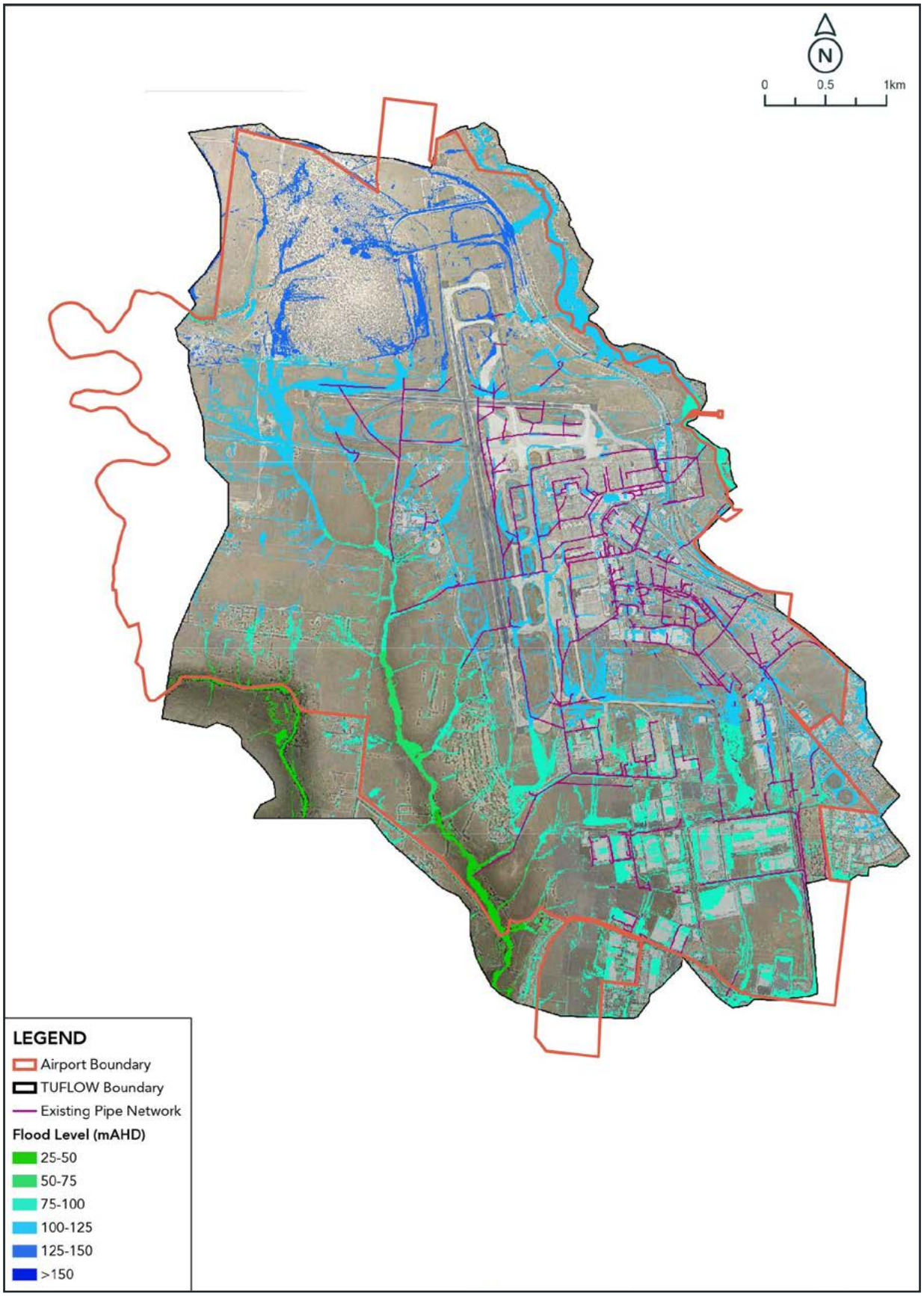
Source: BECA

Figure B4.3
Reporting reach stations locations for flows on Arundel Creek



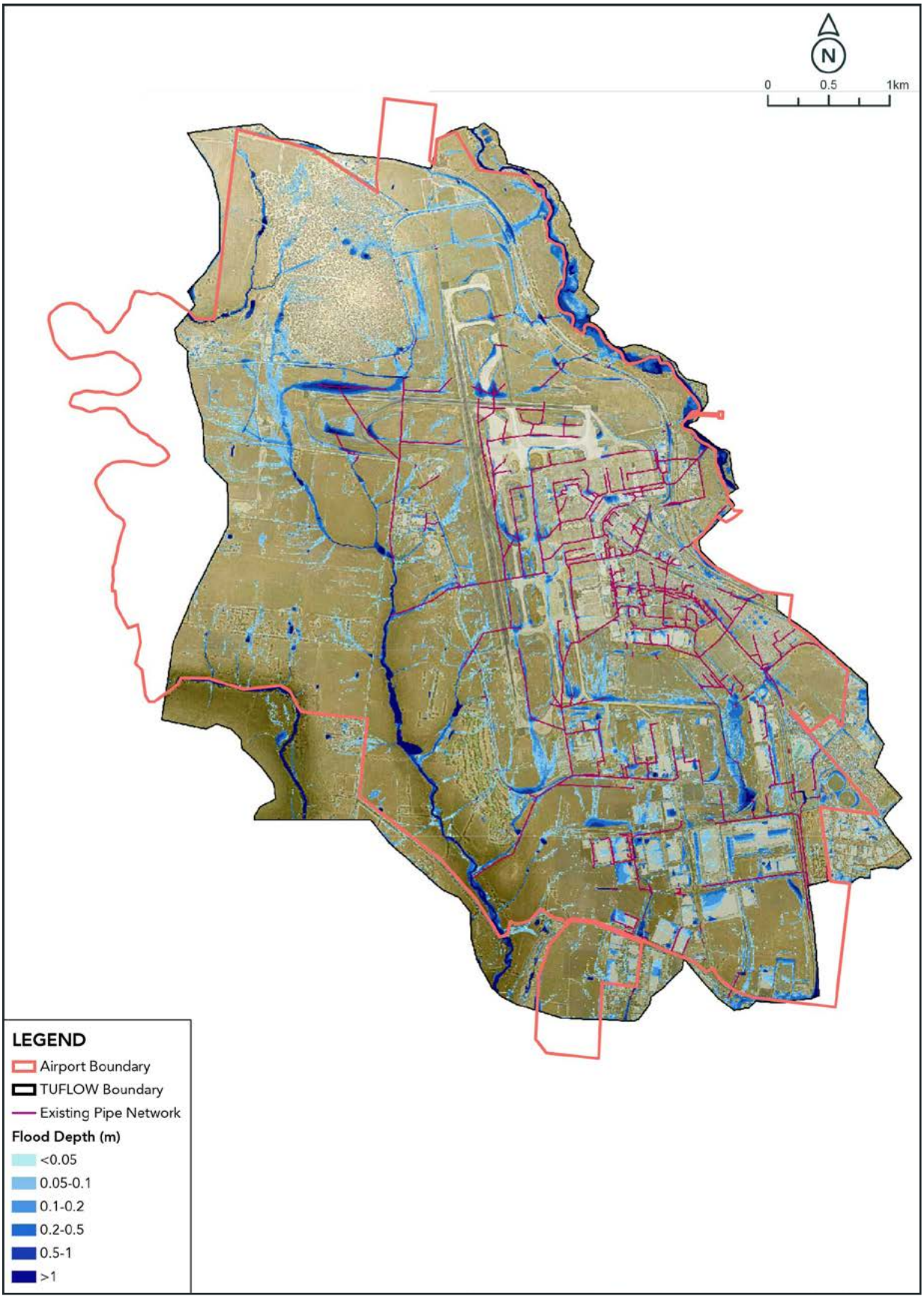
Source: BECA, 2020

Figure B4.4
Existing condition flood level 1% AEP



Source: BECA, 2020

Figure B4.5
Existing condition flood depth 1% AEP



Source: BECA, 2020

B4.6.8
Surface water quality

Extensive water monitoring has been undertaken by APAM across the estate and upstream and downstream catchments, at over 90 monitoring locations with electronic records dating back to 2009.

APAM is required to monitor surface water quality as part of the environmental obligations under its long-term lease of the airport. Some tenants are also responsible for monitoring surface water derived from tenant-related operations. Figure B4.6 presents the current APAM monitoring locations. The current annual monitoring program consists of approximately 45 locations, including key up-gradient and down-gradient discharge points. The intention of the monitoring network is to meet APAM's responsibilities, verify tenant monitoring programs, and limit duplication of data collected by tenants.

Table B4.7 presents the water quality parameters that are monitored as part of the monitoring program. Higher frequency (i.e. quarterly) monitoring has been undertaken in the past but given the long term records, the surface water conditions have been well established and has recently been reduced to annual for Estate wide monitoring program. Higher frequency monitoring is still undertaken as part of project specific requirements.

Off-airport monitoring - annual human health and ecological risk assessment

In addition to monitoring undertaken as part of lease obligations, additional off-airport waterway monitoring is being undertaken by APAM to support an annual human health and ecological risk assessment report to EPA Victoria. This includes 5 off-site locations (DC09, MR04, MR01, AC12a and MR05) as presented on Figure B4.6.

The monitoring includes collection and analysis of PFAS in surface water and fish at each location.

B4.6.8.1
Stream health monitoring

In addition to surface water quality monitoring, APAM also undertakes stream health assessment monitoring on an annual basis at the monitoring locations in Figure B4.7. The stream health monitoring includes macroinvertebrate sampling to assess potential impacts on receiving waterways from airport activities' runoff

B4.6.8.2
Overview of catchment and receiving water conditions

B4.6.8.3
Key contributions to water quality

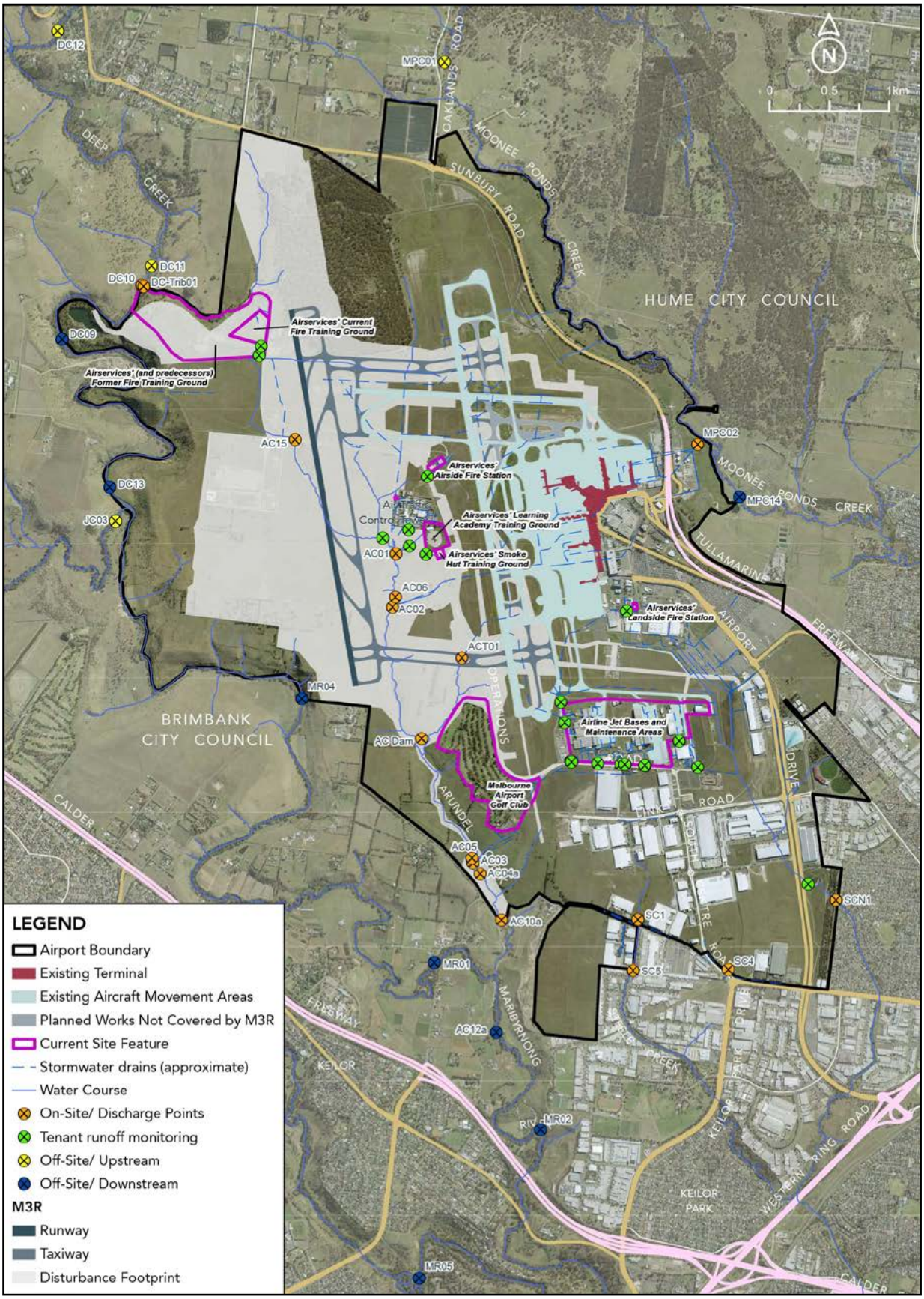
The following is a broad overview of key contributions to water quality in catchments and receiving waterways at Melbourne Airport:

- Natural sources from soil sediment load such as runoff from existing soils across the Melbourne Airport estate and broader catchment, (e.g. naturally occurring metals in soil)
- Agricultural practices (both past and present) in non-operational areas of the airport estate and within the broader catchments (e.g. nutrient loads, faecal coliforms)
- Application of pesticide and herbicides as part of pest management in operational areas of the airport
- Runoff from operational areas of the airport where use of chemicals and fuels are required as part of general operations
- Historic accidental spills/releases, which may also occur as secondary sources within sediment in the artificial and natural drainage lines
- Potential impacts during construction activities including increased sediment loads and runoff from imported fill
- Groundwater discharges to surface water systems.

Table B4.7
Water quality parameters monitored

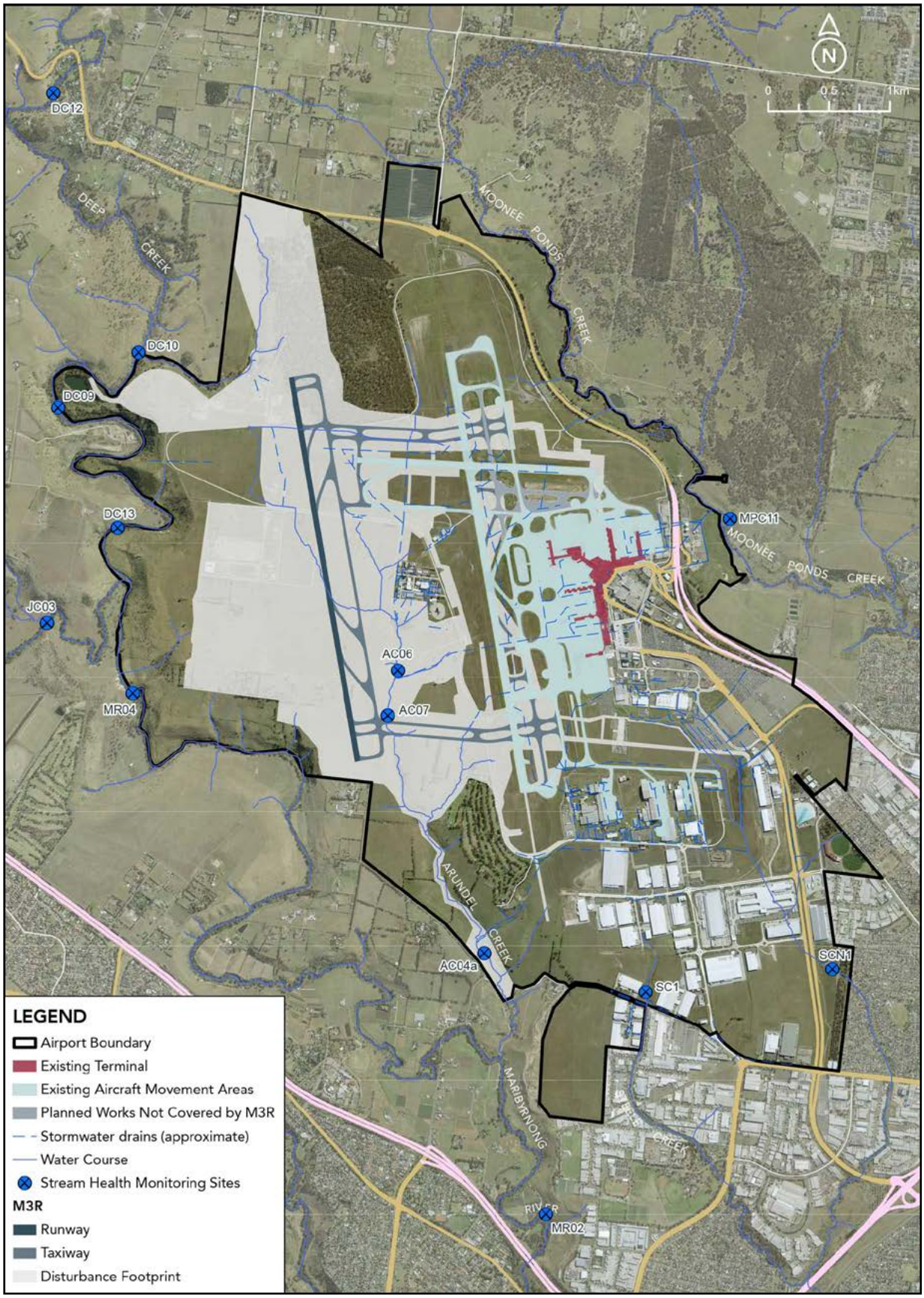
Group	Individual parameters
Physico-chemical	Electrical conductivity, pH, dissolved oxygen, temperature, turbidity, total dissolved solids, suspended solids, hardness, biochemical oxygen demand, chemical oxygen demand
Metals	Aluminium, arsenic, copper, cadmium, chromium, lead, zinc, nickel
Nutrients	Total nitrogen, nitrate, nitrite, total kjeldahl nitrogen, total phosphorus
Hydrocarbons	TPH C6-C40 fractions, benzene, toluene, ethylbenzene, xylenes, naphthalene, chlorinated hydrocarbons, oil and grease, methylene blue active substances
Pesticides and herbicides	Phenoxy acid herbicides, triazine herbicides, synthetic pyrethroids, fungicides, organophosphorus pesticides, organochlorine pesticides
Microbiological	E. coli, faecal coliforms
Per- and poly-fluoroalkyl substances (PFAS)	Extended suite of 28 key PFAS compounds

Figure B4.6
Water quality sampling locations



Source: Senversa, 2020

Figure B4.7
Stream health monitoring sites



Source: Map produced by Senversa from Elgin 2020b

B4.6.8.4
Monitoring parameters

Melbourne Airport's surface water quality monitoring program is outlined in **Section B4.6.8**. The monitoring program is reviewed and updated periodically to ensure currency and ongoing relevance. It includes monitoring for parameters listed in Airport Regulations and Environmental Reference Standard (Vic), and consideration of the known water quality contributions as listed in **Section B4.6.8.3** above.

The most recent monitoring events were undertaken in Spring 2021 and select off-site locations in Autumn 2022. Some minor variance occurred due to the site conditions and inclusion of additional locations when targeting potential runoff from operational areas.

It should be noted that the adopted guidelines consider water quality within the airport boundary (Airport Regulations) or in the receiving waters (Environmental Reference Standard (Vic)). Runoff into Arundel Creek and other natural creek lines within the airport bounds is governed by Commonwealth legislation (Airport Regulations). Stormwater runoff and discharge from natural creeks leaving Melbourne Airport is governed by Victorian legislation (Environmental Reference Standard (Vic)). Many of the monitoring locations within the current monitoring program specifically target drainage discharge points to understand where impacts may be derived from to help identify improvement measures. They are not necessarily reflective of water quality within natural drainage lines. Monitoring of all airport boundary discharge points is included in the monitoring program in order to understand potential contributions to off-site water quality.

B4.6.8.5
Existing water quality conditions

General water quality indicators – Airport Regulations

Average concentrations across the historic data set have been compared to Airport Regulations to give a summary of existing water quality conditions. They are summarised in **Table B4.8** below.

For the purposes of this MDP, assessment of project risks from general water quality indicators will need to consider the current risk profile and general water quality. Indicators will be managed to ensure the risk profile does not increase and/or improving it as part of the project works.

Comparisons against Environmental Reference Standard (Vic) quality objectives

The following sites are considered representative of airport discharge and receiving waters (as defined in Environmental Reference Standard (Vic)):

- Site AC10a has been selected to represent the quality of Arundel Creek as a receiving water containing three upgradient stormwater discharge sites (including AC01, AC02 and AC03). It also represents water quality discharging from the airport boundary
- Site DC-Trib01 and DC10 for water quality discharging into Deep Creek at the airport boundary
- MPC02 as the outfall discharge point into Moonee Ponds Creek and in stream down gradient boundary at site MPC14

Table B4.8
General water quality indicators – Airport Regulations

Group	Individual parameters	Comments
Physico-chemical	Average concentrations for physico-chemical parameters generally meet Airport Regulations. The key exceedances are: Salinity (mg/L) in particular, the long-term averages in DC-Trib01 and AC10a Turbidity based on the variation of total suspended solids compared to long term averages.	Surface water sampling is often undertaken during rainfall events, not during low flow periods where turbidity and total suspended solids would not be as significant.
Nutrients	Average concentrations for ammonia (as N), total nitrogen, phosphorous (as P) have been reported above Airport Regulations.	Ammonia, total nitrogen and phosphorous also exceed at some upgradient locations and are considered to be catchment wide issues.
Microbiological	Average concentrations for faecal coliforms have been exceeded across the airport.	Faecal coliforms have also been reported at upgradient locations and are considered to be a catchment wide issue.

- SCN1, SC4 and SC5 as the boundary discharge points for Steele Creek and Steele Creek North. As the project will have limited impact on these catchments, further discussion about them is considered unwarranted. They have been excluded from the data set.
- Off-site data where available for quality indicators has also been assessed to provide indication of general conditions in the receiving waters both upstream and downstream of key discharge points.

The historic data set for the above locations (AC10a, DC-Trib01, DC10, MPC02 and MPC14) was reviewed against Environmental Reference Standard (Vic) quality indicators with consideration of quality information from off-site sampling points. The results are summarised in Table B4.9 below.

Review of the surface water data against Environmental Reference Standard (Vic) indicates that not all objectives are met. This is generally consistent with the outcomes from assessment against the airport Regulations. These quality indicators can often be impacted by broader catchment quality and environmental factors. As previously noted, because surface water sampling is undertaken during rainfall events (to maximise available sampling locations in the network) it is not necessarily a true indicator of general water quality in the receiving waters.

Stream Health

The most recent results for stream health monitoring (2022) are presented in Table B4.10.

The stream health conditions are considered to be more influenced by broader catchment conditions and rainfall - they do not necessarily correlate to impacts directly associated with airport activities and resultant discharges.

Table B4.9
General water quality indicators – Environmental Reference Standard (Vic)

Quality Indicator	Metric	Receiving water objective	Environmental Quality Indicator Results
Electrical Conductivity	75th percentile	≤ 2000 µS/cm	The objective was not met at AC10a, DC-Trib01 and DC10
pH	25th percentile	≥ 6.8	The 25th percentile objective was met at all locations
	75th percentile	≤ 8.0	The 75th percentile objective was not met at DC-Trib01 and DC10 which reported pH at 8.1 and 8.5 respectively. pH of 8.1 has also been reported upstream (DC11) and downgradient (DC09)
Dissolved Oxygen[1]	25th percentile Maximum	≥ 70% Saturation 130 % Saturation	Field and laboratory DO was reported below the 25th percentile at MPC02 at 47%-68% saturation (4.3 mg/L-6.2 mg/L). The 25th percentile was also not met upstream MPC01 or downstream (MPC14) Field and laboratory DO was reported above the maximum at DC10 at 132% to 143% (12-13 mg/L) noting that DO upstream (DC11) and downstream (DC09) reported 9µg/L (99%) and 11µg/L (121%) respectively
Turbidity	75th percentile	≤ 15 NTU	The objective was not met at AC10a (24 NTU) and MPC02 (18 NTU) It is noted that turbidity in most off-site locations including upstream of key discharge points was not met
Total phosphorus	75th percentile	≤ 55 µg/L	The objective was not met at most locations including upstream and downstream of key discharge points
Total nitrogen	75th percentile	≤ 1,050 µg/L	The objective was not met at AC10a and MPC02 The objective was also not met in upstream locations (MR04, MR01, MPC01) and downstream location (MR02) of these discharge points
E. coli[2] (water based recreation)	Short term indicator	≤ 260 orgs / 100mL (consecutive sample) ≤550 orgs/100 mL (single sample)	Average E. coli concentrations exceeded the consecutive sample guideline at AC10a, MPC02, MPC14 Maximum E. coli concentrations have exceeded the single sample guideline at AC10a (with historical data from nearby AC10), DC10 and MPC02 95th percentiles indicate that water quality is not suitable for primary contact recreation but is suitable for secondary contact recreation at site discharge points noting that sampling is often undertaken during rainfall events

Note 1: Dissolved oxygen was converted from mg/L to % saturation assuming 1 atmospheric pressure and temperature of 20 degrees Celsius.

Note 2: These results are provided for general comparison only as the collection of E. coli data as part of surface water monitoring program does not fully comply with the Environmental Reference Standard (Vic) requirements to allow for direct comparison with the guidelines.

PFAS

PFAS (per- and poly-fluoroalkyl substances) are manufactured chemicals used for more than 50 years. PFAS make products non-stick, water repellent; and fire, weather and stain resistant. PFAS have been used in a range of consumer products such as carpets, clothes and paper, and in firefighting foams, pesticides and stain repellents.

At airports, Aqueous Film Forming Foams (AFFF) containing per- and poly-fluoroalkyl substances (PFAS) were historically used because they are very effective at putting out liquid fuel fires. At Melbourne Airport, AFFF has been stored in aircraft hangers for deluge systems; and used extensively in training for, and responding to, firefighting emergencies involving liquid fuels. Potential source areas in the project area include the following Airservices Australia and their predecessors' facilities as presented in **Figure B4.6**:

- Current and former Fire Training Grounds (FTGs)
- The Melbourne Airport Fire Station
- The Smoke Hut.

Diffuse PFAS impacts are widespread across the project area, and a number of secondary sources of PFAS contamination have also been identified. However, these are predominantly associated with surface water drainage, groundwater contamination and water re-use impacts (e.g. Melbourne Airport golf course).

The key PFAS compounds of concern at the airport are perfluorooctane sulfonate (PFOS) and perfluorohexane sulfonate (PFHxS). Although other PFAS compounds have been detected above laboratory limits of reporting (LOR), PFOS and PFHxS are considered suitable indicators of overall PFAS impacts and the primary risk drivers because they:

- Have as high or higher toxicity than other PFAS for which toxicological studies have been conducted
- Have screening and toxicity reference values published by Australian agencies for use in both screening level and detailed quantitative health risk assessments
- Comprise the majority (i.e. predominantly greater than two-thirds) of total analysed PFAS compounds at Australian sites where PFAS-containing fire-fighting foams have been used.

Screening levels are also available for perfluorooctanoic acid (PFOA). However, PFOA has not been demonstrated to be a risk driver at Australian sites (due to its lower toxicity than PFOS and PFHxS) and its occurrence at lower concentrations in environmental media.

PFAS compounds (specifically PFOS, PFHxS and PFOA) are reported in surface water with exceedances of adopted guidelines at the site boundary. Surface water impacts are most pronounced downgradient of areas of historic use. Some other secondary source contamination in sediment within drainage lines has been reported.

Table B4.11 summarises PFAS impacts across the project area, and average concentration from monitoring data collected between 2016 and 2020.

PFOS concentrations are exceeded at all locations (both on and off-site) due to the low guideline limit of 0.00023 µg/L for 99 per cent protection of species (which is adopted in consideration of bioaccumulation potential). It should be noted that this guideline limit is below the laboratory limits of reporting of 0.01 µg/L. Average concentrations of cumulative PFHxS and PFOS also exceed acceptable thresholds for stock watering (at most locations), and primary contact recreation (in Arundel Creek and Deep Creek Tributary). Average and maximum PFOA concentrations also exceed stock

Table B4.10
Stream health results

Catchment	Stream Health
Arundel Creek Sub-Catchment	In general, stream health in Arundel Creek does not meet Environmental Reference Standard (Vic) quality objectives which has been attributed to poor stormwater quality, peak stormwater flows and poor habitat conditions. Recent fencing off of reaches from stock for the past few years has improved the condition of riparian and instream habitats. The conditions are stable with results falling within historical ranges with some minor improvements noted in 2022 at some sites. It should be noted that these are all on-site locations and not representative of off-site receiving water conditions.
Deep Creek Sub-Catchment	Monitoring in Deep Creek has shown to generally meet Environmental Reference Standard (Vic) quality objectives for stream health and has continued to show high ecological value.
Maribyrnong River	Monitoring in the Maribyrnong River indicates good stream health but with some continued impairment reported in the lower sections of Maribyrnong River at MR04 which is within and downstream of areas of increased levels of land clearing, urban runoff, intensive agricultural use (market gardening) and Arundel Creek.
Moonee Ponds Creek	Some continued improvement to stream health has been reported in Moonee Ponds Creek. The stream health of Moonee Ponds Creek is impacted by upstream catchment runoff contributions as well as from discharge from the airport (stormwater quality and peak flows) that are impacting on the habitat conditions at the reference monitoring point. APAM has been actively undertaking improvements to support better stream health in Moonee Ponds Creek including native re-vegetation planting and weed removal within riparian zones, stormwater treatment and mitigation measures at the Estate discharge point and other Estate management improvements including limiting the use of herbicides.

watering at some locations within the airport boundary. For locations within the airport boundary, primary contact recreation is not permitted. Controls have also been put in place to restrict stock access to creeks within the airport boundary.

Estate-wide human health risk assessments have been commissioned by APAM and identified that on-site risks are low and acceptable with existing management controls. Off-site risks have also been assessed to be low and acceptable, with the exception of:

- Potentially unacceptable health risks due to recreational fish consumption. These risks are managed via an EPA fish consumption advisory.
- Potentially unacceptable risks to ecological receptors due to indirect exposure pathways (bioaccumulation of PFAS in the aquatic food chain).

Active clean up of impacted off-site waterways to reduce these risks has been assessed as impracticable due to the associated physical damage to the off-site ecosystems and riparian zones, which is considered to be more harmful than the potentially elevated risk posed by PFAS pollution. APAM is therefore working with airport tenants as part of broader estate management improvements to reduce PFAS migration from the airport into surrounding waterways – with the objective of progressively reducing the off-site risk profile. For the purposes of this MDP, assessment of project risks from PFAS will need to consider the current risk profile and how PFAS impacts will be managed to ensure the risk profile does not increase and/or can be improved as part of project works.

Metals and toxicants (non-PFAS)

Average and maximum concentrations across the historic data set have been compared to Airport Regulations (and, where applicable, to Environmental Reference Standard (Vic)) to provide a summary of existing water quality conditions. They are summarised in Table B4.12.

Estate-wide risk assessments are currently in progress to confirm whether off-site risks from non-PFAS contaminants pose a risk to environmental values (including aquatic ecosystems, primary contact recreation, irrigation and stock watering) and are being addressed as part of broader estate management. For the purposes of this MDP, assessment of project risks from non-PFAS contaminants will need to consider the current risk profile, and how non-PFAS impacts will be managed to ensure the risk profile does not increase and/or can be improved as part of project works.

Table B4.11
Summary of PFAS impacts across the project area

Catchment	Summary of PFAS presence
Arundel Creek Catchment	Key source areas within this catchment are the Airservices Australia lease areas, including the Main Fire Station, Learning Academy and Smoke Hut (refer to **Figure B4.6**). Historically, run off from the current Fire Training Ground (FTG) area was also received by this catchment. Secondary source sediment and drainage infrastructure contamination has been reported, as well as impacts from using PFAS contaminated water from Arundel Dam to irrigate the Melbourne Airport golf course. Run off from the operational areas of the airport including the maintenance areas are also identified as historical source areas. Average concentrations of Sum of PFHxS and PFOS at AC10a discharge point are 3.7 µg/L. In addition to concentration data, estimates of contaminant load indicate that Arundel Creek is the key discharge point that contributes to offsite discharge of PFAS.
Deep Creek and Deep Creek Tributary	The key source areas within this catchment are the current and former FTG (refer to **Figure B4.6**) as well as secondary sources in sediment within the tributary. As Deep Creek Tributary generally only flows during high rainfall events, although the reported concentrations at the site discharge point are high, the overall contaminant load and impact to water quality in Deep Creek and Maribyrnong River is lower than that estimated from Arundel Creek. Average concentrations of Sum of PFHxS and PFOS at DC-Trib-01 discharge point are 167 µg/L but reduce to 1.5 µg/L at the receiving water location (DC10) in Deep Creek
Moonee Ponds Creek	The key sources areas within this catchment are the Joint User Hydrant Infrastructure (JUHI) (aviation fuel) facility (refer to **Figure B4.6**) as well as operational areas of the airport where historically PFAS may have been stored or used as part of firefighting activities. Average concentrations of Sum of PFHxS and PFOS at MPC02 (discharge point) are 0.12 µg/L and 0.064 µg/L at MPC14 (receiving water location).
Maribyrnong River	The sum of PFHxS and PFOS concentrations reported within surface water of the Maribyrnong River and lack of attenuation over long distances indicate that there is likely secondary source contamination in sediments in the river from PFAS that has accumulated over time. The off-site sampling program in 2022 indicates concentrations at the upper reaches at MR04 of 0.025µg/L increasing to 0.071µg/L at MR01 (upstream of Arundel Creek discharge point) and 0.109µg/L (downstream of Arundel Creek discharge point. Downstream concentrations at MR05 only reduce marginally to 0.099µg/L. There is also the potential for other downstream sources between MR01 and MR05 to be contributing to surface water quality in the Maribyrnong River.

B4.7
ASSESSMENT OF POTENTIAL IMPACT

The construction and operation of M3R has the potential to modify existing catchment-specific water quality, surface water and erosion characteristics.

The construction stages of the program include large-scale earthworks and use of plant and machinery that present risks for enhanced erosion and sedimentation, and discharge of PFAS, hydrocarbons and other hazardous materials. These effects may be experienced on-site and off-site. Operational phase impacts resulting from the increase in impervious land use include modified hydrologic and hydraulic responses to rainfall events and altered water quality.

This section assesses likely impacts on local site features and off-site features with respect to erosion potential, water quality and surface water. The assessment process is based on a review of project-specific site characteristics that is both qualitative and quantitative in nature. Impacts are assessed relative to the existing condition and legislative requirements.

B4.7.1
Erosion potential

The potential for erosion within the M3R development footprint results from the stripping of topsoil, vegetation removal and bulk earthworks. Impacts may occur at the site of erosion, in the transportation of sediments into surface water systems, and/or at the site of sediment deposition.

B4.7.1.1
Construction phase

The primary activities identified as having the potential to contribute to erosion risk during preliminary staging and construction include:

- Excavation and placement of imported materials during preparation, and development of large earthwork platforms and haul roads
- Removal of vegetation and topsoil stripping
- Exposure of large areas of unstabilised ground during excavations

Table B4.12
Summary of non-PFAS impacts across the project area

Group	Airport Regulations	Environmental Reference Standard (Vic)
Metals	Aluminium, copper and zinc are the key dissolved metals concentrations that exceed Airport Regulations (average and maximum concentrations). To a lesser degree, chromium, cadmium, lead and iron have also been reported but generally not at site boundary discharge points. Aluminium is also reported in Moonee Ponds Creek and Deep Creek upgradient of the airport which indicate the widespread presence of aluminium in the catchments and not a site derived pollutant. The presence of copper, iron zinc and chromium are also reported in soil and groundwater (refer to **Chapter B3: Soils, Groundwater and Waste**) and are inferred to be associated with natural background concentrations in soils.	Metals also exceed multiple environmental value guidance with many also exceeding upstream of the airport.
Hydrocarbons	Long term averages are below Airport Regulations with the majority of records below laboratory detection limits. Petroleum hydrocarbons have been reported on occasion above Airport Regulations at drain discharge points within Arundel Creek, Moonee Ponds Creek.	Hydrocarbon concentrations have historically exceeded primary contact recreation and stock watering at site discharge point MPC02 but average concentrations are all below Environmental Reference Standard (Vic) guidance.
Pesticides and herbicides	Dieldrin has been reported above Airport Regulations at some locations including at the discharge point (MPC02) and at the down gradient location (MPC14) in Moonee Ponds Creek and AC10a (Arundel Creek discharge point). Dichlorodiphenyltrichloroethane (DDT) has historically reported above Airport Regulations at some onsite locations. Other herbicides have also been detected but not above adopted criteria. The presence of these contaminants in the airport is largely attributed to legacy pest and weed control within operational areas of the airport. In particular, insecticides have been used in runway easements to control insect populations in an attempt to reduce bird strikes. Dieldrin and DDT have been banned for this use since the late 1980s and concentrations are reflective of diffuse contamination from historical use.	Maximum and average dieldrin concentrations have exceeded aquatic ecosystem 95% protection at site discharge points (AC10a and MPC02).

- Bulk excavation and handling of material to be re-used as fill
- Stockpiling of significant soil volumes directly up-gradient of drainage lines
- Placement of fill material within the Arundel Creek gully during culvert and taxiway construction
- Modification of Arundel Creek's existing embankments.

The specific mechanisms expected to increase the erosion potential during the above activities include:

- Exposure of clay soils which may dry and release fine sediments via surface run-off or wind erosion
- Improper placement, containment or stockpiling of soil leading to increased erosion of materials
- Direct mobilisation of soils from embankments through physical modification of existing surfaces.

Impacts from erosion processes will include the loss of soils from newly-formed surfaces or stockpiles, access issues if significant rills or gullies are formed, and potential construction delays if sub-grade materials or working platforms and batter slopes are eroded. Downstream impacts include a reduction in surface water quality, sediment build-up at depositional locations, and reduction in air quality through release of dust particles.

B4.7.1.2
Operational phase

During the post-construction and operational phases of M3R, erosion risks may be associated with greater run-off and surface water flows from an increase in impermeable surfaces. These ongoing risks may increase sediment loading in surface waters in the absence of suitable design considerations and effective mitigation measures.

B4.7.2
Surface water

B4.7.2.1
Proposed modification and expected outcomes

M3R works have the potential to impact the surface water and flooding behaviour of Arundel Creek and the Maribyrnong River. Moonee Ponds Creek, Steele Creek North and Steele Creek catchments are located predominantly outside the project footprint, and any impact by the proposed development is expected to be minimal.

The proposed works will increase the impervious surfaces within Arundel Creek catchment and, without mitigation, may cause increased flows to enter the waterway. The additional impervious surfaces are proposed to be drained using a combination of buffer strips, open grassed swales, and a new pit/pipe drainage system to a series of discharge points along Arundel Creek.

The proposed development will also require the filling of parts of the Arundel Creek valley to ensure a continuous level surface for the southern cross-field taxiways. This will result in the existing creek conveyance being replaced with a culvert at this location. The realigned Operations Road will also cross a tributary of Arundel Creek adjacent to the Melbourne Airport golf course. The crossing of this tributary will require a culvert to ensure conveyance of the tributary is maintained.

Expected outcomes from these changes include potential modification of:

- Surface run-off (flooding) i.e. changes in the timing, frequency and volume of flow. The net effect of M3R will vary from catchment to catchment depending on the extent of change it is subject to, relative to its existing size and hydrologic function.
- Loss of floodplain storage. The infilling of the Arundel Creek valley will result in a loss of floodplain storage within the Arundel Creek system, potentially exacerbating flood levels along the valley.
- Flow volumes will be increased for events and as a long-term average.
- Flow events will occur more frequently - smaller rainfall events will give rise to more frequent flow events in drains and waterways due to reduced infiltration.

The key changes resulting from the proposed implementation of M3R include:

- Modification to catchment areas and drainage
- Increases in impervious area
- Modifications to land use.

In terms of modifications to catchments and drainage, the Arundel Creek catchment will increase in size by 160,000 square metres, with almost all M3R infrastructure draining into Arundel Creek (**Figure B4.8**).

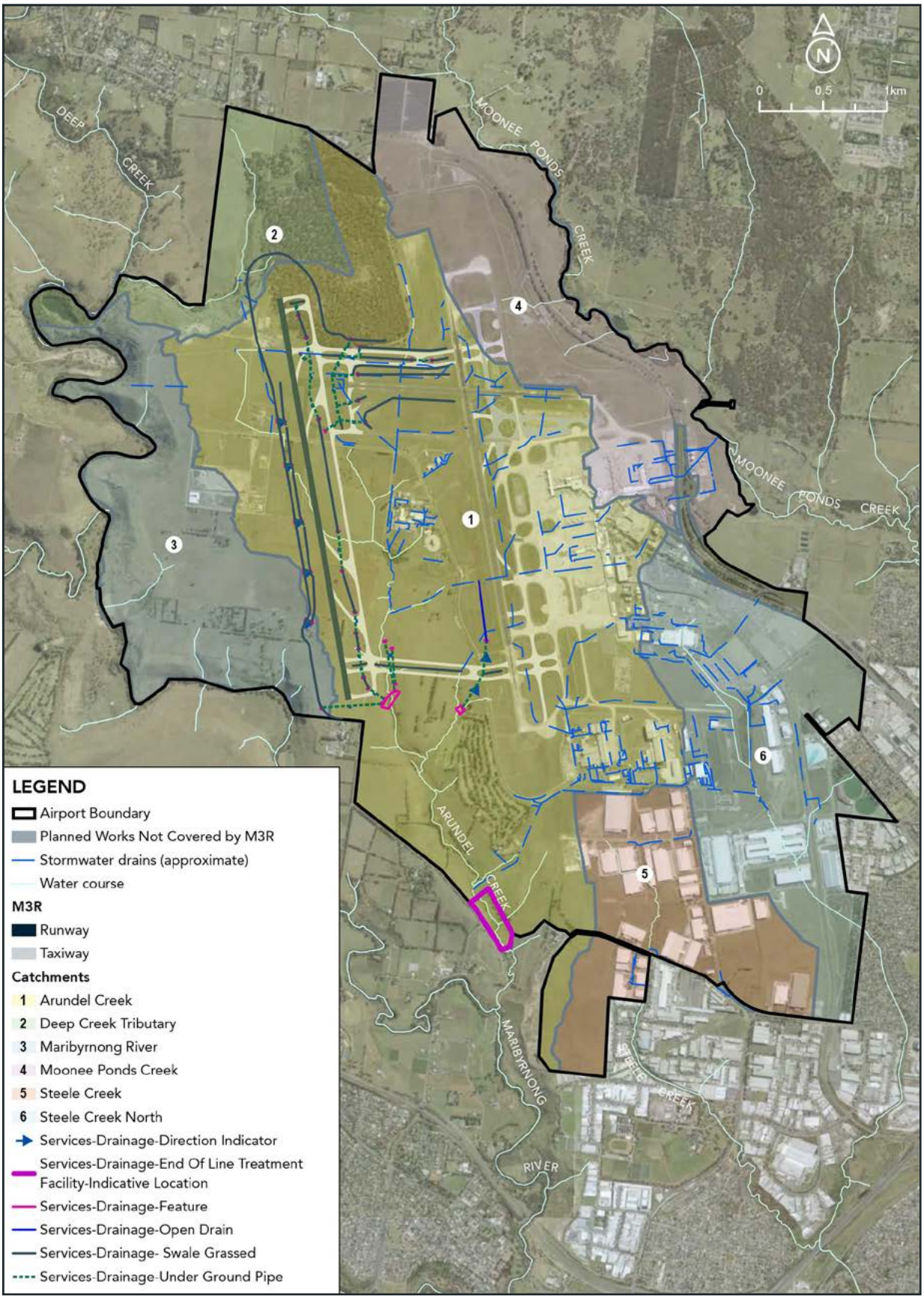
Associated with M3R is a new stormwater collection and conveyance system. This includes capturing run-off from the runway surface and all associated taxiways, and conveying these flows to Arundel Creek. Stormwater discharges will occur on the upstream and downstream ends of the proposed Arundel Creek culvert. Additionally, an outfall will be required in a tributary of Arundel Creek adjacent to the golf course (**Figure B4.9**).

B4.7.2.2
Quantification of changes and outcomes

As described in **Section B4.6.7**, hydraulic modelling has been completed for Arundel Creek including:

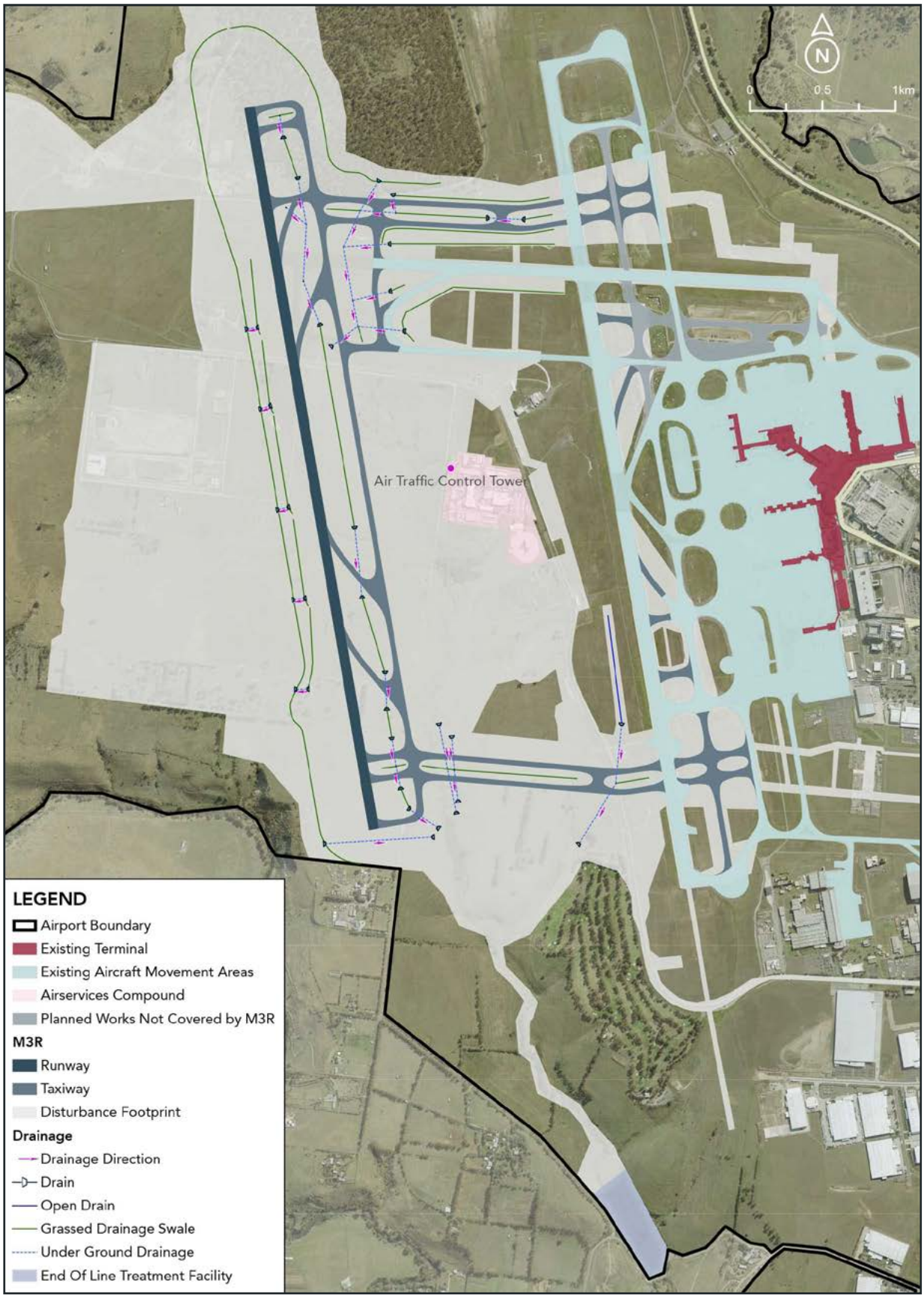
- The Arundel Creek valley, to determine the impact of the partial infilling of the valley
- The stormwater drainage system, to determine the increases (or decreases) to peak flow at discharge locations along the waterway.

Figure B4.8
Proposed development and catchment boundaries



Source: Modelled by Senversa using existing surface elevations sourced from Photomapping Project #5806, Melbourne Airport LiDAR Acquisition (8 March 2017) and finished design levels (BECA, 2020.

Figure B4.9
Indicative M3R stormwater network



Source: APAM

Results

The Arundel Creek hydraulic model (as described in Section B4.6.7) was modified to include the proposed M3R development. This involves modelling the inclusion of an approximately 500 metre culvert and the associated partial infilling of the Arundel Creek valley to allow for the southern cross-field taxiways.

The hydraulic model was tested for the one per cent AEP flood event. Figure B4.10 and B4.11 show the representative peak flood levels and maximum depths for the M3R development scenario condition in the one per cent AEP event.

In general, the flooding and flow paths have been confined to the new swales and underground cross drainage through to the Arundel Creek culvert. Minor flooding is modelled to occur on existing runway 09/27 and adjacent Taxiway Echo. Modification to the preliminary swale and drainage system will be done during detailed design to eliminate any flooding in or near to paved areas.

The drainage philosophy for M3R is to attenuate discharge rates to pre-development levels in Arundel Creek. The peak one per cent flows in the M3R development scenario are shown in Table B4.13; they are lower or comparable to the existing flow along Arundel Creek. Accordingly, the M3R development scenario is expected to control post-development flows to existing conditions. This has largely been achieved by using online grass swales located parallel to the new north-south runway (16R/34L).

Frequent flows

In addition to the rare flood events discussed in the previous sections, M3R will have implications for the more frequent rainfall runoff events at the airport. Increases in frequent flow events have the potential to impact receptor species in the receiving environment. Impacts on ecology are described in Chapter B5: Ecology.

B4.7.3 Water quality

B4.7.3.1 Proposed modifications and expected outcomes

Key operational stage changes resulting from the implementation of M3R include:

- Modification to catchment areas and drainage
- Increases in impervious area
- Modifications to land use.

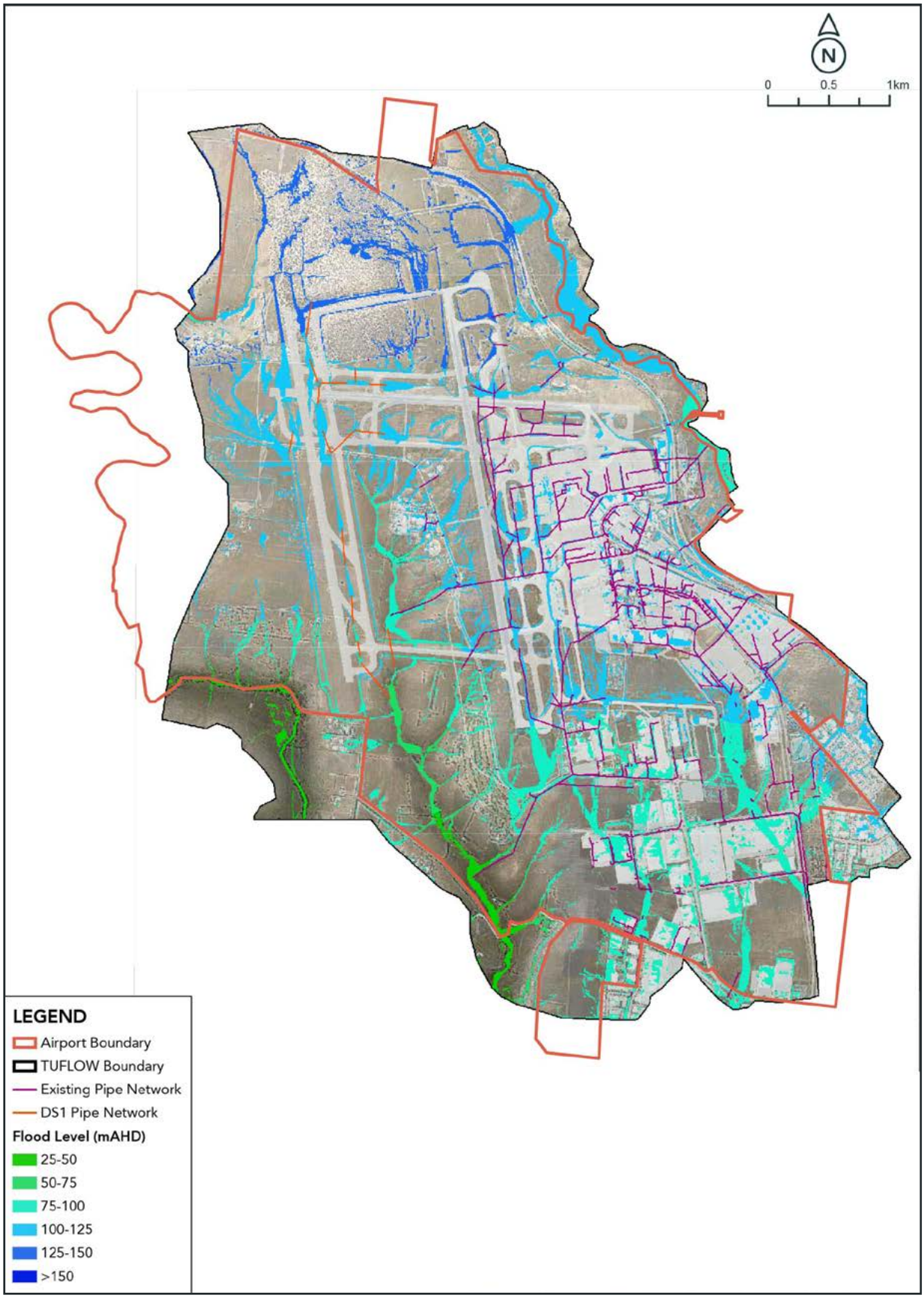
The implementation of large areas of pavement associated with runways and taxiways will increase the ratio of impervious to pervious areas, and change the mixture of land use within the catchment. Expected water quality outcomes from these changes include:

- Hydrology – changes in the timing, frequency and volume of flow. Increases in flow volumes and rates generally increase the pollutant generation potential of a catchment.
- Water quality – changes in the quality of water and load of pollutant generated. Typically, low intensity uses (such as vegetated lands) generate lower quantities of pollutants in run-off, while higher intensity usage types (such as urban areas) generate significantly higher quantities of pollutant in run-off. Therefore, intensification of land use brought about through runway and taxiway development will generally increase a catchment's pollutant generation potential.

Table B4.13
Peak 1% Flows existing and M3R development scenario along Arundel Creek

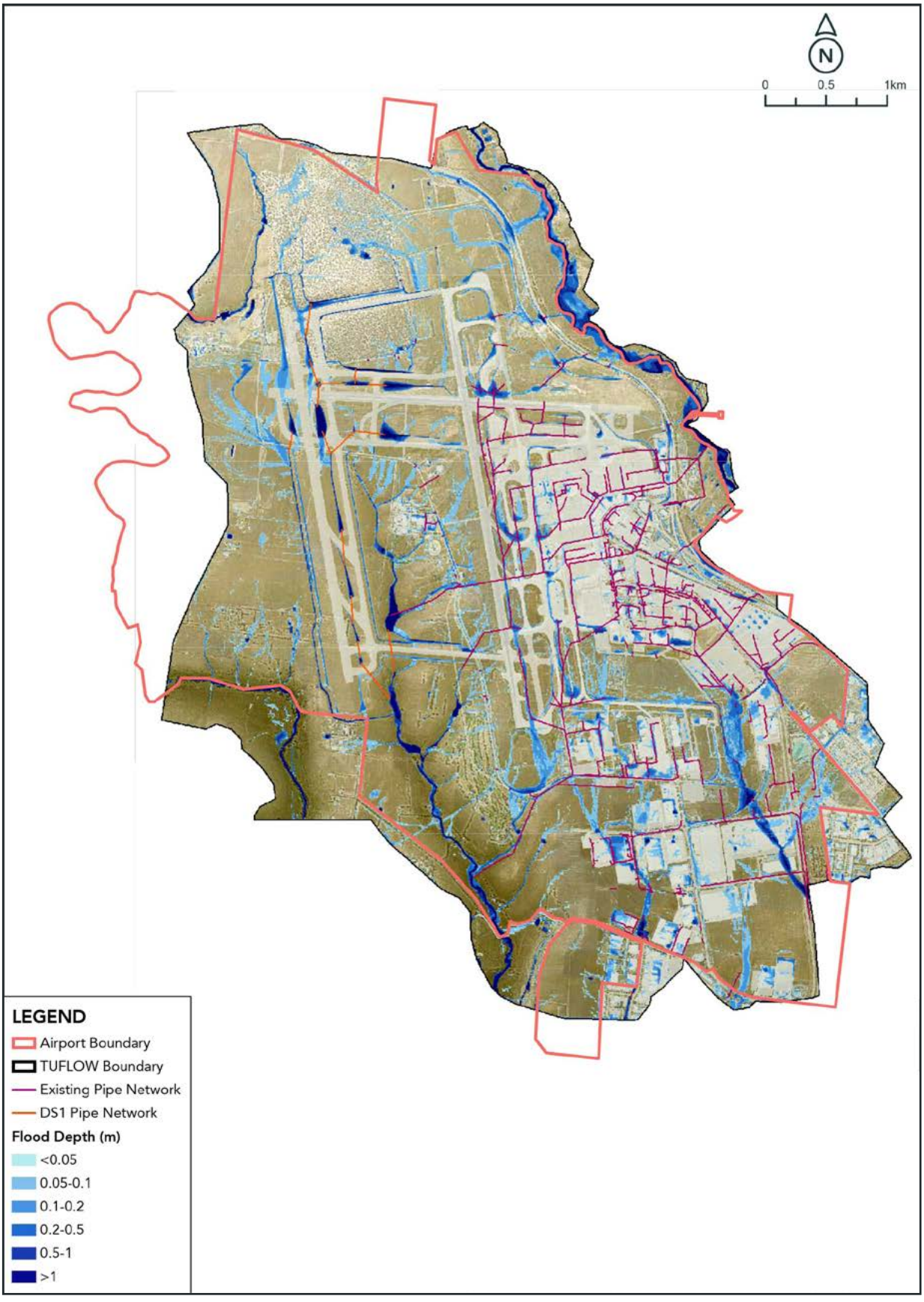
Reporting locations	Critical duration	Median temporal pattern	1% AEP peak flows (m^3/s)
Existing Condition			
Downstream of ACO2	2 Hours	Temporal Pattern 2	36.94
Downstream of ACTO2	2 Hours	Temporal Pattern 2	6.66
Downstream of ACO3	2 Hours	Temporal Pattern 8	66.06
M3R Development Scenario			
Downstream of ACO2	2 Hours	Temporal Pattern 7	13.02
Downstream of ACTO2	1.5 Hours	Temporal Pattern 6	4.81
Downstream of ACO3	2 Hours	Temporal Pattern 7	57.77

Figure B4.10
Development scenario flood level 1% AEP



Source: BECA, 2020

Figure B4.11
Development scenario flood depth 1% AEP



B4.7.3.2
Quantification of changes and outcomes

The M3R stormwater design process included the following tasks. They were undertaken to refine design and assess potential impacts on pollutant loads and concentrations:

- Modelling of the proposed future case model *without* stormwater mitigation applied
- Modelling of the proposed future case model *with* stormwater mitigation applied.

In both models, the catchment extents are adjusted as necessary to reflect the modified landform, drainage and land use resulting from M3R.

Predicted impacts without mitigation

Table B4.14 provides the mean annual load for the M3R development without mitigation.

Table B4.14
Unmitigated developed mean annual pollutant loads

Parameter	Mean Annual Load (kg/y)
Gross pollutants (kg/y)	Not calculated
Total Suspended Solids	176e3
Total Phosphorous	594
Total Nitrogen	4.45e3

Source: BECA 2017

Gross pollutants have not been calculated. Melbourne Airport currently manages gross pollutants and Foreign Object Debris (FOD) as part of typical airfield and broader estate safety management. Management of gross pollutants will be expanded to cover the M3R development.

Without mitigation and management measures and controls, pollutant loads may increase from the existing site condition due to the implementation of M3R. These increases would result from the combination of increased flow (due to increased impervious catchment) and increased pollutant concentrations in run-off from surfaces that have undergone intensification.

The combination of higher pollutant concentrations, particularly in event run-off and increased flow, provides for the increase in predicted mean annual load.

The predicted impacts of the flow and concentration increases in airport run-off include increased flow volume, peak flow and pollutant concentrations in Arundel Creek and the lower Maribyrnong River. Without mitigation, the impacts of the increased flows and pollutant loads would likely result in the deterioration of water quality in these waterways, thereby reducing current ecosystem and waterway social and cultural use values. Other impacts resulting from the increased flow could include geomorphic modifications within the receiving waterways as they adjust to modified hydrology and changes including sedimentation, reduced bank stability, and vegetation growth patterns.

In line with the Melbourne Airport Environment Policy and Melbourne Airport Environment Strategy, mitigation of these potential impacts will be further refined in the design phase of the project, and further refine the proposed Water Sensitive Urban Design (WSUD) treatment train outlined in this document.

Mitigation approach

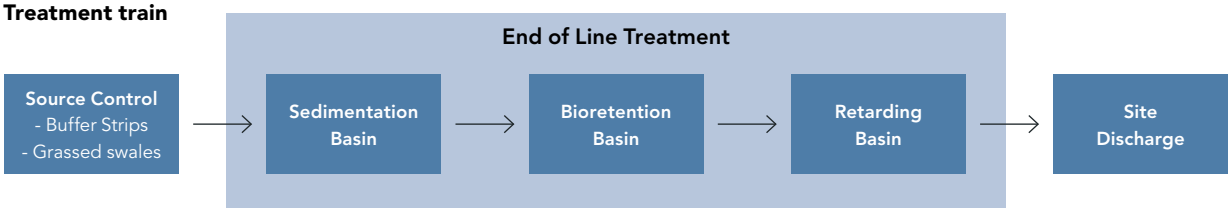
A water quality and quantity control program based on WSUD principles is part of the M3R design process. The program is responsive to M3R design, and aims to mitigate the impacts of the development on the receiving environment.

This treatment train approach of M3R will utilise a series of devices that operate to remove particular pollutants in the stormwater stream. The correct order and size of devices ensures they operate within their hydraulic loading capacities and can remove relevant pollutants.

Stormwater treatment systems proposed to be utilised are illustrated in Figure B4.12 and include:

- Buffer strips adjacent to the runways and taxiways
- Grass swales collecting and conveying stormwater
- Sedimentation basin
- Bio-retention systems
- Retardation basin.

Figure B4.12
Treatment train



Source: BECA 2020

The proposed arrangement of most of these treatment systems is shown in **Figure B4.9** (note that buffer strips are not explicitly represented). In converting the conceptual stormwater design to a design for construction, all modelling assumptions will be confirmed during the detailed design phase.

The treatment train starts at the source: the runways and taxiways. Run-off from these surfaces sheet flows over buffer strips (essentially gently graded grassed area) adjacent to the impervious surfaces. The buffer strips are effective in removing coarse or medium-sized sediments. The configuration of the buffer strips in MUSIC represents the proposed M3R design.

Stormwater, having passed through the buffer strips, then enters into grassed swales, which act as both treatment and conveyance devices. The collection and slow movement of water along the swales promotes coarse- to medium-sized sediment fractions to settle and become entrained in the grass. Because the swales proposed as part of M3R are long (relative to typical urban development swales), the travel times for stormwater will generally be quite long. This provides ample time for treatment to be affected. While attenuation will be present within the swales, they will all be designed with appropriate grade to be free of standing water following rainfall events.

A sedimentation basin has been located downstream of ACO3, providing sedimentation removal potential for the full Melbourne Airport Arundel Creek catchment as part of the stormwater management treatment train. The sedimentation basin is expected to remove particles sized 125 µm or larger. The bioretention system will be located downstream of the sedimentation basin.

In addition to the sedimentation and bioretention basins, an appropriately sized retarding basin will be included to ensure peak flows are retarded back to existing condition peak flows. This will supplement the online attenuation provided by the grass swales and ensure there is no increase to peak flows downstream of the airport estate into Arundel Creek.

Analyte concentration information was unable to be used directly within the MUSIC modelling due to the spatial distribution of the water quality data. In lieu of direct use of the sampling data results, empirical relationships between Total Suspended Solids (TSS) and heavy metals will be relied upon for the qualification of heavy metal reduction. There is significant research and literature available exploring the correlation between TSS and heavy metal concentrations (Nasrabadi et al, 2018) - many studies demonstrate a positive correlation between the two. Studies also demonstrated that excellent removal of dissolved heavy metals can be expected through bioretention infiltration (Davis et al, 2003, Jianlong et al, 2017). Adsorption and filtration are the most dominant metal retention processes present within bioretention systems, with metals becoming largely immobile following bonding to bioretention media, and predominantly concentrated within the top layer of biofiltration media.

Specific pH management has not been included within the assessment. The pH of stormwater flows may be altered during the construction phase as a result of concrete installation and curing, some of this will be related to the proposed stormwater treatment train. Should non-conforming pH levels be observed during construction or operations, appropriate mitigation measures will be implemented.

Hydrocarbons are a common contaminant found within an airfield environment. Refuelling and maintenance activities on aircraft introduce the potential for fuel and oil spills that can become mobilised into the stormwater network. These activities are undertaken on the apron areas where there are a number of mitigation measures including flame traps, sumps and cut off valves should the spill enter the drainage network. These mitigation measures allow for an immediate and effective response to prevent hydrocarbons entering the natural waterways. Melbourne Airport has a mature and effective apron spill response procedure including dedicated airside personnel and equipment to minimise any potential spills to the draining network.

Large spill incidents and responses are managed in accordance with Melbourne Airport's Emergency Management Plan, which will be updated to incorporate changes associated with M3R. Similar to other end-of-line treatment of storm water at Melbourne Airport, during incidents, the outfall will be able to be blocked/shut off to prevent release of contaminants and allow for clean-up on site, prior to allowing further discharge of storm water.

M3R conceptual design has ample additional space to increase the level of treatment beyond that currently achieved. This allowance provides assurance that, in the event that the revised modelling to be completed during detailed design indicates additional treatment is required, this can be accommodated within the extents of M3R. Specifically, modifications could be made to the swale to incorporate additional infiltration zones or bioretention systems to increase treatment performance. During design refinement, additional modelling will be able to account for new relevant information such as revised MUSIC modelling parameters, revised objectives values (e.g. load reductions or discharge concentration limits) and monitoring data as relevant to the assessments.

Once construction has commenced, there are additional controls which will be applied to ensure stormwater mitigation measures have been established correctly and are operating at design levels. During the maintenance period (extended for at least two years for vegetated stormwater controls) the following elements will be verified by the contractor:

- No water ponding in swales (for more than a couple of hours after rainfall flows have passed)
- Underflow drainage is working adequately
- Vegetation has established appropriately
- Water quality testing is in place at defined locations to verify the quality of inflows and discharges during rain events.

During the operational phase, continued monitoring and maintenance will be required by Melbourne Airport to ensure stormwater systems remain operational. Key elements for monitoring will include adequacy of vegetation coverage, adequacy of drainage and longer-term mechanisms for renewal of media in bioretention systems.

Predicted impacts

Discharge into Arundel Creek consists of flow from runways, taxiways, aprons, other paved areas, buildings and grassed areas. The proposed drainage system directs all runoff from within the M3R development into Arundel Creek and through the stormwater treatment train described previously.

Table B4.15 provides the mean annual loads from the developed site incorporating WSUD mitigation measures.

Table B4.15
M3R expected mean annual pollutant loads, mitigated and unmitigated

Parameter	Mean Annual Load (kg/y)	
	Unmitigated	Mitigated
Gross pollutants (kg/y)	Not calculated	Not calculated
Total Suspended Solids	176E3	95.0e3
Total Phosphorous	594	421
Total Nitrogen	4.45E3	3.01e3

Source: BECA, 2020

Gross pollutants have not been calculated. Melbourne Airport currently manages gross pollutants and FOD as part of typical airfield safety management. Management of gross pollutants will be expanded to cover the M3R development.

In reference to Table B4.15, Victoria Planning Provisions set an aspirational target for compliance for the developed mitigated site in pollutant load reductions. These provisions require development to achieve 80 per cent retention of TSS, 45 per cent retention of total phosphorous, 45 per cent retention of total nitrogen and 70 per cent retention of gross pollutants. The proposed stormwater design achieves these minimum targets for all pollutants (Table B4.16).

Table B4.16
M3R pollutant reduction performance

Parameter	% Reduction Level Targets	% Reduction Level
Total Suspended Solids	80	85.3
Total Phosphorous	45	61.2
Total Nitrogen	45	45.1

Source: BECA, 2020

B4.8
AVOIDANCE, MANAGEMENT AND MITIGATION MEASURES

The construction and operation of M3R will, without mitigation and management measures, impact surface water, water quality and quantity, and erosion potential.

The assessment primarily compares two main scenarios: the current scenario (effectively a No Build scenario or the baseline condition for the proposed M3R) and the opening day scenario post-construction of M3R when operation begins. The highest likelihood of impacts occurs from the commencement of construction to the point of operation. Beyond this point, there may be some minor increasing effects related to water quality (increases to pollutant loads) resulting from increased aircraft movements associated with increased usage of the airport.

B4.8.1
Erosion potential

Management and mitigation measures to effectively limit the risk of erosion during M3R will include industry standard requirements in addition to specific controls implemented based on site conditions. The specific details regarding implementation and monitoring of mitigation measures will be included in a Construction Environmental Management Plan (CEMP) developed for M3R following final design approval. This will be developed by an International Erosion Control Association Australasia specialist.

B4.8.1.1
Mitigation measures in design and construction

M3R details several design considerations (some or all of which will be implemented as mitigation measures following more detailed design stages) for management of potential erosion risk.

A Sediment and Erosion Control Plan will also be developed as part of the CEMP detailing mitigation measures specific to each significant aspect of the construction phase. While the detailed design and CEMP will detail specific mitigation measures, the following measures will be considered to minimise sedimentation impact to waterways:

- Minimisation of site disturbance and barrier fencing
- Gravelling of non-vegetated areas
- Grass buffer zones installed adjacent to waterways and swale drains
- Erosion control blankets to be installed in erosion-prone locations before vegetation is established
- Check dams and sediment traps can be installed in swales
- Rock filter dam installed in areas of high erosion potential and fast flowing water to reduce the water velocity and trap suspended sediment within the dam
- Sediment weir installed in areas of high erosion potential and fast flowing water to reduce the water velocity and trap suspended sediment within the dam
- Dust control to minimise wind erosion in locations prone to dust generation
- Filter socks to be placed around or adjacent to minor storm water inlets
- Vibration grids located in series at the exits of the site
- Large sediment basin.

Erosion can also be minimised by seasonal scheduling of construction works (where possible), revegetation, and rock or gravel placement over exposed soil roads or channels.

Effective implementation of the mitigation measures incorporated into design and construction will result in a low erosion risk following development. To ensure this risk remains low for future operation, physical features will be maintained and erosion potential will be considered for any future development.

B4.8.2
Surface water

B4.8.2.1
Mitigation in design

M3R design includes several mitigation measures inherent in the design (swales, bioretention zones and retention basins). These measures are shown to be effective in the reduction of M3R development impacts to existing flows. The approaches adopted are considered industry best practice and based on the available information. No further measures are required.

B4.8.2.2
Mitigation in construction

During the construction of M3R, there is a risk that a significant rainfall event could result in an increase to the existing condition discharges if the designed drainage infrastructure has not been completed.

This risk could occur if the construction of the new runway did not occur in parallel with the construction of the required drainage infrastructure (swales and retention basins). This risk is considered low due to the requirements to implement elements of this drainage infrastructure to manage the water quality during the construction process (CEMP). The CEMP will also include controls and management of dewatering where required to remove standing or stored water from the construction site following a rainfall event.

B4.8.3
Water quality

B4.8.3.1
Mitigation in design

M3R design has explicitly considered management of water, given its critical nature for safe airport operations. The design therefore includes best practice stormwater initiatives for the operational phase of M3R.

The conceptual stormwater treatment systems proposed to be utilised include:

- Buffer strips adjacent to the runways and taxiways
- Grass swales collecting and conveying stormwater
- Infiltration/bio-retention systems integrated into the grass swales.

In converting the conceptual stormwater design to a design for construction modelling, assumptions and approaches will be confirmed. This is also a best practice approach and provides the highest level of design certainty to Melbourne Airport and regulators.

All modelling limitations will be addressed during detailed design to refine and optimise the sizing and configuration of selected stormwater treatment measures. If required, device sizes will be increased to achieve the design requirements applied to M3R - there remains ample opportunity to do this within the current design configuration. The detailed design will be completed to applicable regulatory requirements.

B4.8.3.2
Establishment phase

Once construction has commenced, additional controls will be applied to ensure the stormwater mitigation measures have been established correctly and are operating at design levels. During the on-maintenance period (which could extend for at least two years for vegetated stormwater controls) the following elements will be verified by the contractor as part of the normal construction verification process:

- No water ponding in swales (for more than a couple hours after rainfall flows have passed)
- Underflow drainage is working adequately
- Vegetation has established appropriately.

B4.8.3.3
Operation

During the operational phase, continued monitoring and maintenance will be required to ensure that stormwater systems remain operational. Key elements for monitoring will include adequacy of vegetation coverage, adequacy of drainage and longer-term mechanisms for renewal of media in bioretention systems.

B4.8.3.4
PFAS

As discussed in **Chapter B3: Soils, Groundwater and Waste**, PFAS management is a minimum requirement for any construction work conducted at Melbourne Airport where disturbance of soil, groundwater or surface water is anticipated. The Melbourne Airport PFAS Management Framework (APAM, 2020) was developed to deliver consistent environmental management practices for potential environmental risks posed by PFAS impacted material on construction and maintenance projects at Melbourne Airport. The framework outlines the minimum environmental management requirements to be included in any project-specific CEMP. The current understanding of PFAS impacts and potential risks during construction is well understood, and APAM has a number of existing and effective management controls in place, both as part of wider estate management and as part of project-specific works. These include controls currently being implemented under other current construction projects with MDP approvals.

As PFAS impacts are widespread across the project area, a project-specific PFAS Management Strategy is proposed to be developed to provide a framework for how PFAS is to be managed to maximise re-use potential and protect human health and the environment.

The PFAS Management Strategy will be supported by a project-specific risk assessment to confirm that risks during works and longer-term risks are considered low and acceptable. Confirmation of management and remediation options (including further site investigations and detailed feasibility) will be required to be completed as part of detailed design works. These further investigations are primarily to confirm specific management measures and appropriate placement locations that can be integrated into the design and construction phases. An integrated approach during detailed engineered design will be required to confirm any proposed controls appropriately mitigate risks. CEMPs will be required to be aligned with the framework to be outlined in the PFAS Management Strategy.

The PFAS Management Strategy will inform the requirements for surface water controls that will need to be considered as part of the detailed design process, and potential treatment measures in addition to the treatment train that is proposed for other water quality parameters in the Arundel Creek catchment.

B4.9
CONCLUSION

Summary assessments of the impact of M3R on erosion, surface water and water quality (in accordance with the significance assessment frameworks in **Section B4.5**) are provided in **Table B4.17**, **Table B4.18** and **Table B4.19**.

B4.9.1
Erosion potential

The baseline site and soil conditions within M3R study area indicate a relatively low potential for erosion. Significant rainfall and wind conditions are offset by cohesive soils and established vegetation with generally flat or undulating topography throughout most of M3R study area. Localised areas of minor instability and potential erosion risk were identified within Arundel Creek.

The potential for increased erosion risk will be primarily associated with construction activities (including soil and vegetation stripping, bulk earthworks and development of temporary staging platforms). Effective mitigation measures to be implemented throughout the construction phase are considered capable of reducing erosion risk to acceptable levels. Specific strategies to control localised risks will be developed within the CEMP, which will reduce erosion potential in the central area of M3R to a negligible residual impact risk.

During the post-construction and operation phases of M3R, ongoing erosion risks are expected to be low, based on implementation of suitable management and maintenance (including inspections of drains, and maintaining vegetation and media along drains).

B4.9.2
Surface water

The proposed M3R project includes provision for the attenuation of flows from the airport due to the increased impermeable area. The modelling undertaken to date demonstrates that the Build peak flow discharges to the Moonee Ponds Creek, Arundel Creek and Maribyrnong River are all lower than the No Build levels. Furthermore, the modelling of Arundel Creek

demonstrates that the infilling of the creek valley and addition of culverts to replace the conveyance of the creek at the alignment of the runway only results in minor flood level increases on the upstream side of the culvert, within the boundary of the airport land.

The modelling has demonstrated that there is no flood level increase in the one per cent AEP flood event downstream of the proposed culvert underneath the proposed runway (16R/34L) located on Arundel Creek. The impact risk for surface water is considered low.

The proposed design will be checked against additional modelling requirements as part of later design phases.

B4.9.3 Water quality

Melbourne Airport is located on Commonwealth land but ultimately discharges stormwater to waterways outside the airport which fall under Victorian Government jurisdiction. It is important to consider these waterways as part of a holistic approach to environmental management. The environmental operations of the airport are regulated under the *Airports Act* and the *Airport Regulations*. Desired environmental conditions of receiving waterways are stipulated under Victorian legislation including the Environmental Reference Standard (Vic).

Water quality discharging from the airport does not currently meet all *Airport Regulations* and Environmental Reference Standard (Vic) quality objectives. This is not an uncommon issue: many quality objectives are also not met in the broader catchment areas. However, M3R presents an opportunity to improve surface water discharge quality, particularly from Arundel Creek which is the main discharge point for the airport.

In addition to improvements to the drainage network and the proposed end-of-line treatment train for Arundel Creek, additional measures will be developed as part of the proposed PFAS Management Strategy. The PFAS Management Strategy will incorporate a whole-of-project approach to PFAS management: from source management to mitigation of surface water impacts discharging off-site.

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Table B4.17
Impact assessment summary – erosion

Environment aspect & baseline condition	Assessment of original impact					
	Original Impact	Mitigation inherent in design/practice	Significance			
			Duration	Severity	Likelihood	Impact
Construction						
Erosion potential in the M3R study area Low potential for erosion due to soil conditions generally comprising fine-grained basaltic clay with overlying topsoil and established vegetation.	Increase in erosion potential during placement of large earthworks platform and haul roads.	Proposed lime stabilisation of exposed clay surface during construction. Appropriate material handling and transport procedures. Other potential stabilisation tools to consider include soil binders/hydromulch and mulch.	Short Term	Moderate	Likely	Medium
	Degradation of existing surface leading to sediment release from topsoil/ vegetation stripping and bulk excavation for fil reuse.	Appropriate drainage controls to manage overland surface water flow across excavated areas. Renovation (ripping and/or topsoil reinstatement) of exposed surface prior to revegetation.	Short Term	Minor	Possible	Low
	Erosion and release of soils from stockpiles and temporary work areas.	Controlled placement, compaction and shaping of stockpiled material to protect from surface water loading/run-off. Topsoil coverage and vegetation of long-term stockpiles. Dust suppression methods.	Temporary	Minor	Possible	Low
Erosion potential along creek embankments Some areas of existing instability observed and potential for additional erosion occurrence due to steep slopes and presence of alluvial and colluvial sediments.	Erosion events and release of sediment during modification of embankments and development of work platforms/structure.	Excavation and/or stabilisation of areas of instability within M3R. Temporary controls including bunds, silt fences and toe of slopes.	Temporary	Moderate	Possible	Medium
Operation						
Erosion potential in the M3R study area Low potential for erosion due to soil conditions generally comprising fine-grained basaltic clay with overlying topsoil and established vegetation.	Increase in erosion potential via surface loading from reduction of pervious surface.	Suitable revegetation of non-paved areas. Design of appropriate run-off management including culverts, buffer strips and grass swales.	Long Term	Minor	Possible	Low
Erosion potential along creek embankments Some areas of existing instability observed and potential for additional erosion occurrence due to steep slopes and presence of alluvial and colluvial sediments.	Increase in erosion potential of existing embankments from surface loading and increased frequent flows.	Stabilisation methods including revegetation, reinforced soil structure, geofabrics and riprap and modification of embankment slopes.	Long Term	Minor	Possible	Low

Mitigation and/or management measures	Assessment of residual impact					
	Residual Impact	Significance				
		Duration	Severity	Likelihood	Impact	
Construction (cont.)						
Further analysis of staging plans to limit exposed area, and streamline material handling. Development of specific sediment and erosion control plan within the EMP.	Some sediment run-off during material handling and placement.	Short Term	Negligible	Likely	Negligible	
No management measures in addition to those inherent to design/practice area required.						
No additional mitigation or management measures in addition to those inherent to design/practice area required.						
Appropriate staging to undertake works with increased risk during lower rainfall/surface water flow periods. Effective engineering controls (e.g. suitable batter slopes, shoring, retention walls, stormwater drainage) confirmed in final design.	Minor sediment release during modification of embankments and development of work platforms/ structures during construction.	Temporary	Minor	Possible	Low	
Operation (cont.)						
No additional mitigation or management measures in addition to those inherent to design/practice area required.						
No additional mitigation or management measures in addition to those inherent to design/practice are required.						

Table B4.18
Impact assessment summary – surface water

Environment aspect & baseline condition	Assessment of original impact					
	Original Impact	Mitigation inherent in design/practice	Significance			
			Duration	Severity	Likelihood	Impact
Flood conditions in the Arundel Creek Current peak discharges have been determined for the Arundel Creek Modelling has demonstrated the current flooding conditions.	Increased flow rates from site due to increased impervious surfaces resulting in increased flood levels.	Use of swales to attenuate the discharge back to existing conditions.	Temporary	Negligible	Almost certain	Low
	Increased flood velocities due to concentrated discharge from outlets and culverts.	Use of energy dissipaters at outlet structure to reduce outlet velocity.	Temporary	Negligible	Almost certain	Low
	Increased flood levels upstream of the airport.	Use of retention basins and storage to maintain discharges to existing conditions.	Temporary	Negligible	Almost certain	Low
	Increased flow rates from increased impervious surfaces decreasing the performance of existing drainage.	Upgraded drainage elements and additional drainage elements.	Temporary	Negligible	Almost certain	Low

Table B4.19
Impact assessment summary – water quality

Environment aspect & baseline condition	Assessment of original impact					
	Original Impact	Mitigation inherent in design/practice	Significance			
			Duration	Severity	Likelihood	Impact
Construction						
Water quality in all waterways within or downstream of the airport.	Existing waterways both within project area and the receiving waters show some exceedances of water quality objectives, including physico-chemical, nutrients, and toxicants.	Construction Environmental Management Plans will identify risks associated with planned construction activities and higher level risks will be mitigated through explicit controls on machinery, products or construction practices. The CEMP will also detail monitoring requirements and define an inspection/ audit program.	Short Term	Moderate	Possible	Medium
Operation						
Post construction water quality conditions – non-PFAS.	Existing waterways both within project area and the receiving waters show some exceedances of water quality objectives including physico-chemical, nutrients, and toxicants.	Surface runoff from M3R will increase flow in Arundel Creek. Current stormwater guidance associated with new construction projects will provide improvements to current stormwater network, particularly in Arundel Creek. This includes use of swales, bio-retention swales, buffer strips or similar to mitigate increases in pollutant loads	Long Term	Minor	Likely	Medium

Mitigation and/or management measures	Assessment of residual impact					
	Residual Impact	Significance				
		Duration	Severity	Likelihood	Impact	
No additional mitigation or management measures in addition to those inherent to design/practice are required.						
No additional mitigation or management measures in addition to those inherent to design/practice are required.						
No additional mitigation or management measures in addition to those inherent to design/practice are required.						
No additional mitigation or management measures in addition to those inherent to design/practice are required.						

Mitigation and/or management measures	Assessment of residual impact					
	Residual Impact	Significance				
		Duration	Severity	Likelihood	Impact	
Construction (cont.)						
No additional mitigation or management measures in addition to those inherent to design/practice are required. Airport wide monitoring programs commissioned directly by APAM will provide an additional level of monitoring throughout the project duration.		Short Term	Moderate	Possible	Medium	
Operation (cont.)						
Refinement of the model during detailed design phase to address existing modelling assumptions to ensure an optimised outcome that is fit for purpose.	Sufficient space exists to include additional stormwater treatment to ameliorate impacts under normal operations. A residual risk will remain from extenuating circumstances (major disaster/emergency, force majeure etc) that are not part of general operational activities.	Long Term	Beneficial	Likely	Beneficial	

Chapter B5
Ecology

Summary of key findings:

- The project will have impacts on 78.74 hectares of Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia, 90.49 hectares of Natural Temperate Grassland of the Victorian Volcanic Plain, 9.75 hectares of Golden Sun Moth habitat, 64.34 hectares of Growling Grass Frog habitat and 68.02 hectares of Swift Parrot habitat
- Mitigation measures will be implemented through the Construction Environmental Management Plan to reduce impacts where possible
- An offset management strategy has been prepared. This identifies offsets to compensate for the residual significant impact on threatened species and ecological communities, in accordance with the EPBC Act Environmental Offsets Policy (DSEWPaC 2012b).

CHAPTER B5 CONTENTS

CHAPTER B5 CONTENTS (cont.)

CHAPTER B5 FIGURES

CHAPTER B5 FIGURES (CONT.)

CHAPTER B5 TABLES

CHAPTER B5 TABLES (cont.)

CHAPTER B5 PLATES

B5.1 INTRODUCTION

B5.1.1
Context

This chapter reports on the ecological values present within Melbourne Airport's Third Runway (M3R) project area. It outlines the ecological survey methods; details the findings of the surveys; and provides a significance assessment of the project's likely impacts on threatened species, ecological communities, listed migratory species and relevant ecological features on Commonwealth land.

Implications for the project were assessed in relation to key Commonwealth biodiversity legislation and policy. The ecological assessments described in this chapter were undertaken for Australia Pacific Airports (Melbourne) Pty Ltd (APAM) by Biosis Pty Ltd.

This chapter has been updated following regulator review of the exposure draft and preliminary draft versions of the Major Development Plan (MDP) Ecology Chapter and addresses comments received on those documents. Results have been updated to reflect the reduced impact area for the project (received on 2 June 2021).

- The ecological assessments described in this chapter were completed to fulfill the requirements of the *Airports Act 1996* (Airports Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). These are the key pieces of Commonwealth environmental legislation under which Melbourne Airport operates. Although the Airports Act does not define what a significant environmental or ecological impact is, the EPBC Act gives guidelines for assessing impacts to Matters of National Environmental Significance (MNES) and the environment on Commonwealth land.

All ecological assessments for the project were undertaken in accordance with Commonwealth survey guidelines; and with reference to the listing advice for threatened species, ecological communities and migratory species.

B5.1.2
Project area description

The M3R project area is approximately 834 hectares in size. It includes Commonwealth and freehold land owned and/or controlled by Melbourne Airport in Tullamarine, Victoria, that is approximately 19 kilometres north-west of Melbourne's Central Business District (**Figure B5.1**).

The project area is located within the:

- Victorian Volcanic Plain and Central Victorian Uplands bioregions
- Catchment area of:
  - Maribyrnong River
  - Arundel Creek
  - Moonee Ponds Creek
  - Steele Creek and Steele Creek North
- Management area of Melbourne Water (waterways)
- City of Hume municipality (freehold land portions).

The project area supports a range of land uses including:

- Airside: active operational airfield containing runways, taxiways and other infrastructure associated with operation of the airfield. This area is predominantly a highly modified and managed environment
- Landside: various uses including carparks, business park, terminals, undeveloped areas, roads, concrete-recycling plants, grazing land, dams, waterways, drainage lines, stockpile sites and a golf course. This land ranges from highly modified to relatively intact (e.g. some waterways and woodland habitats are intact).

B5.1.2.1
Impact area description

The impact area (Figure B5.1) is approximately 772 hectares in size. It includes land within the project area not subject to existing approvals for the Taxiway Zulu and Northern Access Road development.

B5.1.2.2
Local area description

For the purposes of this chapter, the local area is the area within a 10-kilometre radius of the centre of the project area.

B5.2
METHODOLOGY AND ASSUMPTIONS

This section provides a summary of the methods used for the ecological assessments. Detailed survey methods for targeted surveys and native vegetation assessments can be found in Appendix B5.A.

Desktop assessments were initially undertaken to inform the level of field investigation required to assess the project with regard to key Commonwealth biodiversity legislation and policy.

B5.2.1
Desktop assessment

B5.2.1.1
Climate, soil, geomorphology and land use history (physical conditions)

Climate, soils, geomorphology and the history of land use within the project area have influenced the type, extent and condition of native vegetation and habitat that is present.

A review of these influences formed part of the assessment of Ecological Vegetation Classes (EVCs), threatened species habitat, listed Threatened Ecological Communities (TECs) and listed migratory species habitat – either within the project area or with the potential to occur in it.

The following resources formed the basis of the physical conditions review (Figure B5.2 to Figure B5.8):

- Historic subdivision plans of the Parish of Tullamarine drafted by government surveyors (Kemp, 1840; Doll c.,1849; Hoddle, 1850)
- Historic maps of Sunbury prepared by the Commonwealth Government's Department of Defence (DoD, 1915; DoD, 1938)
- Historic photo map of Sunbury, produced by the Victorian Government's Department of Crown Lands and Survey (DCLS, 1946)
- An inventory of sites of botanical significance in the western region of Melbourne (McDougall, 1987)
- EVC modelling as displayed on NatureKit, a biodiversity decision-making support tool maintained by the Victorian Government Department of Environment, Land, Water and Planning (DELWP, 2020)
- Geological data including the 1:63.360 Geological Survey of Victoria (Mines Department, 1973), 1:250,000 Geological Survey of Victoria (Mines Department, 1970; DNRE, 1997) and geological mapping inferred from geological testing performed as part of the M3R project (Senversa, 2020, unpublished)
- Climate data from the Commonwealth Government's Bureau of Meteorology (BoM) which maintains an active weather station at Melbourne Airport.

Figure B5.1
Location of the project and impact areas for Melbourne Airport's Third Runway

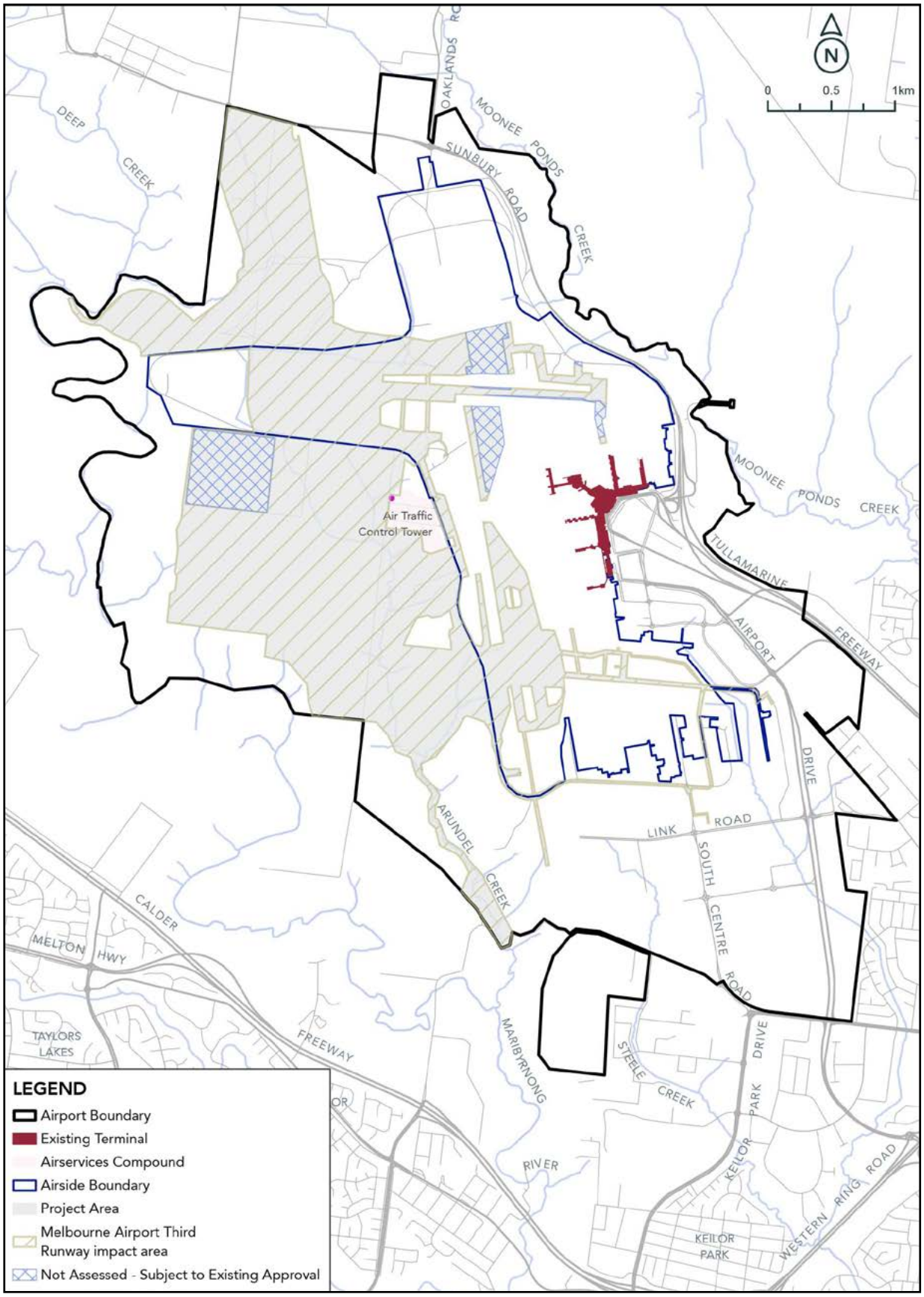


Figure B5.2
1840 historic plan of the Parish of Tullamarine (Kemp, 1840) overlaid with contemporary mapping (Biosis, 2019-2020)

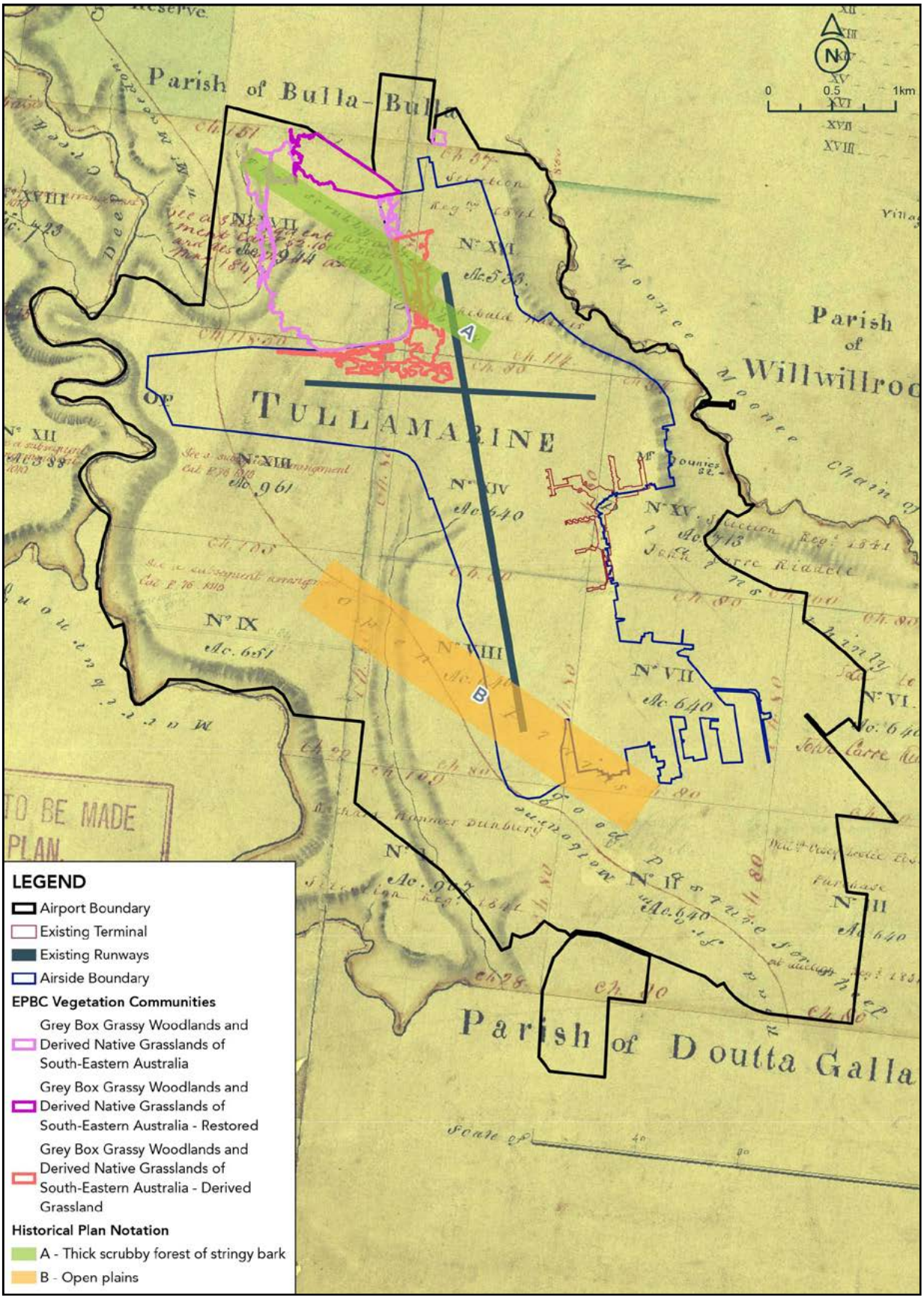


Figure B5.3
c.1849 historic subdivision plan of the Parish of Tullamarine (DoL, c.1849) overlaid with contemporary mapping (Biosis, 2019-2020)

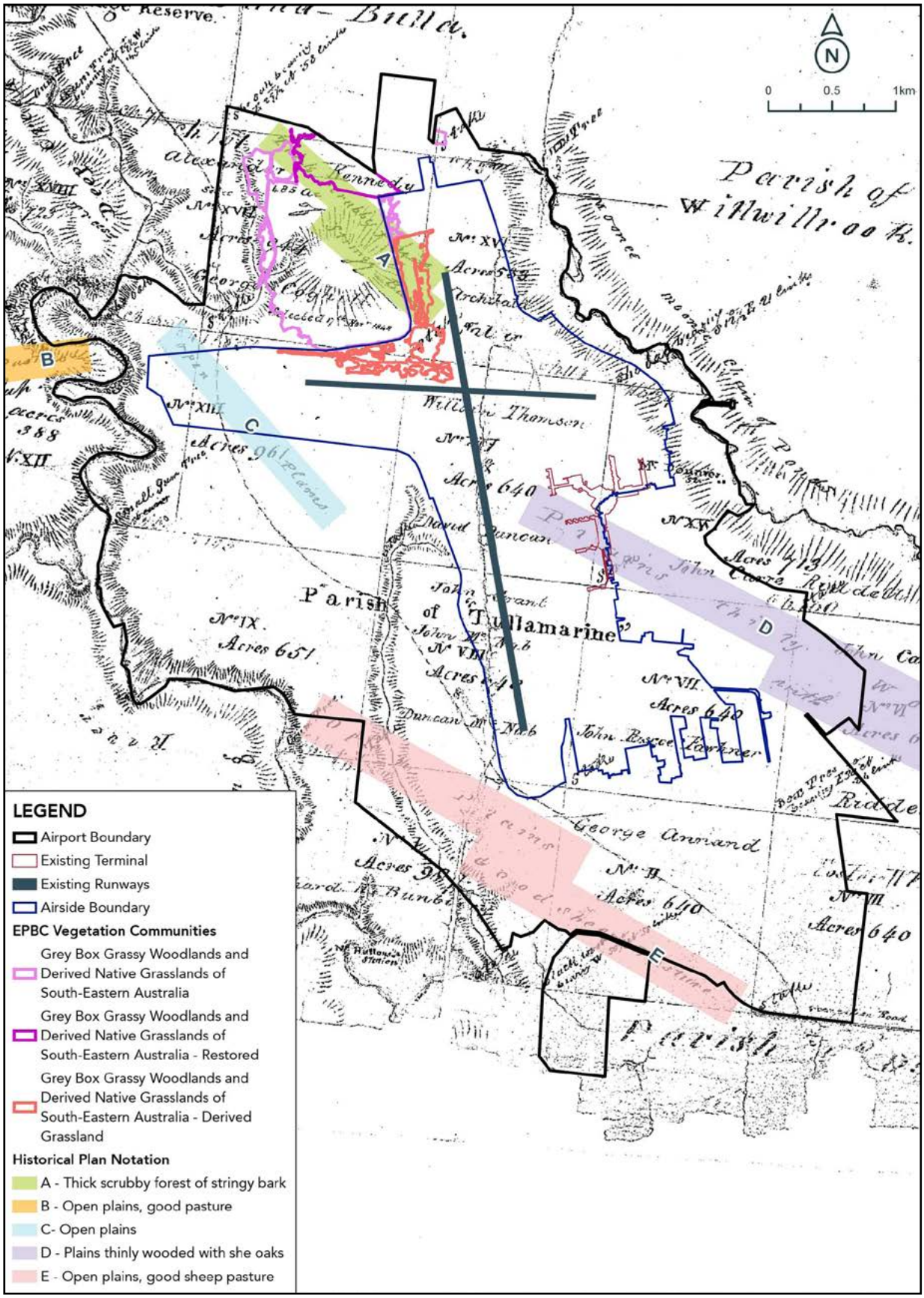


Figure B5.4
1850 historic subdivision plan for the Parish of Tullamarine (Hoddle, 1850) overlaid with contemporary mapping (Biosis, 2019-2020)

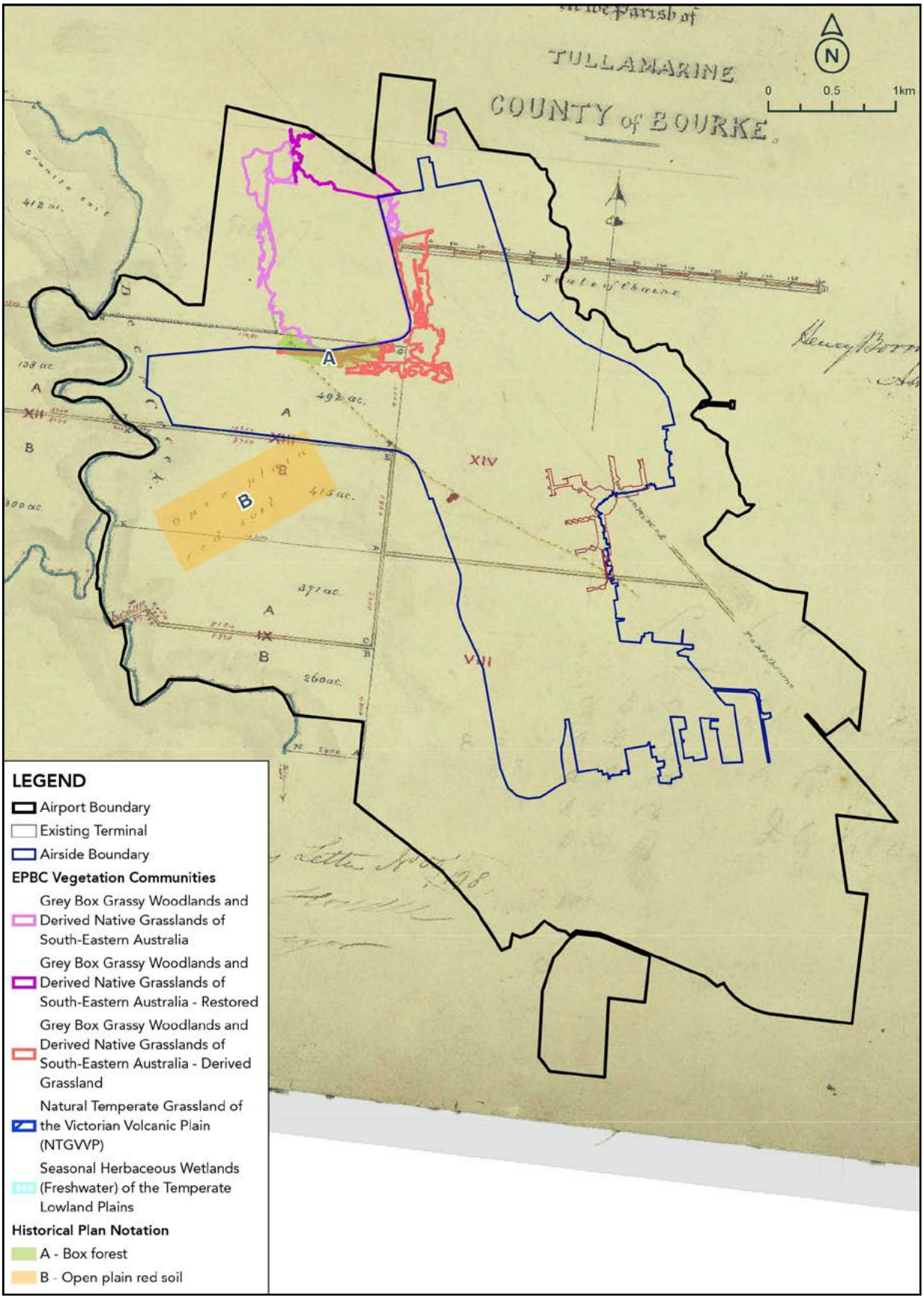


Figure B5.5
1915 historic map of Sunbury (DoD, 1915) overlaid with contemporary mapping (Biosis, 2019-2020)

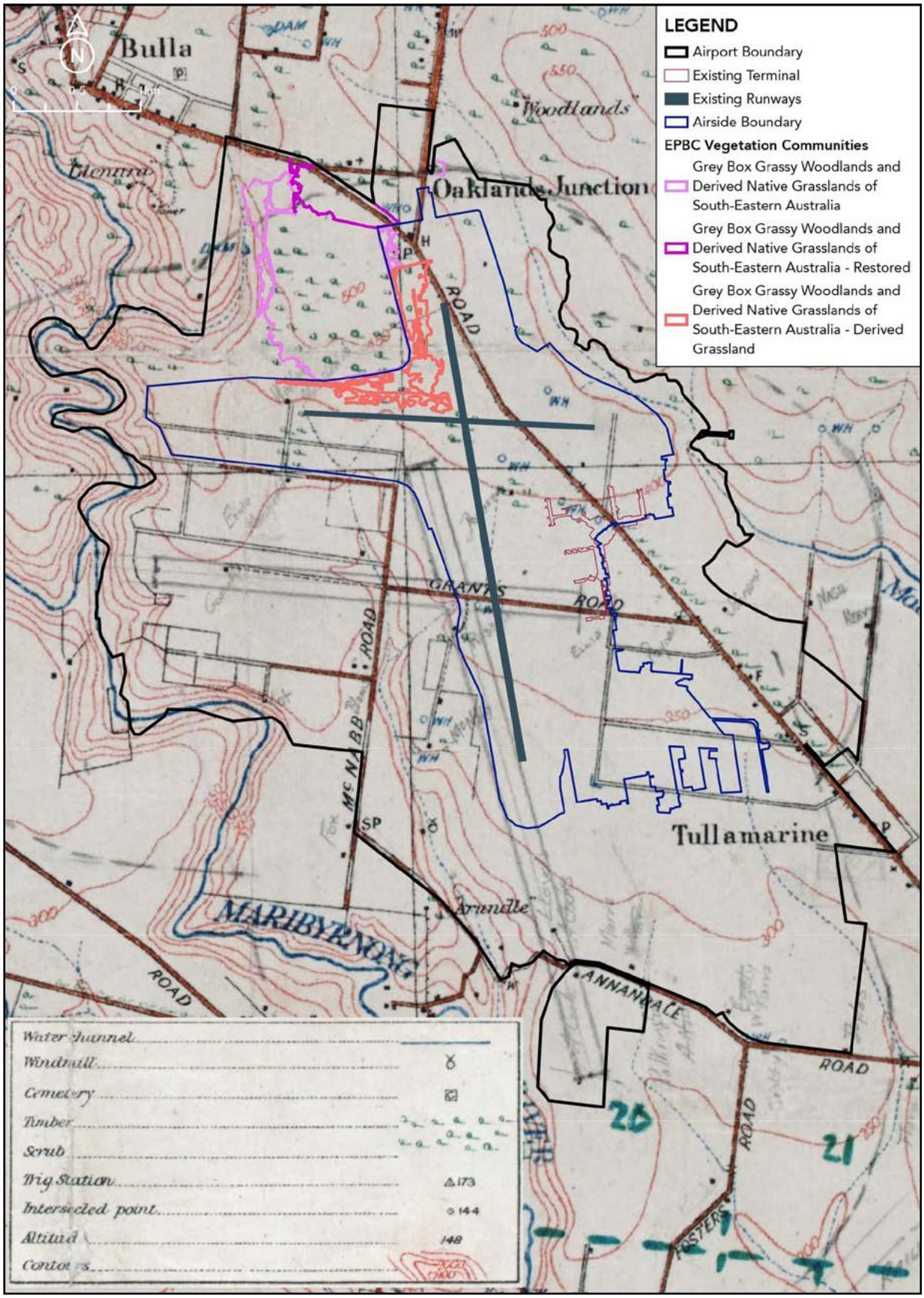


Figure B5.6
1938 historic map of Sunbury (DoD, 1938) overlaid with contemporary mapping (Biosis, 2019-2020)

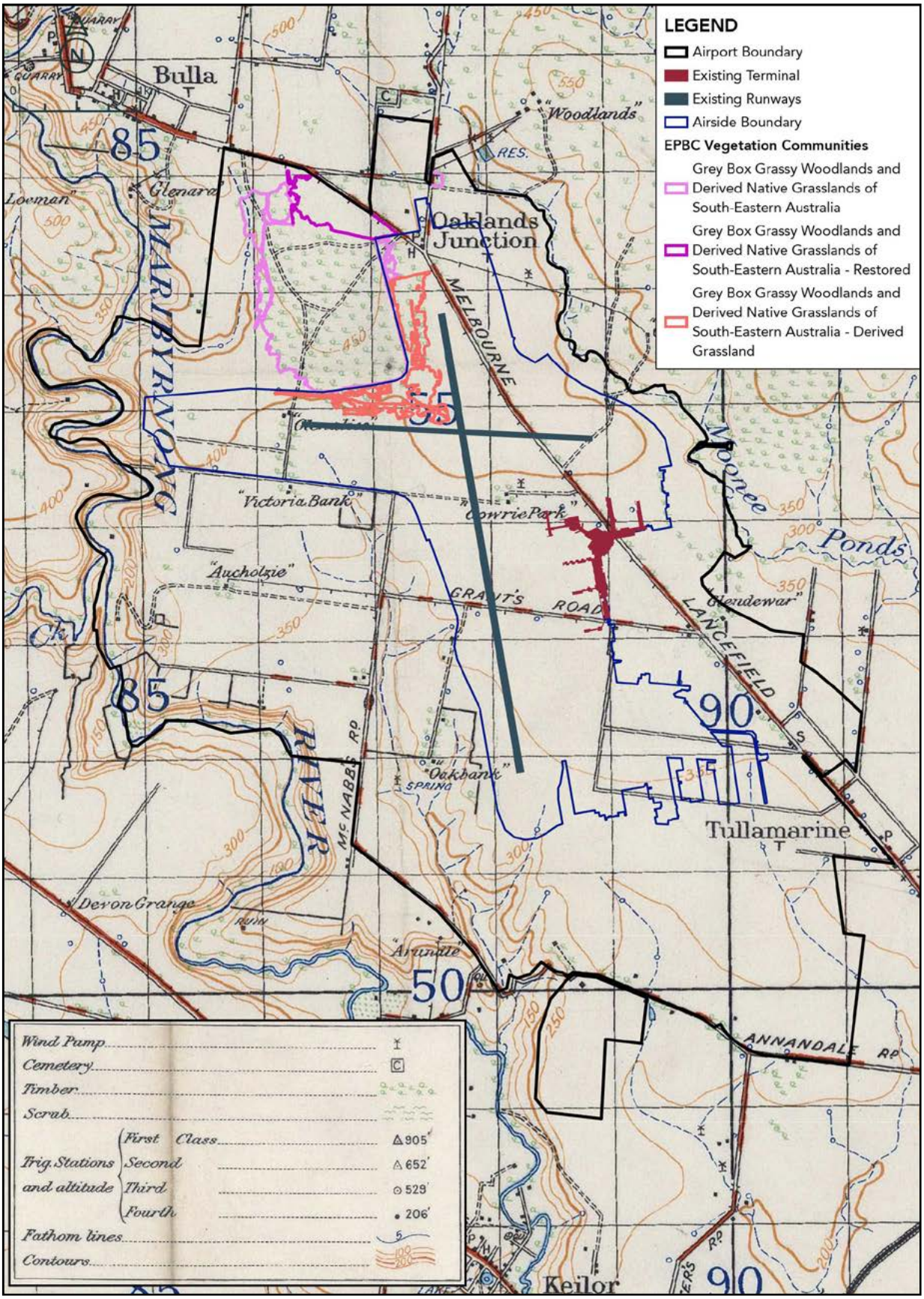


Figure B5.7
1946 historic photo map of Sunbury (DCLS, 1946) overlaid with contemporary mapping (Biosis, 2019-2020)

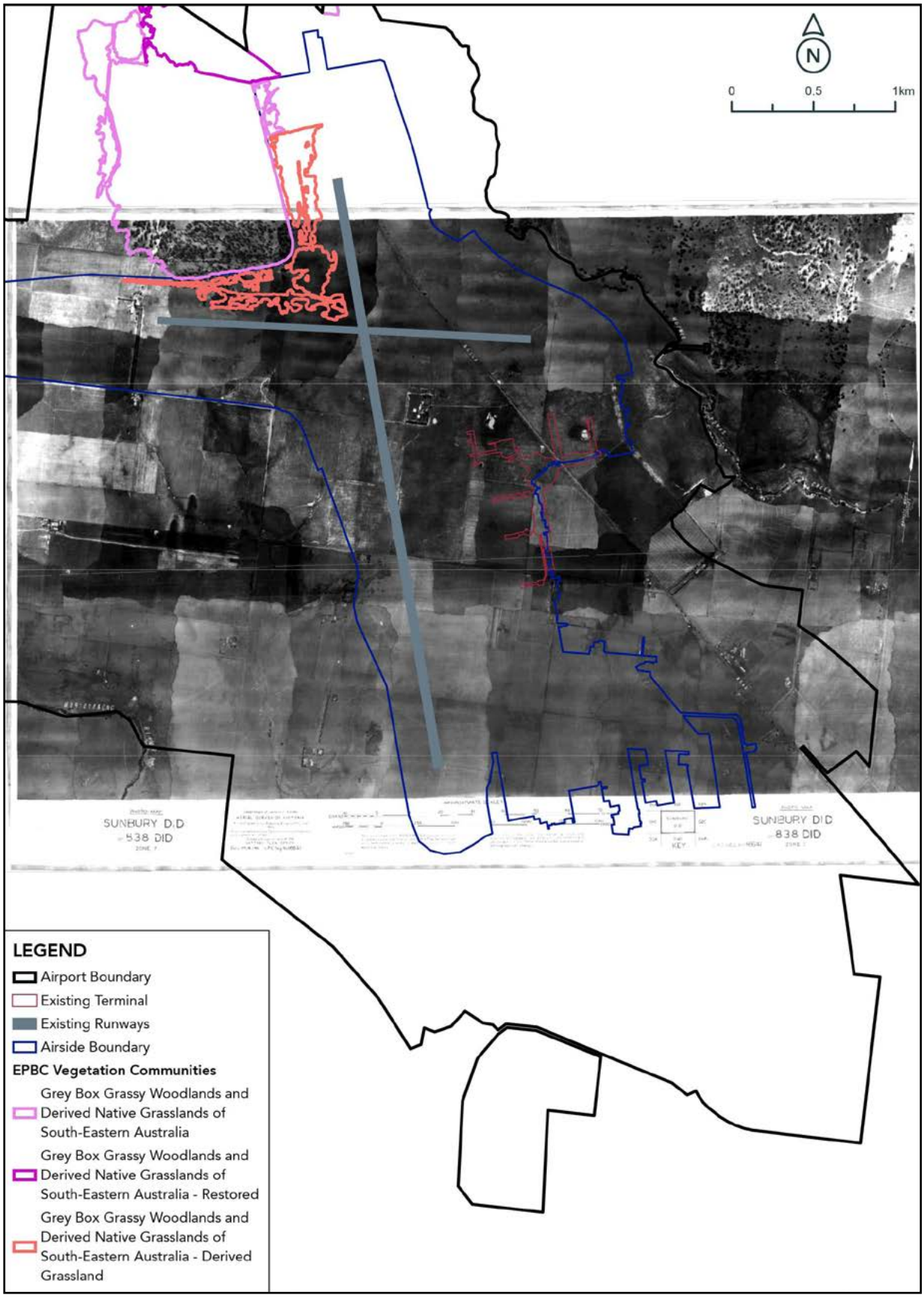
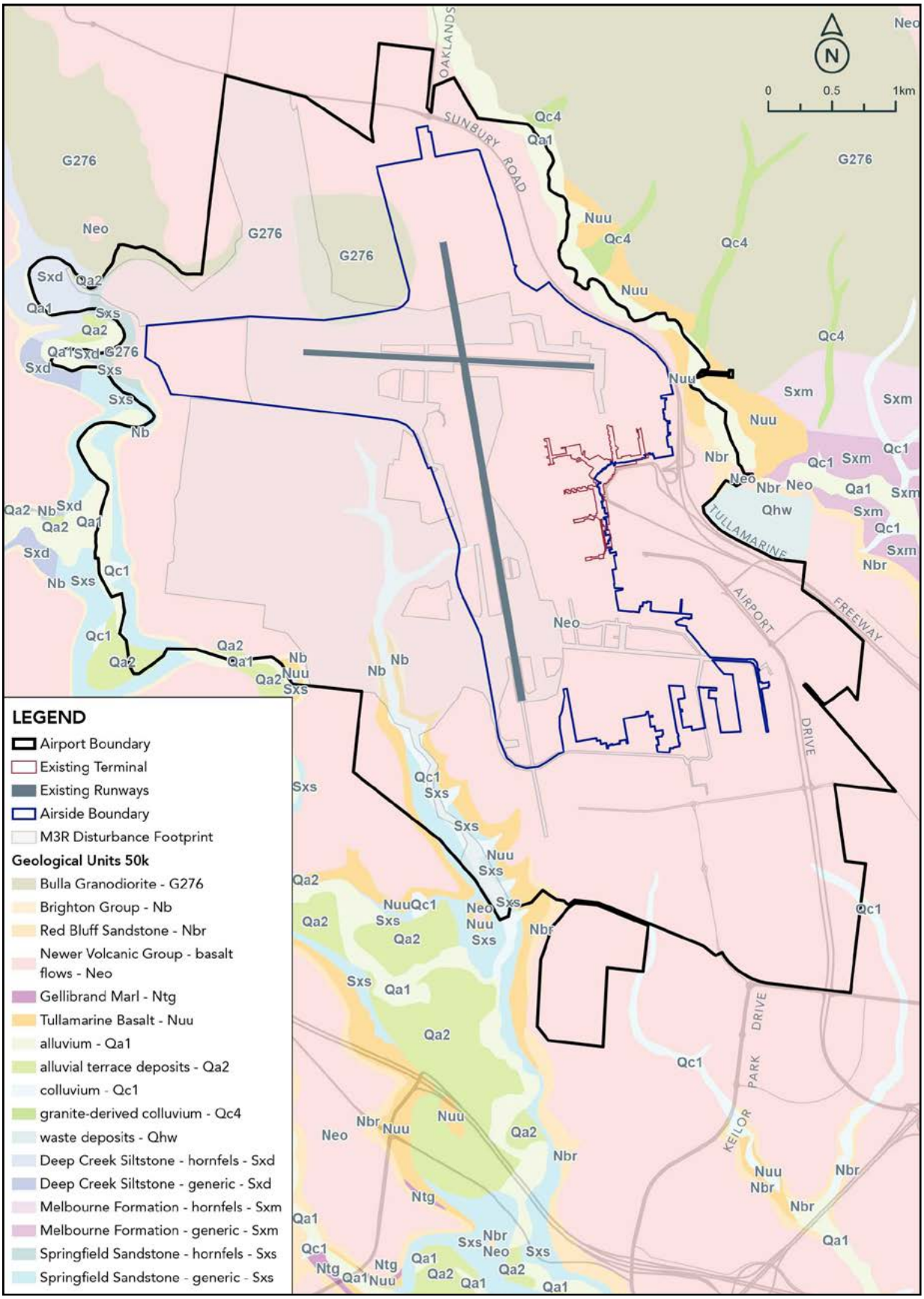


Figure B5.8
Geological features of the M3R project area overlaid with contemporary woodland mapping (Biosis, 2019-2020)



B5.2.1.2
Determining natural values for assessment

Preliminary desktop assessments identified the key threatened species, TECs, listed migratory species and other natural values (such as native vegetation) with the potential to be present within the project area. Natural values were identified based on:

- Their known occurrence within the Victorian Volcanic Plain and Central Victorian Uplands bioregions (e.g. the TEC Natural Temperate Grassland of the Victorian Volcanic Plain)
- Database records within 10 kilometres of the centre of the project area (the local area)
- Previous ecological investigations in and around the project area (see **Figure B5.9** to **Figure B5.14**) including:
    - An inventory of sites of botanical significance in the western region of Melbourne (McDougall, 1987)
    - Vegetation mapping of the Port Phillip and Westernport region (Oates and Taranto, 2001)
    - A flora and fauna assessment for much of Melbourne Airport for the Runway Development Program (Biosis, 2015)
    - Vegetation mapping at Melbourne Airport in financial year 2019 (Biosis, 2019a)
    - Fauna survey program for Hume City Council (Biosis, 2016a)
    - Initial habitat hectare and net gain assessment of the Grey Box Woodland (GAGIN, 2007)
    - Biodiversity assessment for Taxiway Zulu and Northern Compound (Biosis, 2016b)
    - Melbourne Airport ecology gaps study report (Biosis, 2018a)
    - Melbourne Airport Elevated Road MDP specialist flora and fauna study (Biosis, 2013a)
    - Melbourne Airport Grey Box Woodland Environmental Management Plan and associated monitoring reports (Biosis, 2013b; 2014; 2016b; 2017; 2018b)
    - Striped Legless Lizard *Delma impar* survey for Melbourne Airport Business Park (Biosis, 2014b)
    - Golden Sun Moth *Synemon plana* surveys by GAGIN (GAGIN, 2008; 2009; 2010)
    - Swift Parrot *Lathamus discolor* surveys (Steele & Peter, 2019)
    - Grey-headed Flying Fox *Pteropus poliocephalus* surveys (Ecology & Infrastructure International, 2018)
    - Sites of Faunal Significance in the Western Region of Melbourne (inland of Princes Freeway) (Beardsell, 1991)
    - Growling Grass Frog *Litoria raniformis* surveys (Biosis, 2019b, unpublished)
    - A Golden Sun Moth habitat survey (Biosis, 2019c).

In addition, searches of the following databases and online tools were undertaken:

- DELWP's Victorian Biodiversity Atlas (VBA) including the VBA_FLORA25, FLORA100 & FLORA Restricted and VBA_FAUNA25, FAUNA100 & FAUNA Restricted datasets (accessed for preliminary desktop assessment on 12 July 2019, on 11 March 2020, 26 July 2021 and 15 December 2022 for this report)
- Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search Tool (PMST) for MNES protected under the EPBC Act (accessed for preliminary desktop assessment on 12 July 2019, on 11 March 2020 for the exposure draft MDP report, on 26 July 2021 for the preliminary draft MDP report and on 15 December 2022 for this report)
- Birdlife Australia New Atlas database (accessed 17 March 2020).

Following the database searches, threatened species, TECs and listed migratory species were categorised as having a negligible, low, medium or high likelihood of occurring within the project area; or, as having been recorded within the project area.

These categorisations were determined with reference to surrounding records of the species, expert knowledge of ecology of the species, and knowledge of the habitat types present in the project area. The rationale is provided for each species in **Appendix B5.B** and **Appendix B5.C**. Those species or communities for which there was little or no suitable habitat within the project area were assigned a likelihood of low or negligible and not considered further. Species or communities with a medium or higher likelihood of occurring within the project area were subject to further assessment, which varied according to the significance of the species or community. Species or communities of national significance are those listed under the EPBC Act. Species or communities of State significance are those listed under the FFG Act (but not also the EPBC Act).

Nationally significant threatened species and TECs (listed under the EPBC Act) with a medium or higher likelihood of occurring within the project area were the subject of detailed targeted field surveys, if one of the following criteria were met:

- The species or community had not been previously recorded anywhere at Melbourne Airport despite suitable habitat or diagnostic characteristics being present.
- There were parts of the project area where no targeted surveys were known to have taken place despite suitable habitat or diagnostic characteristics being present (e.g. recently acquired land).
- Where survey data was considered outdated (i.e. more than three years since last survey) and there was potential for the project to have a significant impact on the species or community.

Figure B5.9
Previous survey effort for Striped Legless Lizard (SLL) at Melbourne Airport

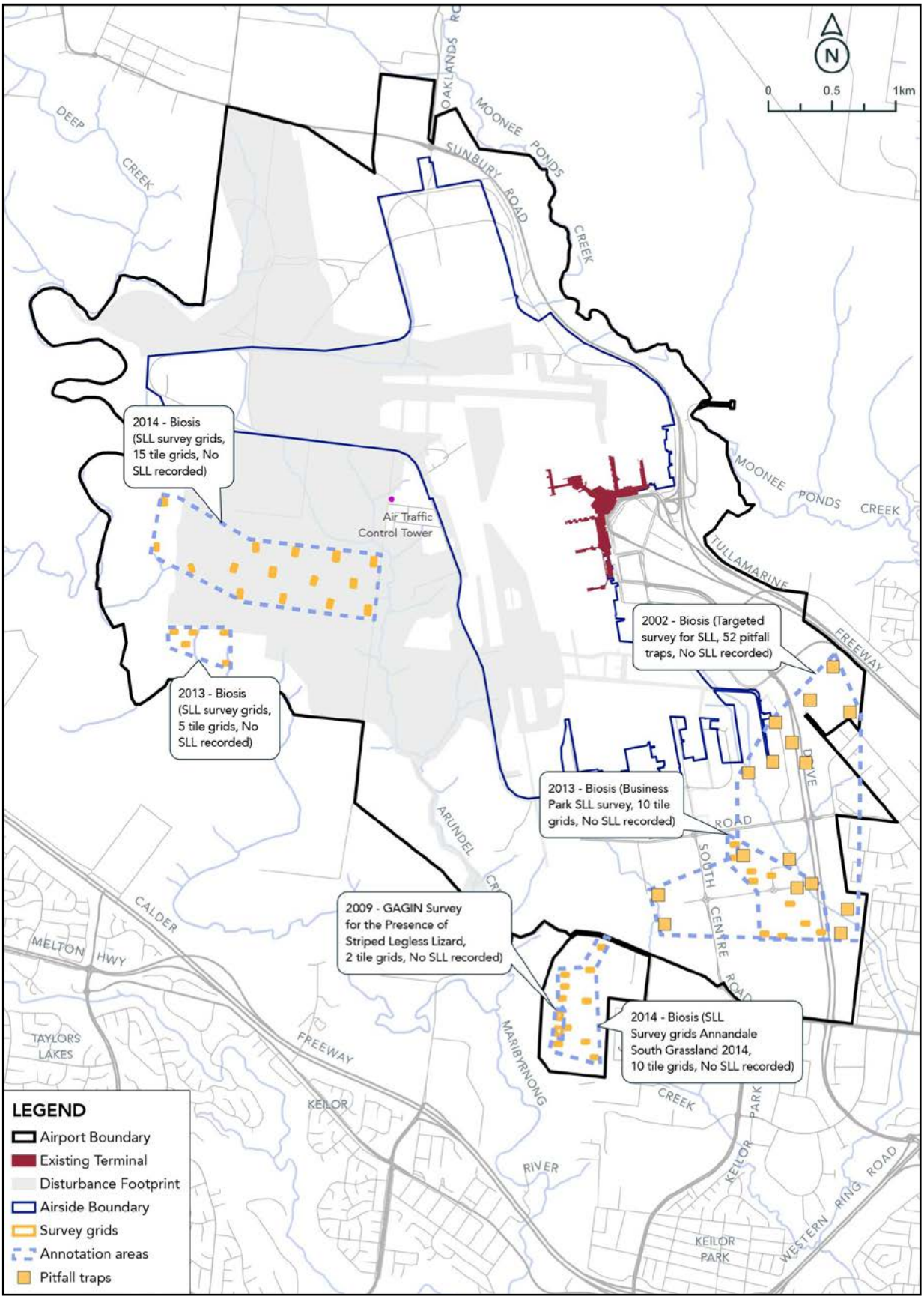


Figure B5.10
Previous survey effort for Golden Sun Moth (GSM) at Melbourne Airport

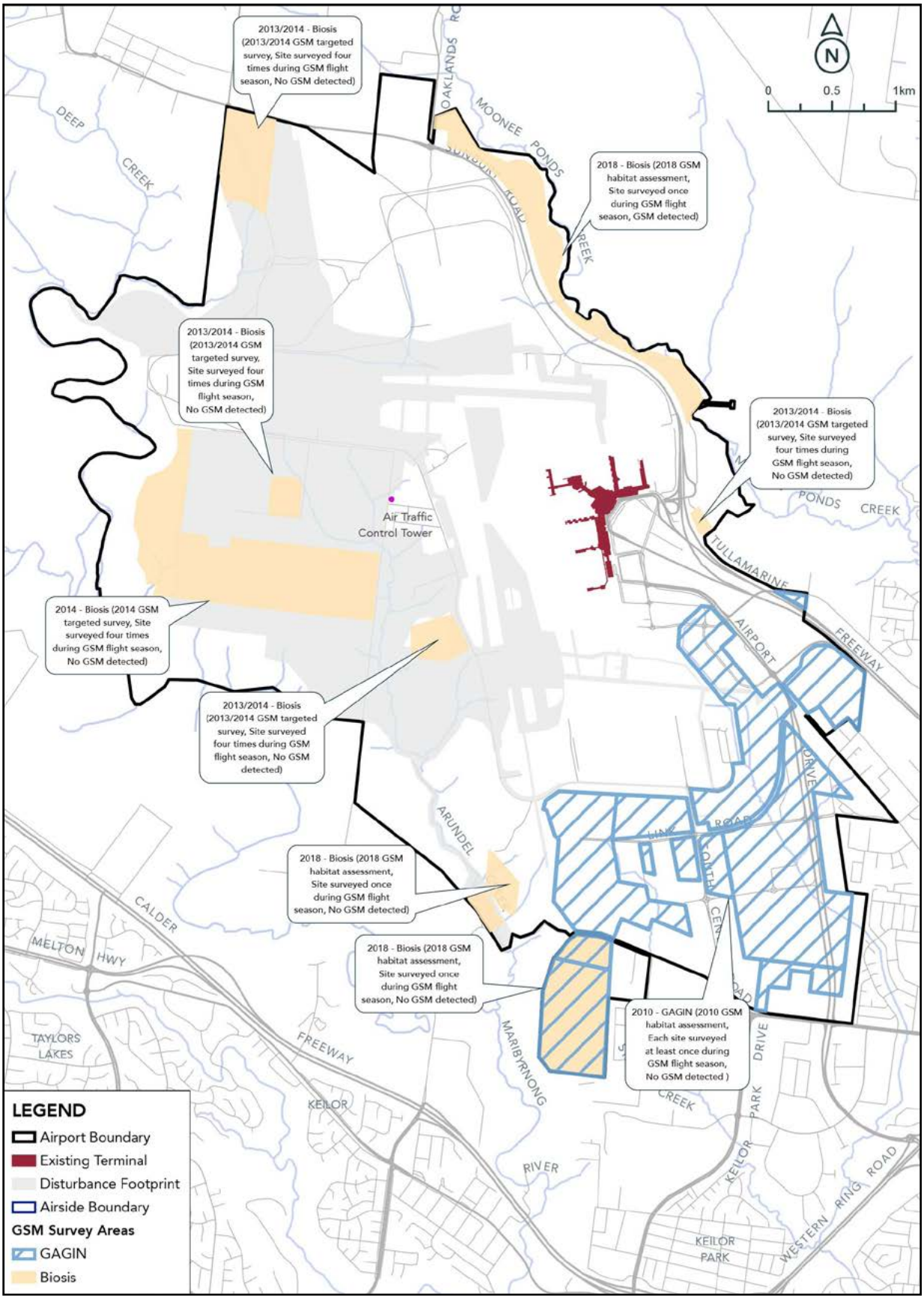


Figure B5.11
Previous survey effort for Growling Grass Frog (GGF) at Melbourne Airport

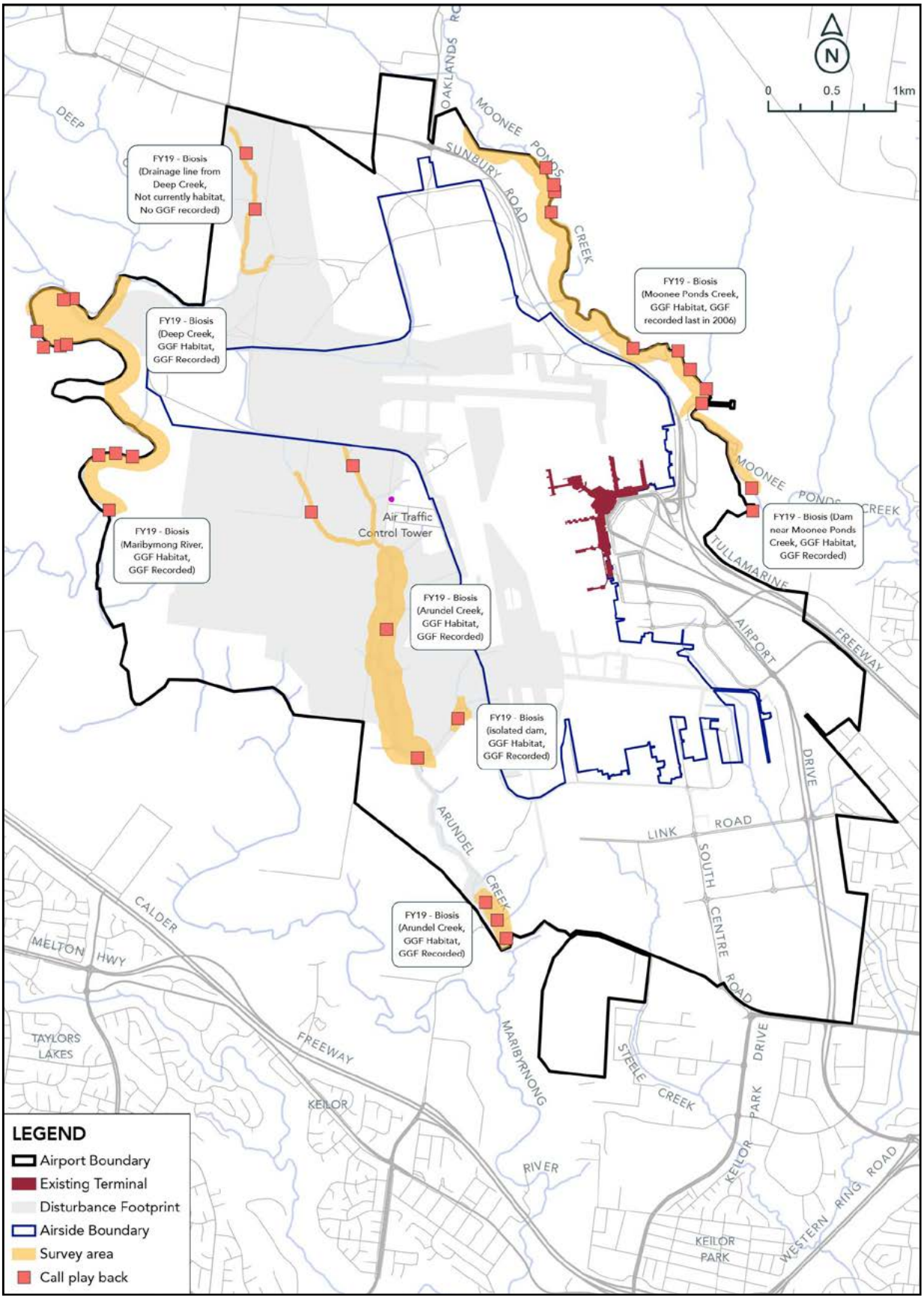


Figure B5.12
Previous survey effort for Swift Parrot at Melbourne Airport

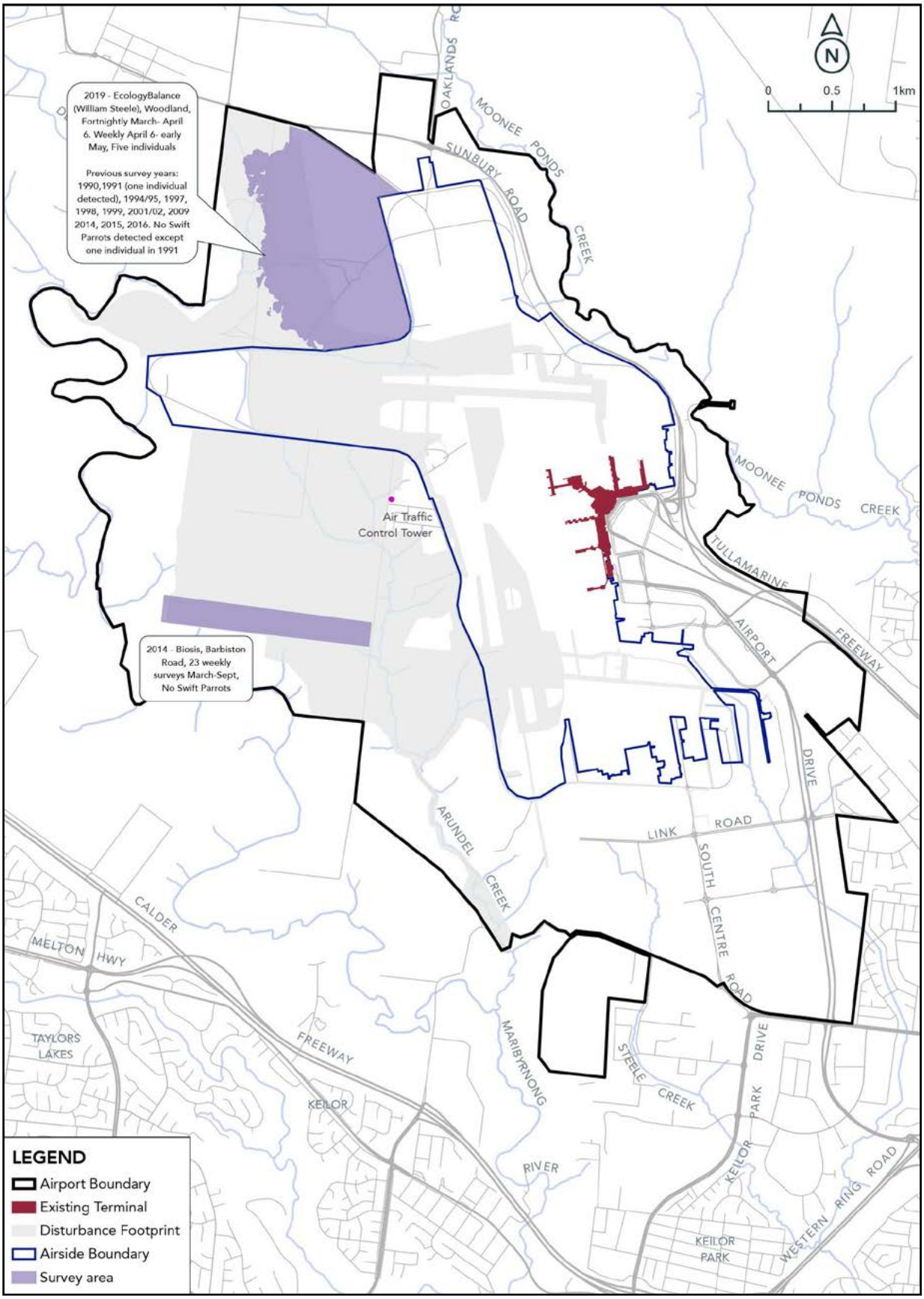
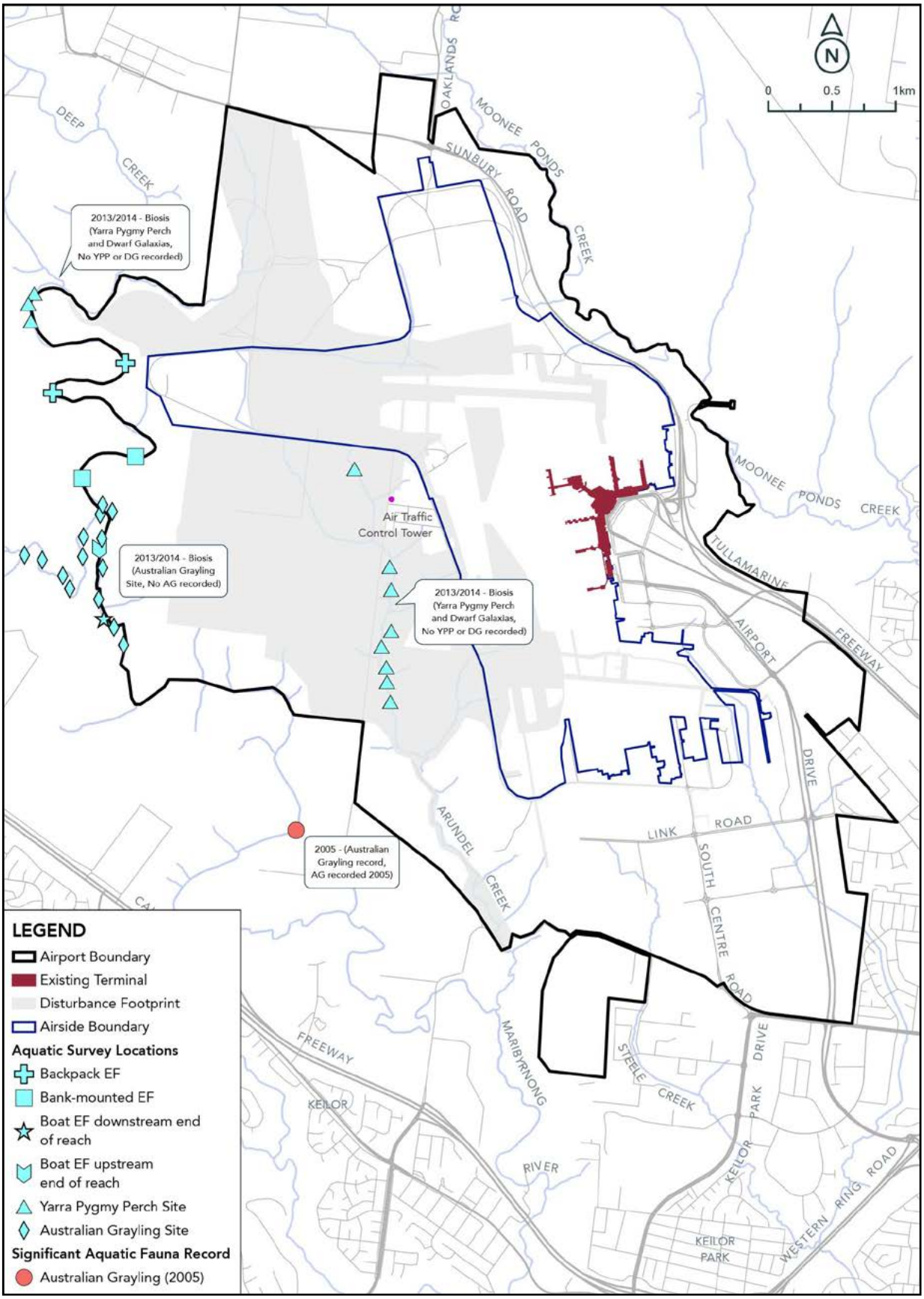
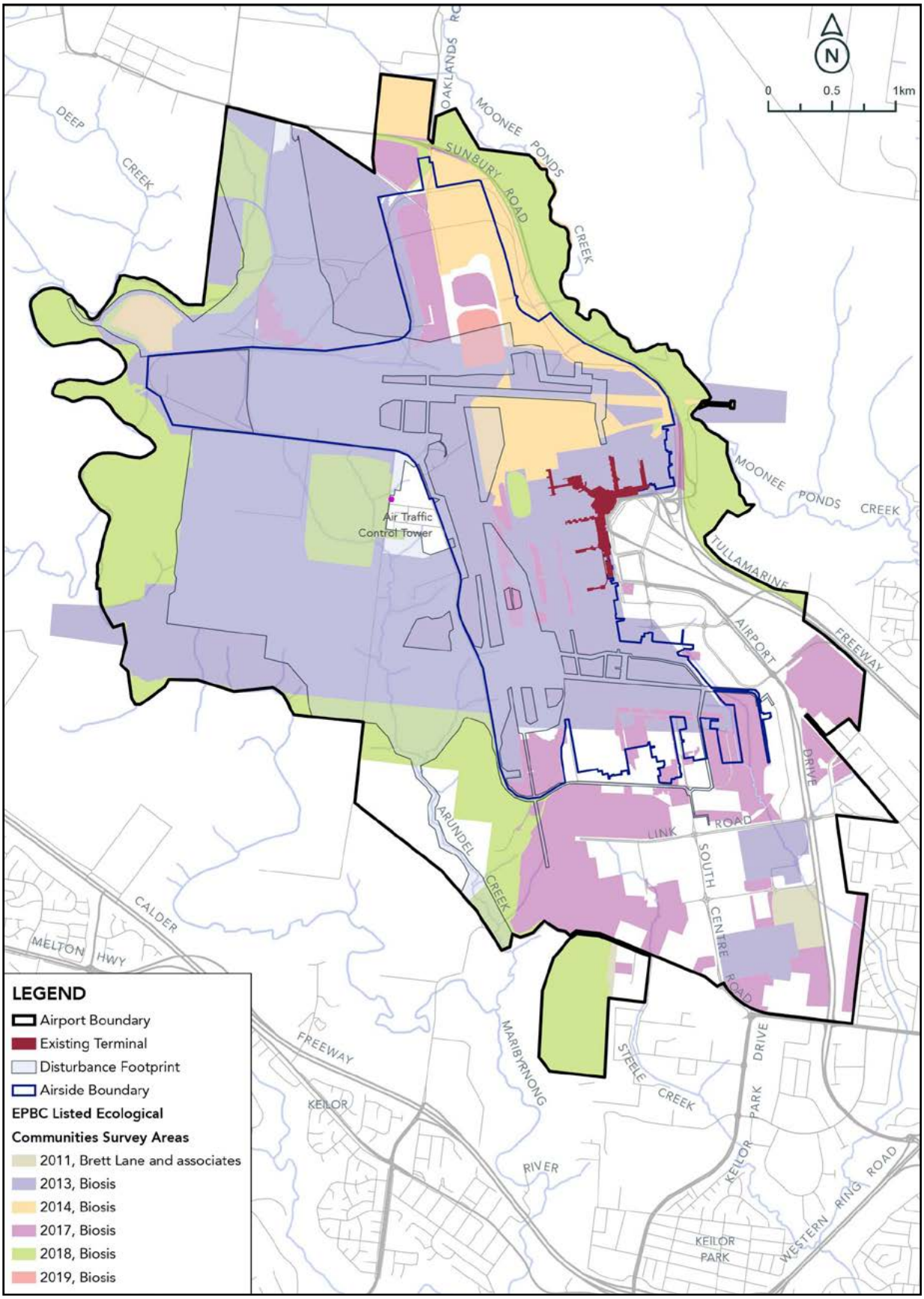


Figure B5.13
Previous survey effort for Dwarf Galaxias, Yarra Pygmy Perch and Australian Grayling at Melbourne Airport[1]



[1] *EF stands for electrofishing which is a scientific survey method used to sample fish populations to determine abundance, density and species composition.*

Figure B5.14
Previous native vegetation surveys at Melbourne Airport



The purpose of targeted field surveys was to establish the presence or absence of the threatened species or TEC and to gain a better understanding of the extent and quality of the species' habitat or TEC across the project area.

No targeted field surveys were undertaken for State significant species or communities (listed as threatened under the FFG Act but not the EPBC Act). Native vegetation surveys provided an indication of the extent of FFG Act threatened communities or habitat for FFG Act threatened species within the impact area.

The following flora, fauna and communities listed under the EPBC Act and/or FFG Act were identified for further consideration.

Threatened flora

No threatened flora of national significance were categorised as having a medium or high likelihood of occurring within the project area, and none were recorded during the field survey and vegetation mapping (see **Section B5.5** and **Appendix B5.B** of this report).

The following flora species are listed under the FFG Act (**Table B5.1**) and were considered to have a medium likelihood of occurrence within the project area due to the presence of suitable habitat and their cryptic or ephemeral nature. This means the species may not be able to be detected by surveys even when present.

Extensive native vegetation surveys have been undertaken across the entirety of Melbourne Airport over the past 10 years (**Figure B5.14**). It is highly likely that threatened flora, if present, would have been detected during these surveys.

Threatened fauna

The following EPBC Act and FFG Act-listed threatened fauna species (**Table B5.2**) were either identified as previously recorded, or as having a medium to high likelihood of occurring within or immediately adjacent to the project area in the preliminary desktop assessment. Therefore, the need for targeted survey and subsequent significant impact self-assessment was considered for EPBC Act-listed species (**Table B5.2**). Targeted survey for FFG Act listed species was not considered.

Migratory species

The following EPBC Act-listed migratory species (**Table B5.3**) were identified as previously recorded, or as having a medium to high likelihood of occurring within or immediately adjacent to the project area in the preliminary desktop assessment. Therefore, the need for targeted survey and subsequent significant impact assessment was considered (**Table B5.3**).

Table B5.1
Threatened flora

Common name	Scientific name	Likely occurrence in the project area	Rationale for likelihood ranking	Targeted survey need
State significance				
Plump Windmill Grass	*Chloris ventricosa*	Medium	There are limited records within the area. The closest record is located within habitat similar to habitat present within Melbourne Airport.	No. Targeted surveys for FFG Act listed flora species were not considered necessary. The vegetation surveys undertaken for the project would have been sufficient to detect these species if present. There is no further regulatory requirement to undertake targeted surveys for these species.
Austral Crane's-bill	*Geranium solanderi var. solanderi s.s.*	Medium	There are recent (<20 years old) records nearby and suitable habitat within the project area. The species can be present in disturbed grasslands and grassy woodlands.	
Pale-flower Crane's-bill	*Geranium sp. 3*	Medium	There are recent (<20 years old) records nearby and suitable habitat within the project area. The species can be present in disturbed grasslands and grassy woodlands.	
Purple Blown-grass	*Lachnagrostis semibarbata var. semibarbata*	Medium	There are limited records within the area but the closest record, within 10 km of the project area, is located within habitat similar to habitat present within Melbourne Airport.	
Rye Beetle-grass	*Tripogonella loliiformis*	Medium	The species was recorded within suitable habitat in the woodland in 1994 but has not been recorded since.	

Table B5.2
Threatened fauna

Common name	Scientific name	Likely occurrence in the project area
National significance		
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Medium
Swift Parrot	*Lathamus discolor*	Recorded
White-throated Needletail	*Hirundapus caudacutus*	High
Grey-headed Flying-fox	*Pteropus poliocephalus*	Recorded
Growling Grass Frog (GGF)	*Litoria raniformis*	Recorded
Australian Grayling	*Prototroctes maraena*	Medium
Golden Sun Moth (GSM)	*Synemon plana*	High
Striped Legless Lizard (SLL)	*Delma impar*	Medium

Rationale for likelihood ranking	Targeted survey need
There is suitable woodland habitat for this species within the project area and the species is also likely to forage in planted trees.	No. The species was listed after field assessments were conducted and is assumed to be present within the project area. Targeted surveys for the species are unlikely to produce additional information to assist with current understanding of the species' use of the project area. A significant impact self-assessment was undertaken for the species (Section B05.6).
The species was recorded in the Grey Box Woodland within the project area in 2019 (Steele & Peter, 2019). The Grey Box Woodland represents a large example of intact habitat for the species in the southern extent of its mainland range. Other scattered eucalyptus and planted trees may also provide foraging habitat for the species on occasion however scattered trees are unlikely to provide significant habitat for the species.	No. Following a review of previous targeted survey effort (**Figure B5.12**), additional targeted surveys were not recommended. A significant impact self-assessment was undertaken for the species (**Section B5.6**).
It is likely that the species utilises all of the above ground habitat at Melbourne Airport. Additional interrogation of Birdlife Australia's online database (Birdata) revealed there is an incidental record of the species from 2010 (Birdlife Australia) over Sky Road in Melbourne Airport and other records surrounding the Airport. The species is known to have a preference for foraging above wooded areas and is known to roost in the canopy and hollows of trees in forests and woodlands.	No. The species is assumed present. Targeted surveys for the species are unlikely to produce additional information to assist with current understanding of the species' use of the project area. A significant impact self-assessment was undertaken for the species (**Section B5.6**).
The species is known to forage in flowering eucalypts within the project area (Ecology and Infrastructure International, 2018). The closest 'camp' for the species is located approximately 20km south-east of the project area. Habitat present within the project area is unlikely to provide important habitat critical for the survival of this species.	No. The species is known to use habitat in the project area. Targeted surveys for the species are unlikely to produce additional information to assist with current understanding of the species' use of the project area. A significant impact self-assessment was undertaken for the species (**Section B5.6**).
Growling Grass Frog has been recorded in Arundel Creek and Moonee Ponds Creek within the project area and Deep Creek and the Maribyrnong River adjacent to the project area. Breeding, aquatic and terrestrial habitat for the species occurs within the project area.	Yes. Survey data from the 2019 targeted survey is to be utilised (Biosis, 2019b) (**Figure B5.11**). Additional targeted surveys of 270 and 300 Arundel Road were completed as these properties had not been previously assessed. A significant impact self-assessment was undertaken for the species (**Section B5.6**).
Targeted surveys between 2013 and 2014 (Biosis, 2015) did not record the species within the project area. However, the species is known to occur downstream from the project area in the Maribyrnong River and is therefore likely to utilise similar suitable habitat in the portion of the Maribyrnong River adjacent to the project area. Permanently altered run-off pathways, volumes and water quality to be managed by design, and relevant approval conditions to ensure integrity of adjacent waterways as habitat for the species.	No. Previous survey data (Biosis, 2015) (**Figure B5.13**) was sufficient for current assessment. No further targeted surveys recommended. A significant impact self-assessment was undertaken for the species (**Section B5.6**).
The species has been recorded from Woodlands Historic Park to the north and east and the Moonee Ponds Creek corridor to the east. Potential habitat for GSM includes grassy habitats supporting suitable larval food plants including Spear Grasses, Wallaby Grasses and the introduced Chilean Needle-grass *Nassella neesiana* and potentially Serrated Tussock *Nassella trichotoma*. Despite previous surveys (**Figure B5.10**) not detecting the species within the project area, there were areas of potential suitable habitat located within the project area that was not previously surveyed.	Yes. GSM targeted surveys were recommended and undertaken in all suitable habitat within the project area. Targeted surveys detected the species in a small area north of the Grey Box Woodland. The likelihood of occurrence has since been changed to 'recorded' (**Appendix B5.C**). A significant impact assessment was undertaken for the species (**Section B5.6**).
Potential SLL habitat is present within the project area. Past targeted surveys have not detected the species within project area (**Figure B5.9**). There are no known database records of the species within a 5km radius of the Airport, although they have been detected just beyond that radius.	Yes. Targeted surveys for the species were recommended and undertaken. No SLL were detected during the current targeted survey and the likelihood of occurrence for this species has since been changed to 'low' (**Appendix B5.C**).

Common name (cont.)	Scientific name (cont.)	Likely occurrence in the project area (cont.)
State significance		
Little Egret	*Egretta garzetta*	High
Plumed Egret	*Ardea intermedia plumifera*	High
Eastern Great Egret	*Ardea alba modesta*	High
Freckled Duck	*Stictonetta naevosa*	Medium
Hardhead	*Aythya australis*	Medium
Blue-billed Duck	*Oxyura australis*	Medium
Musk Duck	*Biziura lobata*	Medium
Grey Goshawk	*Accipiter novaehollandiae*	Medium
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	Medium
Black Falcon	*Falco subniger*	High
Little Eagle	*Hieraaetus morphnoides*	High
Powerful Owl	*Ninox strenua*	Medium
Turquoise Parrot	*Neophema pulchella*	Medium
Common Sandpiper	*Actitis hypoleucos*	Medium
Marsh Sandpiper	*Tringa stagnatilis*	Medium
Common Greenshank	*Tringa nebularia*	Medium
Hooded Robin	*Melanodryas cucullata*	Recorded
Speckled Warbler	*Pyrrholaemus sagittatus*	Recorded
Brush-tailed Phascogale	*Phascogale tapoatafa*	Medium
Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*	High
Eastern Bent-wing Bat	*Miniopterus orianae oceanensis*	High
Platypus	*Ornithorhynchus anatinus*	High
Tussock Skink	*Pseudemoia pagenstecheri*	High
Brown Toadlet	*Pseudophryne bibronii*	Medium
Murray River Turtle	*Emydura macquarii*	Medium

Rationale for likelihood ranking (cont.)	Targeted survey need (cont.)
Suitable habitat is present in watercourses and dams.	No. Targeted surveys for FFG listed fauna species was not considered necessary. The extensive targeted fauna and vegetation surveys undertaken for the project were considered likely to identify many of these species if present. For example, 17 Tussock Skink individuals were recorded from tile grids within the project area during targeted surveys for SLL and two Murray River Turtle individuals were recorded at the quarry dam on the north-western boundary of the project area during targeted surveys for GGF. The likelihood of occurrence for Tussock Skink and Murray River Turtle was subsequently changed from 'medium' or 'high' to 'recorded' (Appendix C). Other FFG Act listed fauna may utilise habitat present within the project area on occasions but are unlikely to be resident within the project area. There is no further regulatory requirement to undertake targeted surveys for these species.
Suitable habitat is present in watercourses and dams.	
Suitable habitat is present in watercourses and dams.	
The species may occasionally use the large water storage dams on Arundel Creek.	
The species may occasionally visit the large water storage dams along Arundel Creek and may fly over the project area.	
The species may occasionally visit the large water storage dams along Arundel Creek and may fly over the project area.	
The species may occasionally visit the large water storage dams along Arundel Creek and may fly over the project area.	
The species may occasionally use the Grey Box Woodland and, to a lesser extent, planted trees within the project area	
The species may occasionally visit waterways and dams in the project area, particularly the Maribyrnong River and potentially the large water storage dams on Arundel Creek.	
Areas of grassland and woodland are suitable habitat for this species.	
Areas of grassland and woodland are suitable habitat for this species.	
Although not previously recorded, this species may use the Grey Box Woodland.	
The species may use the Grey Box Woodland on rare occasions.	
The water storage dams on Arundel Creek may provide temporary foraging habitat for this species when water levels are lower.	
The water storage dams on Arundel Creek may provide temporary foraging habitat for this species when water levels are lower.	
The water storage dams on Arundel Creek may provide temporary foraging habitat for this species when water levels are lower.	
Grey Box Woodland and woodland area along Barbiston Road provide suitable habitat for the species. One individual was recorded within the Grey Box Woodland in 2002.	
Habitat on-site is limited to woodland areas. The species was recorded in the Grey Box Woodland in the project area in 1990. The species has been recorded reliably across multiple years in nearby Woodlands Historic Park, most recently in 2019.	
There is unlikely to be a resident population of the species in the Grey Box Woodland due to the isolation of Melbourne Airport from other suitable habitat and known populations. A 2017 database record from Oaklands Junction confirms that the species is in the local area. However, it is unknown whether that record is from a nearby population or was a young dispersing male. Surveys for this species have not been undertaken in the project area.	
The species recorded from Bulla Hill and School Hill approximately 1.5km north west of the project area (Biosis 2016). Treed areas, particularly the Grey Box Woodland, provide habitat for this species in the project area.	
Treed areas, in particular the Grey Box Woodland, provide habitat for this species in the project area.	
There are recent (2018) records of the species from Deep Creek, at Bulla approximately 1.6 km north-west of the project area (Australian Platypus Conservancy). There are also older records (1990s) of the species from the Maribyrnong River, adjacent to the project area.	
Biosis previously recorded the species at a similar grassland site 5 km east of the project area in 2016. Other recent (<20 years old) records of the species occur within 10 km of the project area and the project area supports suitable grassland habitat	
There is suitable habitat for the species around waterways and in woodland areas within the project area. The species has not been recorded within Melbourne Airport but typical ecological surveys undertaken at Melbourne Airport have been outside of the male calling season for the species.	
At the time of the desktop assessment, there was one record of the species within 10 km of the project area. Waterbodies within and adjacent to the project area were known to provide suitable habitat for the species.	

Table B5.3
Migratory species

Common name	Scientific name	Likely occurrence in the project area	Rationale for likelihood ranking	Targeted survey need
Fork-tailed Swift	*Apus pacificus*	High	The project area is within the core range for the species (DoE, 2015). There are no records from within the project area but there are several records from surrounding areas such as Sunbury, Greenvale and Yuroke from the past 10 years.	No. The species is assumed present. Targeted surveys for the species are unlikely to produce additional information to assist with current understanding of the species' use of the project area and the project's impacts. A significant impact self-assessment was undertaken for the species (**Section B5.6**).
Latham's Snipe	*Gallinago hardwickii*	High	The species has been regularly recorded at the Jacana Wetlands, approximately 4km east of the project area, in the last 20 years (Birdata, Birdlife Australia).	No. Large numbers of this species have never been recorded within the project area. However, targeted surveys have not been undertaken for the species. A significant impact self-assessment was undertaken for the species (**Section B5.6**).
Rufous Fantail	*Rhipidura rufifrons*	Recorded	The project area is within the core range for the species (DoE, 2015). The species was recorded in the Grey Box Woodland in 2009.	No. Targeted surveys for the species are unlikely to produce additional information to assist with current understanding of the species' use of the project area and the project's impacts. A significant impact self-assessment was undertaken for the species (**Section B5.6**).
Satin Flycatcher	*Myiagra cyanoleuca*	High	The project area is within the core range for the species (DoE, 2015). The species was recorded in Woodlands Historic Park in 2007, 2013 and 2015 (Birddata, Birdlife Australia).	No. Targeted surveys for the species are unlikely to produce additional information to assist with current understanding of the species' use of the project area or the project's impacts. A significant impact self-assessment was undertaken for the species (**Section B5.6**).
White-throated Needletail	*Hirundapus caudacutus*	Recorded	The project area is within the core range for the species (DoE, 2015). There is an incidental record of the species from 2010 (Birdlife Australia) over Sky Road in Melbourne Airport and other records surrounding the project area.	No. The species is assumed present. Targeted surveys for the species are unlikely to produce additional information to assist with current understanding of the species' use of the project area or the project's impacts. A significant impact self-assessment was undertaken for the species (**Section B5.6**).

Threatened ecological communities

The following EPBC Act and FFG Act-listed TECs (**Table B5.4**) were identified as previously recorded; or as having a medium to high likelihood of occurring within or immediately adjacent to the project area in the preliminary desktop assessment. Therefore, the need for targeted survey and subsequent significant impact self-assessment for EPBC Act TECs was considered (**Table B5.4**).

B5.2.2
Field Assessment

B5.2.2.1
Threatened species survey methods

Several EPBC Act-listed species were either considered to have a medium to high likelihood of occurring within the project area (**Appendix B5.B** and **Appendix B5.C** of this chapter) or had previously been recorded in the local area.

Targeted surveys were undertaken to determine whether they were present within the project area and, if so, the extent to which they used it. For some species, investigations extended beyond the project area to include the local area. This was to provide a broader understanding of landscape context, and to capture areas adjacent to the project area that may have represented more suitable habitat for the species (thereby increasing the likelihood of detection). EPBC Act listed species for which targeted surveys were undertaken as part of this current assessment included:

- Striped Legless Lizard
- Golden Sun Moth
- Growling Grass Frog.

Table B5.4
Threatened ecological communities

Ecological community	Likely occurrence in the project area	Rationale for likelihood ranking	Targeted survey need
National significance			
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia (Grey Box Woodland)	Recorded	The community is known to occur within the project area.	Yes. Extent and quality assessment of the community was recommended and undertaken.
Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP)	Recorded	The community is known to occur within the project area.	Yes. Extent and quality assessment of the community was recommended and undertaken.
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (SHW)	Medium	The community is known to occur within the project area.	Yes. Presence/ absence survey for Seasonal Herbaceous Wetlands was undertaken during the native vegetation assessment of the entire project area. Seasonal Herbaceous Wetlands was not recorded within the project area and a significant impact self-assessment was not considered necessary for the community.
State significance			
Victorian Temperate Woodland Bird Community	Recorded	This community includes the woodlands stands in the project area. Listed woodland birds within this community that have been recorded or may occur are Swift Parrot, Speckled Warbler, Jacky Winter *Microeca fascinans*, and Hooded Robin.	No. The extent of this community corresponds with the extent of the Grey Box Woodland community.
Western (Basalt) Plains Grassland i.e. all the Plains Grassland that we have mapped	Recorded	This FFG Act listed community is similar to the EPBC Act grassland community present in the project area.	No. The extent of this community corresponds with all Plains Grassland mapped within the project area during the native vegetation surveys.
Western Basalt Plains (River Red Gum) Grassy Woodland	Medium	Plains Grassy Woodland (EVC 55) in the project area has affinities with this community when River Red-gum is dominant canopy species.	No. Vegetation surveys undertaken within the project area would identify this community if present.

Detailed survey methods for each species are provided in **Appendix B5.A**. Survey effort and location of targeted survey for listed species is provided in **Figure B5.15**.

Golden Sun Moth

The initial site assessment determined that suitable habitat for Golden Sun Moth was present within the project area.

Previous surveys of Melbourne Airport land west of Sunbury Road had failed to detect the species. However, due to the presence of suitable habitat, feedback from the Commonwealth, and lack of current knowledge of the species within the project area, targeted surveys for this species were recommended.

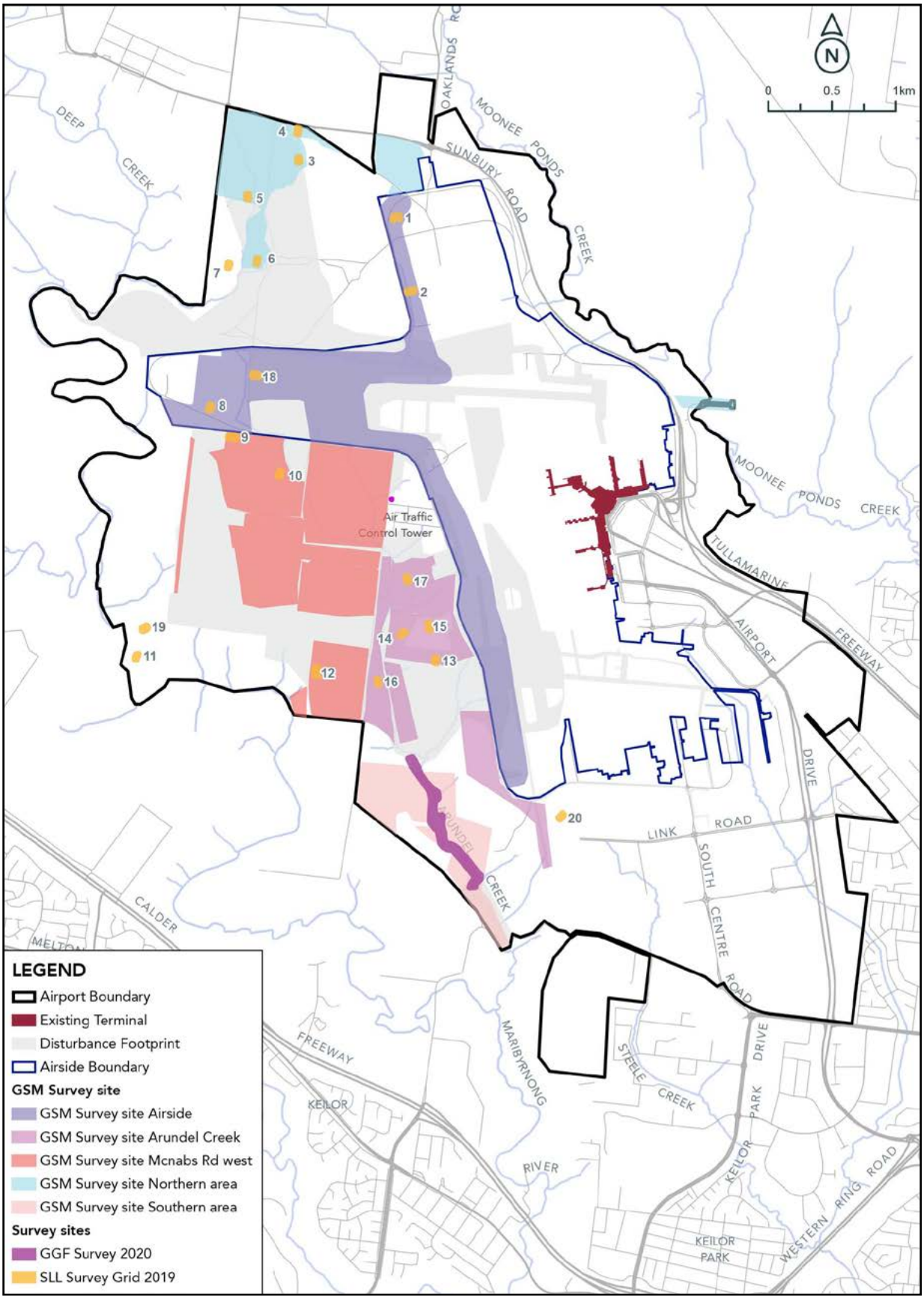
Four surveys were conducted, on days with appropriate weather conditions and in accordance with the Commonwealth survey guidelines (DEWHA, 2009a).

Growling Grass Frog

Previous habitat assessments and targeted surveys for the Growling Grass Frog were undertaken in February 2019 (Biosis, 2019b, unpublished) across all of Melbourne Airport's land. Since then, additional land has been acquired by Melbourne Airport.

A habitat assessment and targeted survey for the Growling Grass Frog was undertaken within the new land (located at 270 and 300 Arundel Road) in February 2020. The information and data obtained in February 2019 and 2020 was utilised for this assessment. The targeted surveys were undertaken in accordance with Commonwealth survey guidelines (DEWHA, 2010).

Figure B5.15
Targeted fauna survey effort for Melbourne Airport's Third Runway



Striped Legless Lizard

To determine its presence or absence, targeted surveys were conducted from September to December 2019 following Commonwealth referral guidelines for the vulnerable Striped Legless Lizard, *Delma impar* (DoE, 2011).

Arrays of terracotta roof tiles were placed in areas of potential habitat in and adjacent to the project area. Twenty tile grids were deployed, each consisting of 50 tiles with five-metre spacing between them arranged in a grid of 10 x 5 tiles. They were checked 15 times at weekly intervals between September and December 2019.

Australian Grayling

Australian Grayling surveys were undertaken between 2013 and 2014 by Biosis for the Runway Development Program. Detailed survey methods are recorded in the Biosis 2015 report (Biosis, 2015).

Although these surveys were undertaken more than seven years ago, subsequent surveys were not recommended because targeted surveys for this species are usually unsuccessful. The species is very difficult to catch, even in dense populations. Additional surveys would not therefore further enhance understanding of this species' use of the Maribyrnong River.

Swift Parrot

The most recent Swift Parrot survey was undertaken in autumn 2019 (Steele and Peter, 2019). This report and other available reports were used to assess the presence of the species within the project area and the subsequent significant impact self-assessment.

Grey-headed Flying-fox

The most recent survey for this species was undertaken by Ecology and Infrastructure International (2018). This report and other available reports/databases were utilised for assessing the presence of the species within the project area, and the subsequent significant impact self-assessment.

Threatened flora

All EPBC Act-listed threatened flora species are considered to have a low likelihood of occurrence within the project area and therefore no targeted surveys were undertaken for these species.

B5.2.2.2 Threatened Ecological Communities (TECs) and native vegetation survey methods

Threatened Ecological Communities (TECs) are unique assemblages of plants, animals and ecological interactions. Although the species that make up an ecological community may be common and widespread, it is their presence in a particular part of the landscape that makes them important.

Ecological communities become threatened when landscape-scale modifications (such as land clearing for agriculture on fertile soils) cause the loss of a community and its function across widespread geographical areas. Ecological communities may also be threatened when restricted to small geographical areas or highly localised environmental conditions.

Threatened ecological communities are protected under Victorian and Commonwealth legislation. After background research, four TECs listed under Victoria's FFG Act and five TECs listed under the Commonwealth's EPBC Act were considered to have some potential to be present in the project area (see **Appendix B5.B** of this chapter).

It should be noted that there is often an overlap between Victorian and Commonwealth legislation in the listing of a community, with broadly similar communities listed but given different names in each jurisdiction. In addition, each jurisdiction has its own thresholds for delineating a TEC based on location, characteristics and condition.

EPBC Act listed communities tend to have a much narrower and well-articulated set of key diagnostics published by the Commonwealth Government; FFG Act listed communities have broader descriptions and less well-defined condition thresholds in the Victorian Scientific Advisory Committee's nomination documents.

Usually, ecological communities would require separate consideration for identification and impact assessment across the two jurisdictions. However, given the project is assumed to occur entirely on Commonwealth land, FFG Act provisions do not apply (see **Section B5.3**). Although impacts on EPBC Act TECs have been assessed in detail according to the Significant Impact Guidelines 1.1 (DoE, 2013) impacts on FFG Act listed communities have been considered only as part of an assessment of impacts on the environment more broadly, in accordance with the Significant Impact Guidelines 1.2 (DSEWPaC, 2013).

EPBC Act listed TECs are identified in accordance with listing advice and supporting policy statements produced by the Commonwealth Government. The process of identifying whether a particular patch of native vegetation is a TEC relies on an assessment of:

- Bioregional context
- Landscape setting
- Vegetation structure
- Tree size and density (for treed communities)
- Plant cover
- Plant species richness (species diversity)
- Ecological function.

These considerations were incorporated into the following three-step approach to assessing EPBC Act-listed TECs within the project area:

1. Identifying and mapping all native vegetation using the Victorian EVC classification system
2. Identifying and mapping all areas of native vegetation that satisfy the criteria for TEC listed under the EPBC Act
3. Assessing the quality of all TECs present.

Identifying and mapping native vegetation

Survey effort and location of the current native-vegetation assessment is provided in **Figure B5.16**.

Native vegetation within the project area was identified and mapped for two reasons. First, the type and extent of native vegetation helped assess the project's impacts on the environment on Commonwealth land. Second, the type and extent of native vegetation helped to identify the potential presence of TECs.

The listing advice for TECs refers to EVC equivalents indicating the potential presence of each TEC (TSSC, 2008; TSSC, 2010; TSSC, 2012). The Victorian system of classifying native vegetation into EVCs was therefore used to define and map native vegetation within the project area (DELWP, 2017; Appendix B).

The key terms used for identifying and mapping native vegetation are explained in **Table B5.5**. Patches of native vegetation were assigned to an appropriate EVC with reference to EVC benchmarks for the bioregion (DSE, 2004a; DSE, 2004b). Where native vegetation patches crossed the project area boundary, mapping and assessment of native vegetation often extended beyond the project area to some of the local area. This was to provide a better understanding of the quality of the native vegetation and its landscape context.

Identifying and mapping TECs

Where a patch of native vegetation was suspected to be a TEC, listing advice and policy statements provided key diagnostic characteristics and condition thresholds that allowed for an objective determination of TEC presence.

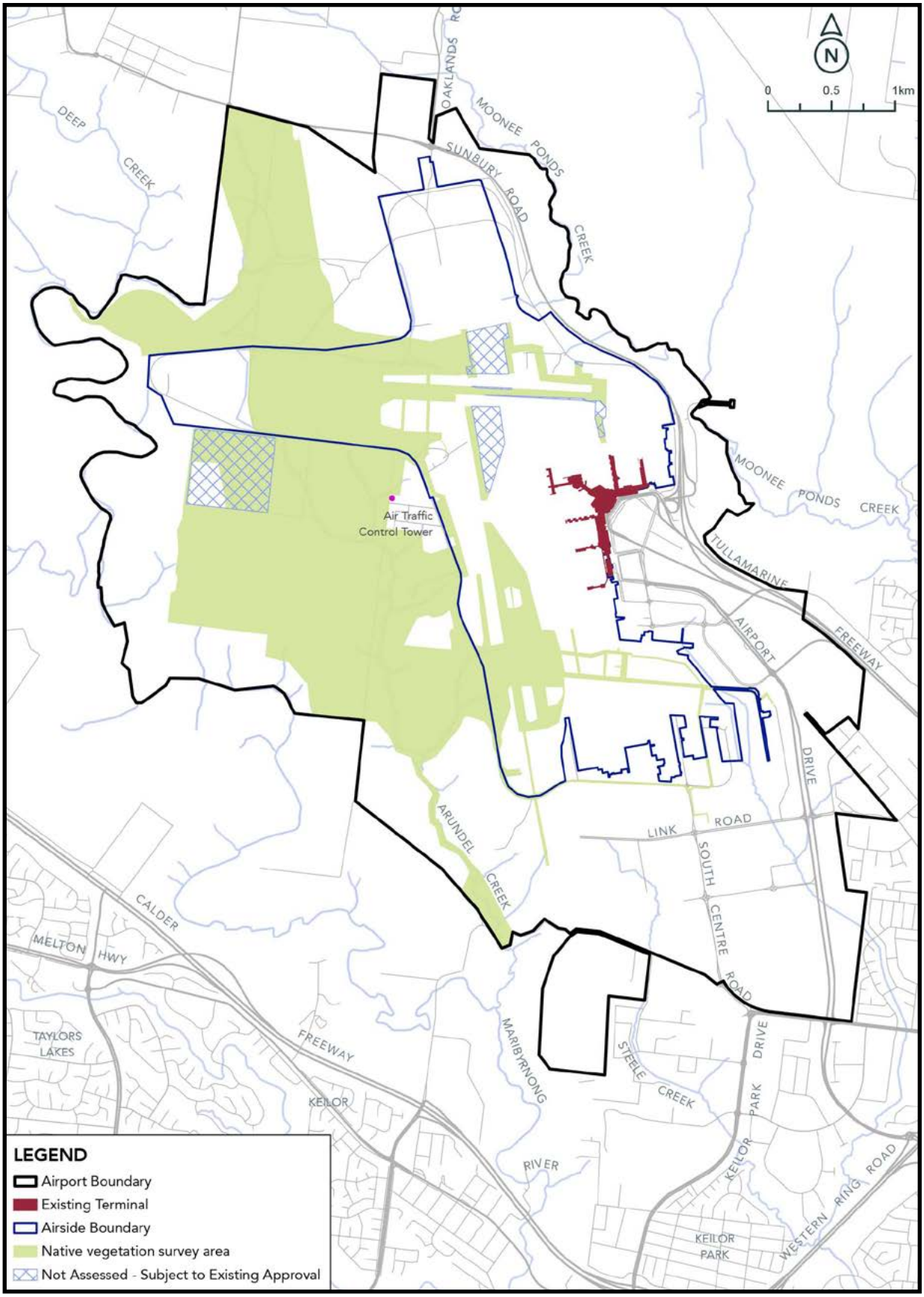
The methods used to identify listed TECs, define their spatial extent, and assess their condition are outlined below for the relevant communities.

These methods vary depending on community type (e.g. grassland, woodland or wetland) and the information required to accurately define, map and assess the condition of the TEC. The methods are linked to standard practices outlined in Commonwealth listing advice; and also utilise Victorian methods for defining vegetation extent and metrics for quality assessment (**Table B5.5**).

Table B5.5
Key definitions used for identifying, mapping and assessing native vegetation and TECs

Term	Definition	Reference
Native vegetation	Plants that are indigenous to Victoria, including trees, shrubs, herbs, and grasses.	Victoria Planning Provisions clause cl., 73.01
Patch of native vegetation	An area of vegetation where at least 25% of total perennial understorey plant cover is native or 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 (Note that the Current Wetlands Map was excluded from this definition for the purposes of this assessment.)	DELWP, 2017 p. 6
Habitat zone	A habitat zone is a single continuous patch of vegetation of the same EVC and condition. New habitat zones are only defined when one of the following conditions is met: • The EVC changes • A clear physical boundary occurs • The site condition score (out of 75) varies by at least 15 points through sampling and the extent of the continuous patch of vegetation to be removed is greater than 1 hectare.	DELWP, 2018 p. 15
Scattered tree	A native canopy tree that does not form part of a patch.	DELWP, 2017 p. 6
Canopy tree	A mature tree (i.e. it is able to flower) greater than 3 metres in height and normally found in the upper layer of the relevant vegetation type (EVC).	DELWP, 2017 p. 35
Ecological Vegetation Class (EVC)	A native vegetation type classified on the basis of a combination of its floristics, lifeforms and ecological characteristics.	DELWP, 2017 p. 35
Patch of a Threatened Ecological Community (TEC)	A discrete and uniform area that comprises the ecological community. It does not include substantial elements of other ecological communities, such as woodlands dominated by other tree species and other types of grasslands. However, a patch of the listed ecological community may include small-scale variations in vegetation, and small-scale disturbances, such as tracks or breaks, that do not alter its overall functionality – including the easy movement of wildlife or dispersal of plant spores and seeds.	TSSC, 2008 p. 50 TSSC, 2010 p. 10
Diameter at Breast Height (DBH)	The diameter of the main trunk of a tree, measured over bark at 1.3 metres above ground level and used to assess the condition of treed vegetation.	DELWP, 2017 p. 9

Figure B5.16
Native vegetation survey effort for Melbourne Airport's Third Runway



Grey Box (*Eucalyptus microcarpa*) Grassy Woodland and Derived Native Grasslands of South-eastern Australia

Listing advice (TSSC, 2010) and the supporting policy statement (DSEWPaC, 2012a) describe this community in two condition states: an intact woodland form (treed condition state) and a derived native grassland form where tree cover has been historically removed (derived grassland condition state).

The methods used to identify this community in both of its states, are summarised in **Table B5.6** and are taken from TSSC (2010). A randomised sampling approach was used to collect ground-layer condition information for the woodland community. This method is outlined in detail in **Appendix B5.B**.

Natural Temperate Grassland of the Victorian Volcanic Plain

A field checklist (**Appendix B5.A**) was used to identify the presence or absence of NTGVVP in areas mapped as suitable EVCs (i.e. Heavier-soils Plains Grassland).

The checklist was based on the key diagnostic characteristics and condition thresholds outlined in the listing advice for the TEC (TSSC, 2008). Where this was unclear, further clarity was sought from the NTGVVP Information Sheet (DSEWPaC, 2011a) and, if required, guidance provided by DCCEEW (and its predecessors).

Table B5.6
Approach for identifying the Grey Box Woodland community

Criteria	Condition Thresholds	Method used to test patch against threshold
Tree cover	If tree crown cover is at least 10%, the 'treed' condition state is present. If tree crown cover is less than 10%, the 'derived grassland' condition state is present.	Assessment of tree crown cover from aerial photography and ground observations.
Dominant tree species	For treed patches, Grey Box must be the dominant or co-dominant tree species in the canopy layer. For derived grassland, there must be evidence that the vegetation was once woodland dominated or co-dominated by Grey Box.	For treed patches, identification of dominant tree species on site. For derived grassland, assessment of historical records (e.g. aerial imagery) and observations of trees stumps, logs, recruitment or regenerating Grey Box.
Patch size	Patch must be greater than 0.5 ha to firstly qualify as the community, and then different native cover and diversity thresholds apply based on a 2 ha threshold for patches in the 'treed' condition states.	Patches were mapped to determine size and areas. Minor physical barriers were aggregated based on ecological function (e.g. fauna movement prospects, seed/genetic dispersal, water and nutrient cycling, recruitment and regeneration).
Weediness	The vegetation cover of non-grass weeds in the ground layer is less than 30% at any time of the year. Any site that has >=30% cover of non-grass weeds in the ground layer is not the community.	For treed patches, plant cover data was collected according to a comprehensive life form schema using 47 randomly located 50 x 1m point intercept transects (i.e. 2350 data points across the site, Appendix B5.B). For derived grassland patches, plant covers were estimated with reference to cover charts and, if required, 1 x 1 m quadrats.
Tree stem size and density	For treed patches ≥2 ha in size there must be at least 8 trees/ha that are >60 cm DBH or hollow-bearing. For treed patches ≥2 ha in size that do not meet the large tree and hollow tree density requirements above there must be at least 20 live trees/ha that are >12 cm DBH.	Tree size, hollow status and density sampling was undertaken using 31 randomly allocated 1 ha plots.
Species richness/ diversity	For treed patches <2 ha, there must be at least 8 perennial native species in the mid and ground layers. For derived grassland patches, there must be at least 12 perennial native species in the ground layer.	For treed patches, plant cover data was collected according to a comprehensive life form schema using 47 randomly located 50 x 1 m point intercept transects (i.e. 2350 data points across the site, Appendix B5.B). For derived grassland patches, plant covers were estimated with reference to cover charts and, if required, 1 x 1 m quadrats. Plant species richness data in derived patches was collected using the VQA method.
Perennial native species cover	For treed patches ≥2 ha with at least 8 trees/ha that are >60 cm DBH or hollow-bearing, perennial native grasses must make up ≥10% perennial native grass cover in the ground layer. For all other patches (derived grassland, treed patches <2 ha in size or treed patches ≥2 ha in size with at least 20 live trees/ha that are >12 cm DBH), perennial native species must make up ≥50% of total perennial ground layer vegetation cover.	For treed patches, plant cover data was collected according to a comprehensive life form schema using 47 randomly located 50 x 1 m point intercept transects (i.e. 2350 data points across the site, Appendix B5.B). For derived grassland patches, plant covers were estimated with reference to cover charts and, if required, 1 x 1m quadrats. Tree size, hollow status and density sampling undertaken using 31 randomly allocated 1 ha plots.

The approach to completing the field checklist is outlined in Table B5.7. The percentage cover of native flora within each grassland patch was estimated by reference to predefined cover charts. Where cover estimates were close to the condition threshold, gridded one-by-one metre quadrats (square frames) were used to objectively sample plant cover within the grassland patch and confirm the veracity of cover estimates.

For the purposes of assessing minimum contiguous size thresholds, the 'grassland patch' was taken to be the area of contiguous grassland that otherwise met all other key diagnostic characteristics and condition thresholds for the TEC – rather than the (generally larger) Heavier-soils Plains Grassland patch.

In addition, the 'native vegetation remnant' was taken to be the contiguous area of native vegetation, whether or not belonging to more than one EVC. DCCEEW (formally DAWE) has confirmed that this interpretation is correct and upholds the intention of the listing advice (J. Vranjic, DAWE, pers. comm., March 2020).

Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains

The listing advice for this TEC gives the condition thresholds applying under various environmental conditions (TSSC, 2012). Part A of the condition thresholds was used because field surveys were not undertaken during a prolonged period of drought (i.e. more than one year). Rather, field surveys were undertaken in summer, during typical seasonal wetting and drying, including after periods of heavy rain. The approach to completing the field assessment is outlined in Table B5.8.

Table B5.7
Approach for identifying the Natural Temperate Grassland community

Criteria	Condition Thresholds	Method used to test patch against threshold
Location	With limited exceptions, the grassland patch must be associated with Quaternary basalt soils within the Victorian Volcanic Plain bioregion.	The position of the grassland patch relative to modelled geological and bioregional boundaries was reviewed. Surface soil texture observations were made during vegetation mapping on site.
Perennial native flora cover	Native flora must make up ≥50% of total vegetation cover, excluding introduced annuals, within the grassland patch.	The percentage cover of native flora within each grassland patch was estimated with reference to cover charts and, if required, 1x1 m quadrats.
Dominant grass genera	Grasses in the genera *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* make up ≥50% of total native species cover.	The percentage cover of the four key native grass genera within each grassland patch was estimated with reference to cover charts and, if required, 1x1 m quadrats.
Weediness	For grassland patches where *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* are the dominant native genera, one of the following thresholds must be met: Themeda, Rytidosperma, Austrostipa and/or Poa must also make up ≥50% of total perennial tussock cover or Perennial non-grass weeds must be <30% of total vegetation cover.	The percentage cover of the four key native grass genera and perennial non-grass weeds within each grassland patch was estimated with reference to cover charts and, if required, 1x1 m quadrats.
Native forb cover	For grassland patches where *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* are not the dominant native species, native forbs must make up ≥50% of total vegetation cover during spring-summer (September to February).	The percentage cover of native forbs within each grassland patch was estimated with reference to cover charts and, if required, 1x1 m quadrats.
Patch size	For a native vegetation remnant ≤1 ha, the grassland patch must be ≥0.05 ha and the crown cover of shrubs/trees >1 m tall must be ≤5%. For a native vegetation remnant >1 ha, the grassland patch must be ≥0.5 ha and there must be <2 mature trees per ha.	Contiguous native vegetation remnants and grassland patches were mapped to determine size and areas. Minor physical barriers were aggregated based on ecological function (e.g. fauna movement prospects, seed/genetic dispersal, water and nutrient cycling, recruitment and regeneration). Mature trees were counted and the crown cover of shrubs/trees >1 m estimated with the assistance of recent aerial imagery (i.e. from the past 6 months), where required.

Assessing the quality of TECs

To determine and properly assess the impact on TECs, the quality of native vegetation corresponding to a TEC was assessed using the Vegetation Quality Assessment (VQA habitat hectare) method (DSE, 2004c).

DCCEEW has previously endorsed the 'habitat hectare' method as appropriate for assessing the condition of TECs such as Grey Box Woodland, Natural Temperate Grassland and Seasonal Herbaceous Wetlands in Victoria. This method is further explained in Appendix B5.A.

For the purposes of assessing impacts and calculating offset requirements, each TEC (or condition state in the case of Grey Box Woodland) was assigned a weighted average quality score. The weighting ensured that the contribution a patch of TEC made to the average score of its TEC was proportionate to the total area of the TEC within the impact area.

Table B5.8
Approach for identifying Seasonal Herbaceous Wetlands community

Criteria	Condition Thresholds	Method used to test patch against threshold
Landscape	The patch must be in temperate Australia, on flat plains grading into slopes, lower than 500 m above sea level and generally of poorly draining clay soils, receiving 400-800 mm mean annual rainfall.	The desktop assessment revealed that the project area's location, climate, soil and geomorphology was suitable.
Hydrology	The patch must be on isolated drainage lines or depressions which are seasonally inundated (typically during winter-spring) and subsequently dry (typically by late summer). Rainfall must be the main water source and the salinity of the water is fresh to slightly brackish.	The position of the patch of vegetation in the landscape and types of plants present allowed for hydrological inferences to be made in the field.
Trees and shrubs	Trees and shrubs must be sparse or absent such that the cover of woody species accounts for ≤10% projective foliage cover across the patch.	The cover of trees, shrubs and other woody vegetation was visually estimated in the field, with the assistance of recent aerial imagery (i.e. from the past 6 months), where required.
Dominant species	Native wetland graminoids and/or native wetland forbs characteristic of the community must make up ≥50% of total vegetative cover in the ground layer.	Flora were identified and the cover of native wetland graminoids/forbs was estimated with reference to cover charts.
Native wetland graminoids	One or more of the following native wetland graminoids is typically present: *Amphibromus* spp., *Carex tereticaulis*, *Deyeuxia* spp., *Glyceria* spp., *Lachnagrostis* spp., *Poa labillardierei* and/or *Rytidosperma duttonianum*.	Flora were identified and checked against the list of species typical of the community.
Native wetland forbs	At least one species of native wetland forb must be present.	Flora were identified and checked against the list of species typical of the community.
Contra-indicators	The wetland must not be dominated by or have a significant cover (>25% vegetative cover) of contra-indicative species (e.g. Cumbungi Typha spp., Common Reed Phragmites australis, Spike rushes Eleocharis spp. etc.) or otherwise display hydrological and/or landscape features of contra-indicative EVCs (e.g. Tall Marsh EVC 821).	The position of the patch of vegetation in the landscape and types of plants present allowed for hydrological inferences to be made in the field. Flora were identified and the cover of contra-indicative species estimated with reference to cover charts.
Patch size	If the wetland occurs as a single isolated wetland, it must be ≥0.5 ha. If the wetland occurs as a cluster of many small wetlands in reasonably close proximity, the wetlands within the cluster must collectively be ≥0.5 ha across a total area ≥5 ha (i.e. wetland must account for ≥10% of the total area). If an individual wetland or wetland cluster is <0.5 ha, it must be ≥0.1 ha in size and contiguous with a native vegetation remnant that together with the wetland or wetland cluster is ≥1 ha.	Contiguous native vegetation remnants and wetland patches were mapped to determine size and areas. Minor physical barriers were aggregated based on ecological function (e.g. fauna movement prospects, seed/genetic dispersal, water and nutrient cycling, recruitment and regeneration).

B5.2.2.3
Other natural values

Common species

Information on common flora and fauna species was collected during targeted and incidental survey efforts. It has been added to the flora/fauna recorded lists in Appendix B5.B and Appendix B5.C.

Landscape

Landscape values were defined based on existing bioregional reports and landscape ecology principles, such as the physical and functional connectivity for fauna.

B5.2.2.4
Limitations

The scope of the field assessments captured the entire impact area but not the entire project area (see definitions of each area in Section B5.1). This means that the field assessments were not completed for those parts of the project area subject to existing approvals for removal of native vegetation or fauna habitat.

A discussion of significant assessment limitations and relevant government guidelines is provided below; specific limitations for particular survey methods are detailed in Appendix B5.A where relevant.

Vegetation surveys

- The survey effort was underpinned by a comprehensive coverage of grassland vegetation and a sampling approach for woodland vegetation.
- The dynamic nature of grassy ecosystems means that, over time, vegetation communities change naturally in response to seasonal conditions; and also due to land-management practices (e.g. grazing, slashing). Given that vegetation communities are dynamic, and assessments are snapshots taken at a particular moment in time, a number of limiting factors influence the results of the assessment (these are not mutually-exclusive and their influence varied throughout the assessment period.) Land-management practices influence vegetation structure and floristics on short to medium timescales. Therefore, patch delineation and quality assessments (e.g. habitat hectares assessments) must rely on observed conditions at the time of assessment
- Use of handheld uncorrected GPS means vegetation boundaries are generally accurate to three-to-five metres, corrected through aerial photography interpretation when necessary
- For most temperate grassy ecosystems. the majority of species grow and flower through winter to midsummer. Assessments were conducted over most of the flowering season. This allowed detectability in plant traits, cover, and species richness across the seasons that would contribute to the overall quality assessment outcomes
- The boundaries between Hills Herb-rich Woodland (EVC 71), Plains Woodland (EVC 803) and Plains Grassland (EVC 132) were mapped according to floristics as observed on the ground, historic records (e.g. historic plans and 1946 aerial imagery) and soil/geology. However, the transition between these vegetation types typically occurs over an ecocline. This means the boundary between vegetation types can be diffuse and difficult to define at the site scale. At Melbourne Airport, defining a boundary between woodland and grassland is made more challenging by historic and present land uses. These have resulted in the removal of mature trees from areas of Plains Woodland (EVC 803) in the airside area, thereby converting woodland into derived grassland. While every effort was made to accurately map boundaries between woodland and grassland vegetation types, it should be understood that these boundaries are a construct and therefore do not necessarily represent a clear point of transition visible at all times of the year.

Fauna surveys

- The current survey program was largely undertaken in the spring and summer months, when the majority of fauna species are present, active and readily detectable. However, species active in the autumn and winter months may be present within the project area and undetected during the current survey period
- Targeted surveys for EPBC Act-listed species were undertaken during timeframes recommended by Commonwealth survey guidelines
- The Striped Legless Lizard is a cryptic species and may not be detected by surveys even when present (DSEWPaC, 2011b). Biosis considers the current targeted survey effort – along with the extensive previous surveys undertaken across a large proportion of the project area (Figure B5.9) – sufficient to conclude that the species is highly unlikely to be present within the project area
- A sampling approach was taken for all targeted fauna surveys. For those parts of the project area that were not specifically targeted, additional targeted surveys for fauna were considered unnecessary, given the extent of surrounding targeted fauna surveys and knowledge of the area.

B5.2.3
Potential impacts from flight paths

Desktop assessment was completed to identify potential impacts to species and communities listed as MNES under the EPBC Act, as a result of noise generated from the new flight paths associated with the M3R project. The assessment found the following:

- It is unlikely that the increased noise levels will modify the habitat to the extent that any flora species or ecological communities are likely to decline or the breeding cycles of listed flora species interrupted. Significant impacts to listed flora species, Wetlands of International Importance and ecological communities as a result of increased noise pollution are unlikely.
- There is potential for significant impact to occur to some listed fauna species offsite. This potential impact is largely due to the limited understanding of noise thresholds for these species. Of the listed species identified for potential impact, the Lesser Sand Plover is the only species that occurs within the M3R 'Build' scenario that does not already occur within the 'No Build' scenario noise contour – N60(24hr) >10 (for annual average day).
- There is potential for significant impact to some migratory wader birds which are known to be sensitive to noise and potentially roost within the southern boundary of the M3R Build scenario noise contour (N60(24hr) >10 (for annual average day)) study area, bordering Port Phillip Bay and adjacent to the Point Cook wetlands which will be subject to new impacts under this noise contour. This potential impact is because it is unknown as to whether the increase in noise will result in the species no longer utilising roosting habitat within the area.

Further information regarding the proposed flight paths is outilned in Part C of the MDP.

B5.3
STATUTORY AND POLICY REQUIREMENTS

This section provides a summary of key biodiversity legislation and government policy relevant to the project.

B5.3.1
Applicability of Victoria and Commonwealth legislation and policy

The 834-hectare project area currently includes approximately 821 hectares of Commonwealth land (under jurisdiction of the Commonwealth of Australia) and approximately 13 hectares of freehold land (under jurisdiction of the State of Victoria).

However, it is expected that the freehold land will soon be vested in the Commonwealth and that the entire 834-hectare project area will be Commonwealth land before approval and commencement of M3R. The findings and impact assessments in this report are therefore based on the assumption that the project area is entirely Commonwealth land.

The provisions of the Airports Act and associated regulations are intended to 'cover the field' and provide a comprehensive regime for development at the airport. Although some Victorian environmental laws can apply to Commonwealth land at Melbourne Airport (as per section 136 of the Airports Act) the FFG Act is excluded due to the operation of the provisions of the Airports (Environment Protection) Regulations 1997 that deal with biota and habitat. Similarly, section 112(2) of the Airports Act states that Part 5 of the Act applies to the exclusion of State laws relating to the regulation of building activities or land-use planning, which would include the *Victorian Planning and Environment Act 1987* (P&E Act).

B5.3.2
Commonwealth legislation and policy

B5.3.2.1
Airports Act 1996

The Airports Act and associated *Airports (Environment Protection) Regulations 1997* govern planning approvals and procedures on Commonwealth land at Melbourne Airport. A Major Development Plan (MDP) is required for each major development on Commonwealth land at Melbourne Airport (Airports Act s.88). The Act defines actions that constitute a major development and therefore require an MDP (Airports Act s.89).

B5.3.2.2
Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act applies to actions (e.g. developments and associated activities) with the potential to significantly impact Matters of National Environmental Significance (MNES) or the environment on Commonwealth land.

MNES are typically listed under the EPBC Act following listing advice provided for each MNES (this listing advice is the authoritative description of a MNES). Further policy documents may help with clarifying listing advice, and identifying the presence or absence of specific MNES. Ecological MNES relevant to the project are identified in Section B5.2 and Section B5.5 of this chapter.

The EPBC Act Significant Impact Guidelines 1.1 (DoE, 2013) provide a framework against which potential significant impacts on MNES are assessed. Species-specific significant impact guidelines may further help define significant impacts to certain listed threatened species (e.g. DEWHA, 2009a; DEWHA, 2009b; DoE, 2015; DoEE, 2017). An assessment against the Significant Impact Guidelines 1.1 (DoE, 2013) (and any associated species-specific significant impact guidelines) is provided in Section B5.6.

Section 26 of the EPBC Act requires that APAM seek approval for any action on Commonwealth land that has, will have or is likely to have a significant impact on the environment or any action outside Commonwealth land that has, will have or is likely to have a significant impact on the environment on Commonwealth land.

The EPBC Act Significant Impact Guidelines 1.2 (DSEWPaC, 2013) provide guidance for identifying environmental values and assessing potential significant impacts on the environment as a whole. In accordance with the Significant Impact Guidelines 1.2 State environmental legislation and policy may assist in identifying special environmental values. The Significant Impact Guidelines 1.2 indicate that 'State government protected species lists and heritage lists may assist in identifying components of the environment with special value' and that 'local government may also have information about rare or otherwise important elements of the environment' (DSEWPaC, 2013 p.8).

B5.3.3
Victorian legislation and policy

B5.3.3.1
Flora and Fauna Guarantee Act 1988

The FFG Act is the state's key piece of legislation for the conservation of threatened species and communities, and management of potentially threatening processes in Victoria.

The FFG Act does not apply to Commonwealth land at Melbourne Airport, being excluded by the operation of the Commonwealth Airports (Environment Protection) Regulations 1997. Furthermore, the offences and permit requirements of the FFG Act for the handling of flora do not apply to private land (unless part of critical habitat for the flora). For the purposes of the FFG Act, private land includes land that APAM has leased or purchased at Melbourne Airport because APAM has a right to exclusive possession of this leasehold and freehold land.

However, in accordance with the Significant Impact Guidelines 1.2, the FFG Act as a Victorian Government biodiversity protection mechanism is used as a guide for identifying ecological components of the environment that can be considered to have 'special value' (DSEWPaC, 2013 p.8). Threatened taxa, threatened communities and threatening processes listed under Section 10 of the FFG Act, associated Action Statements, Victorian Scientific Advisory Committee determinations and the Flora and Fauna Guarantee Amendment Act 2019 (which came into effect on 1 June 2020), provide local context for an assessment of impacts to the environment on Commonwealth land under the Significant Impact Guidelines 1.2.

B5.3.3.2
Planning and Environment Act 1987 (inc. planning schemes)

The P&E Act controls the planning and development of land in Victoria; and provides for the development of a comprehensive set of planning provisions for the state (the Victoria Planning Provisions) and specific planning schemes for all municipalities. The local Hume Planning Scheme recognises the Commonwealth's exclusive power to legislate in respect of Commonwealth land at Melbourne Airport, identifying it as 'Commonwealth Land not controlled by Planning Scheme' (Hume Planning Scheme Map Numbers 15, 16, 21, 22, 25 and 26).

Removal, destruction and lopping of native vegetation in Victoria is regulated through the planning schemes and through Victoria's *Guidelines for the Removal, Destruction or Lopping of Native Vegetation* (DELWP, 2017) which is an incorporated document of all planning schemes in Victoria.

These provide a policy setting for defining native vegetation, assessing its values, making decisions regarding clearing and providing compensatory offsets. Although the P&E Act, and therefore the Guidelines, do not directly apply to Commonwealth land at Melbourne Airport, the Guidelines do provide standard methods for defining and assessing native vegetation. These methods have been applied in the absence of a standard Commonwealth approach to native vegetation assessment.

B5.4
DESCRIPTION OF SIGNIFICANCE CRITERIA

B5.4.1.1
Impact assessment approach

In accordance with the Significant Impact Guidelines 1.1, significant impact self-assessments were undertaken for all EPBC Act-listed species, ecological communities and migratory species recorded or assessed as having a medium to high likelihood of occurring within the project area (DoE, 2013). Where available, species-specific significant impact guidelines were relied on to make impact assessments (e.g. DEWHA, 2009a; DEWHA, 2009b; DoE, 2015; DoEE, 2017).

For actions on, or adjacent to, Commonwealth land, impacts on the environment as a whole must be considered. A significant impact self-assessment for relevant ecological features of the environment as a whole was conducted in accordance with the Significant Impact Guidelines 1.2.

B5.4.1.2
Likelihood of a significant impact

A significant impact on the environment is 'likely' if there is a real or not remote chance or possibility of the impact occurring (DoE, 2013).

The significant impact criteria outlined in the Significant Impact Guidelines 1.1 (DoE, 2013), Significant Impact Guidelines 1.2 (DSEWPaC, 2013) and species-specific significant impact guidelines (e.g. DEWHA, 2009a; DEWHA, 2009b; DoE, 2015; DoEE, 2017) were assessed for the project.

The 'likelihood of impact criteria' defined in **Table A8.3 in Chapter A8: Assessment and Approvals Process** were used for this assessment. All categories except for 'rare' are likely to result in a significant impact on the environment as per the relevant significant impact guidelines.

B5.4.1.3
Severity of impact

The severity of an impact is a useful concept when referring to the thresholds for significant impacts on ecological MNES; or to the scale, intensity, timing, duration and frequency of an impact on an ecological component of the environment as a whole.

Table B5.10 describes the criteria used in this chapter to define the severity of an ecological impact (whether on MNES or the environment as a whole). For the purposes of this chapter, where an impact on ecological values would meet the significant impact criteria outlined in any of the relevant Significant Impact Guidelines, it would be considered an impact of major severity.

Ultimately, significant impact assessments must consider the likelihood of an impact occurring, in addition to the severity of the impact if the impact were to occur. The question is whether there is a 'real or not remote chance or possibility' of the impact occurring (DSEWPaC, 2013; DoE, 2013). **Chapter A8: Assessment and Approvals Process** provides a framework for combining severity and likelihood.

The significance matrix is applied in **Section B5.8 Conclusion**, which includes an assessment of the significance of the project's impacts on ecological MNES and components of the environment.

Table B5.9
Severity assessment criteria for ecological impacts

Magnitude	Specialist criteria
Major	A significant impact on an EPBC Act listed threatened species, ecological community or migratory species as defined by the Significant Impact Guidelines 1.1 (DoE, 2013) or relevant species-specific guidelines, where the impact is likely to result in population decline and / or reduction in extent or area of occupancy. A significant impact on the environment, as defined by the Significant Impact Guidelines 1.2 (DSEWPaC, 2013).
High	Any adverse impact on an EPBC Act listed threatened species, ecological community or migratory species that is not significant according to the Significant Impact Guidelines 1.1 (DoE, 2013) and / or is unlikely to result in population decline and / or adversely affect status and extent. Significant adverse impact to a state significant species or ecological community that is likely to result in population decline and / or reduction in extent or area of occupancy.
Moderate	Adverse impacts on native vegetation, as defined by Victoria's Native Vegetation Guidelines (DELWP, 2017), that does not constitute an ecological community of national or state significance. Adverse impacts on flora and / or fauna values of regional importance or on a regional scale. For significant species and ecological communities at a national and / or state scale, adverse impacts are considered moderate once appropriate offsets or controls have been established to mitigate impacts on the national and state scale.
Minor	Adverse impacts on flora and / or fauna values at a local scale only. For significant species and ecological communities, adverse impacts are considered minor once appropriate offsets or controls have been established that mitigate impacts on the national, state and regional scale.
Negligible	No or minimal adverse impacts on flora and / or fauna values at the local scale.
Beneficial	An enhancement of existing ecological values.

B5.4.1.4
Duration of impact

The duration of the impact is considered in the significance matrix applied in **Section B5.8**. The duration-of-impact criteria in **Table A8.2 in Chapter A8: Assessment and Approvals Process** is utilised in this assessment.

B5.5
EXISTING CONDITIONS

Melbourne Airport land can be divided into airside and landside, which represent significantly different land uses and conditions.

Airside is a highly-managed environment containing runways, taxiways, and other infrastructure directly associated with operating the airfield. It is a large flat expanse characterised by hard surfaces, outbuildings and technical equipment, and is surrounded by a large expanse of grassed areas.

Relevant management activities occurring within the airfield include:

- Regular slashing of grasses, with some areas (e.g. near critical infrastructure) mowed up to once per week
- Use of bird deterrents such as motion-activated noise generators and shooting (as a last resort) to reduce the risk of aircraft wildlife strike
- Insecticides applied alongside some lengths of runway to reduce foraging by birds in these high-risk wildlife strike zones.

Airside is undergoing or has recently undergone significant disturbance, subject to relevant approvals, with major earthworks being undertaken for the construction of the Taxiway Zulu and Northern Access project.

Landside is a highly variable landscape: some areas are highly modified and developed (i.e. the business park) while others are used for cattle grazing. Some of these areas have been subject to pasture improvement while others are relatively intact. A large intact woodland area is located in the north-west. An operational construction-materials plant is located south-west of the woodland. Much of landside has been degraded through past land use and it contains expanses of weedy areas punctuated with native vegetation.

B5.5.1
Environmental features

B5.5.1.1
Climate, soil, geomorphology and land use history

Climate, soil and geomorphology influence the observable vegetation and habitat types within the project area.

DELWP's pre-1750 EVC modelling is available via NatureKit and suggests that, before the industrial revolution, the northern two-thirds of the project area (including areas where there are now runways) mostly supported Plains Grassy Woodland, while the southern third of the project area (including a projection north along Arundel Creek) mostly supported Plains Grassland.

Although DELWP's pre-1750 EVC modelling uses climate, soil and geomorphological data as inputs, it is a coarse representation of vegetation types at a landscape scale, ranging from 1:25,000 to 1:100,000 (DELWP, 2020). Historic survey plans, historic aerial imagery, geological maps and contemporary on-ground floristics strongly suggest that DELWP's pre-1750 EVC modelling is not an accurate representation of the vegetation types that were – and, to some extent, still are – present at Melbourne Airport.

Historic parish and subdivision plans from 1840, c.1849 and 1850 suggest that distribution of woodland and grassland across the project area was similar to the present day (**Figure B5.2**, **Figure B5.3** and **Figure B5.4**).

The plans of 1840 and c.1849 describe a 'thick scrubby forest of stringy bark' at the current location of the woodland; and the vegetation to the south, where grassland is currently the predominant vegetation type, as 'open plains', 'plains thinly wooded' or 'good pasture' (Kemp, 1840; DoL c.1849; **Figure B5.2** and **Figure B5.3**).

Robert Hoddle's 1850 subdivision plan places a curved label for 'box forest' along the curved south-western boundary of the present-day woodland. It labels the area immediately south as 'open plain red soil' – in an area currently grassland but described by NatureKit as Plains Grassy Woodland (Hoddle, 1850; DELWP, 2020; **Figure B5.4**).

Maps produced by the Commonwealth Department of Defence (DoD, 1915; DoD, 1938) and Victorian Department of Crown Lands and Survey (DCLS) in the early 1900s add further weight to contemporary vegetation mapping as opposed to NatureKit modelling. DoD maps from 1915 and 1938 depict a dense stand of 'timber' in the vicinity of the present-day woodland, and very sparse trees in what is now grassland further south (DoD, 1915; DoD, 1938; **Figure B5.5** and **Figure B5.6**). Similarly, a 1946 photo map covering part of the project area shows that the woodland boundary then extended almost as far south and east as the current runways – very similar to the present-day distribution of woodland and derived grassland (DCLS, 1946; **Figure B5.7**).

In line with historic maps and plans, geomorphology and floristics suggest that the majority of the project area would have been grassland; with woodland concentrated around a granodiorite rise and outwash known as Radar Hill in the north adjacent to the project area (**Figure B5.8**).

Radar Hill is represented on some historic plans of the area (e.g. DoL, c.1849; **Figure B5.3**). Geological maps show that Radar Hill is a granodiorite or granite intrusion surrounded by plains of basalt lava flows (Mines Department, 1970; Mines Department, 1973; DNRE, 1997; Senversa, 2020, unpublished). While the basalt plains are characteristic of the Victorian Volcanic Plain bioregion and mapped as such on NatureKit (DELWP, 2020), the granodiorite rise of Radar Hill is likely an outlier of the nearby Central Victorian Uplands bioregion.

As the main geological formations weathered over time, relatively infertile granodiorite-derived soils (supporting woodland) have developed at Radar Hill while relatively fertile basalt-derived soils (supporting grassland) formed on the surrounding plain. In addition, granodiorite has weathered and washed out over areas of basalt immediately surrounding Radar Hill, leading to diffuse soil boundaries which in some cases are reflected by diffuse vegetation boundaries between woodland and grassland. Climate, soil and geomorphology have influenced the following floristic patterns observable today and documented in various maps since 1840:

- The granodiorite rise of Radar Hill supports a central patch of Hills Herb-rich Woodland which is often found on granite hill landforms and well-drained-soils (DSE, 2004a)
- A ring of Plains Woodland encircles the Hills Herb-rich Woodland on the basalt surrounding the granodiorite. Plains Woodland generally occurs on silty, loamy or clay topsoils with heavy subsoils. The soils in this area are predominantly basalt-derived and therefore heavy, although weathered, granodiorite is present at or near the surface (washed away from the central rise) and adds a silty component. Gilgai micro-relief is also present in the Plains Woodland, typical of heavy clay soils
- The ring of Plains Woodland appears incomplete due to the removal of trees from the southern and eastern sides (i.e. airside) resulting in the presence of Plains Woodland in derived grassland form
- Within the project area, the derived grassland form of Plains Woodland is typically distinguishable from Plains Grassland on the basis of floristic composition, as follows:
    - Characteristic woodland species, such as Eucalypts *Eucalyptus* spp. (including stumps or suspected stumps), Golden Wattle *Acacia pycnantha*, Gold-dust Wattle *Acacia acinacea* and Common Eutaxia *Eutaxia microphylla*, are present in derived grassland, albeit in stunted or prostrate form due to being regularly slashed. The outermost occurrences of these species (i.e. those records that were most distant from Radar Hill) typically corresponded closely to the woodland boundary observable in 1946 (DCLS, 1946; **Figure B5.7**)
    - Silky Blue-grass *Dichanthium sericeum* subsp. *sericeum* and/or Red-leg Grass *Bothriochloa macra* seem to favour areas of historical disturbance (e.g. tree removal) and soils that appeared to be basaltic with granodiorite (granitic sand) at the surface. Therefore, the boundary between the derived grassland form of Plains Woodland and Plains Grassland often corresponds closely with the point at which there is a strong transition between grassland dominated almost entirely by Silky Blue-grass and/or Red-leg Grass (Plains Woodland) and grassland dominated by wallaby grasses *Rytidosperma* spp. and spear grasses *Austrostipa* spp. (Plains Grassland)
- DELWP's pre-1750 EVC modelling suggests that most woodland within the project area would have been Plains Grassy Woodland (EVC 55_61) which is typically dominated by River Red-gum *Eucalyptus camaldulensis* (DSE 2004b). Woodland around Radar Hill is in fact dominated by Grey Box *Eucalyptus microcarpa*, making Hills Herb-rich Woodland (EVC 71) and Plains Woodland (EVC 803) more appropriate EVCs to assign to this vegetation
- The mean annual rainfall within the project area is 531.3 millimetres (BoM, 2020). Grassland within the project area is therefore more likely to be Heavier-soils Plains Grassland (EVC 132_61) that occurs in areas with a mean annual rainfall of at least 500 millimetres.

B5.5.1.2 Wetlands and waterways

Melbourne Airport land is located on broad expanses of basalt plains with a low rise (Radar Hill) in the north-west. These plains and Radar Hill are bounded by watercourses surrounded by escarpment, hillslopes, cliffs and floodplains to the north-west (Deep Creek), south/south-west (Maribyrnong River) and east (Moonee Ponds Creek); and cutting through the middle of the land from north to south (Arundel Creek and Steele Creek/Steele Creek North).

Other smaller drainage lines and channels associated with these waterways are dispersed across the project area. The three catchment areas for Melbourne Airport are the Maribyrnong River, Arundel Creek and Moonee Ponds Creek; which ultimately discharge into the Yarra River and on to Port Phillip Bay.

Deep Creek is characterised by a deep and narrow valley cut through the surrounding basalt plains, with steep escarpments rising up from the edges of the waterway. In some places these rise immediately adjacent to the waterway and in others they rise beyond areas of floodplain. Within the project area, Deep Creek has many bends that form permanent, still pools of water, and the creek is well vegetated. Deep Creek reaches a confluence with Jackson's Creek where they join and form the Maribyrnong River, a wide, deep and permanent waterway that flows into the Yarra River. The section of Maribyrnong River closest to the project area is wide and fast flowing.

Arundel Creek runs north to south through the centre of Melbourne Airport and connects with the Maribyrnong River south of the airport estate. Arundel Creek is a narrow waterway for most of its length, interspersed with small impoundments and two inline water storage dams.

Moonee Ponds Creek flows in the north-east of the project area and can be considered a semi-permanent waterway. During years of below-average rainfall, the majority of pools within the creek are dry. Historically, Moonee Ponds Creek was known as Moonee Moonee Chain of Ponds which is descriptive of this waterway's nature.

Other unnamed tributaries and drainage channels occur throughout the project area. These have been

modified and comprise a series of impoundments and drainage lines that were dry at the time of assessment (containing little to no water). Some dams are located in paddocks with livestock access, resulting in highly turbid water, pugged embankments, and little to no fringing or aquatic vegetation. Other dams are fenced off from livestock and in better condition.

The majority of Arundel Creek is located within the impact area. Only small areas of the terrestrial land adjacent to Deep Creek and the Maribyrnong River are included within the impact area.

B5.5.1.3
Flora species and vegetation types

A total of 298 plant taxa were recorded in the project area: 136 were native and 162 introduced. A flora species list is presented in **Appendix B5.B**.

Site investigations identified seven terrestrial and two wetland EVCs including:

- Plains Grassy Woodland (EVC 55)
- Creekline Grassy Woodland (EVC 68)
- Hills Herb-rich Woodland (EVC 71)
- Heavier-soils Plains Grassland (EVC 132_61)
- Riparian Woodland (EVC 641)
- Plains Woodland (EVC 803)
- Escarpment Shrubland (EVC 895)
- Aquatic Herbland (EVC 653)
- Tall Marsh (EVC 821).

The remaining vegetation and land cover in the project area is predominantly introduced vegetation and highly-modified. Open water also occurs in association with local creeks and farm dams.

Vegetation types are described in detail in **Table B5.10**. It was determined that the patch of Hills Herb-rich Woodland at Radar Hill corresponded with an outlier of the Central Victorian Uplands bioregion and therefore assessed accordingly (Note: the EVC benchmarks for Hills Herb-rich Woodland are identical to the Victorian Volcanic Plain and Central Victorian Uplands bioregions).

B5.5.1.4
Fauna species and habitat

A total of 72 native and four introduced fauna species were recorded within and adjacent to the project area.

A list of all fauna species recorded during the current field assessment and the 2019 Growling Grass Frog survey (Biosis, 2019b) is provided in **Appendix B5.C**. A breakdown of the detection method for each species is also included. Habitat types for the fauna groups present are described in **Table B5.10** and waterways in **Section B5.5.1.2**.

B5.5.1.5
Landscape context

The project area is located in Melbourne's northern suburbs. Native vegetation has either been cleared or become degraded on most land within five kilometres of the project area. This is due to agricultural activities (mostly livestock grazing) or industrial and residential development.

Nearby waterways (Deep Creek, Jacksons Creek, Arundel Creek, Maribyrnong River and Moonee Ponds Creek) provide the most intact dispersal corridors for fauna. The largest and most intact areas of native vegetation outside the project area, but within the local area, are Woodlands Historic Park to the north-east and Organ Pipes National Park to the west.

Table B5.10
Summary of vegetation and fauna habitat values within the project area (Figure B5.17)

EVC	Vegetation description	Fauna values	Location
Plains Grassy Woodland EVC 55	**Structure:** Small patches dominated by introduced weed species and disturbance-tolerant native species. **Character species:** The dominant overstorey species is typically River Red-gum *Eucalyptus camaldulensis*, although this species was absent from most Plains Grassy Woodland patches within the project area. Understorey species include Golden Wattle *Acacia pycnantha*, Lightwood *Acacia implexa* and Hedge Wattle *Acacia paradoxa*. The ground layer includes native grasses such as Wallaby Grasses *Rytidosperma* spp. and Spear Grasses *Austrostipa* spp. Small herbs are generally present, but prostrate shrubs are the most common non-grass ground cover, particularly Berry Saltbush *Atriplex semibaccata* and Nodding Saltbush *Einadia nutans*. **Weeds:** High threat species such as Serrated Tussock *Nassella trichotoma*, Chilean Needle-grass *Nassella neesiana* and Panic Veldt-grass *Ehrharta erecta* occur.	Plains Grassy Woodland provides habitat for a range of common fauna species such as possums, birds, macropods, bats, reptiles and amphibians. It provides potential nesting and roosting areas for large birds of prey such as Wedge-tailed Eagle *Aquila audax* and owl species. Where the ground cover is dominated by appropriate food species and canopy cover is dispersed, it has the potential to provide habitat for the critically endangered GSM. Plains Grassy Woodland present in the project area is too disturbed to provide habitat for SLL.	This EVC has limited distribution in the project area and is highly fragmented and modified.
Creekline Grassy Woodland EVC 68	**Structure:** An open woodland growing along seasonal creeks and drainage lines with a grassy/sedgy understorey. In some areas, the overstorey is a mix of native species and planted trees. **Character species:** Overstorey is River Red-gum with an understorey of *Cumbungi Typha* spp., Common Reed *Phragmites australis*, Club-rush *Schoenoplectus tabernaemontani*, Hollow Rush Juncus amabilis, Pale Knotweed *Persicaria lapathifolia*, Little Club-sedge *Isolepis marginata*, Common Tussock-grass *Poa labillardierei* and Weeping Grass *Microlaena stipoides* var. *stipoides*. **Weeds:** Common weed species include Spiny Rush *Juncus acutus*, Creeping Buttercup *Ranunculus repens*, Drain Flat-sedge *Cyperus eragrostis*, Panic Veldt-grass *Ehrharta erecta* and Water Couch *Paspalum distichum*.	Provides habitat for a range of common fauna species such as possums, birds, macropods, bats, reptiles, and amphibians. Significant species likely to utilise this habitat include the GGF. Migratory waterbird species may use this habitat on occasion including Latham's Snipe.	Along the riparian zones of Arundel Creek and Deep Creek.
Hills Herb-rich Woodland EVC 71	**Structure:** An open woodland with a sparse shrub layer and grassy ground layer on gently rising elevated locations. **Character species:** Overstorey is dominated by Grey Box *Eucalyptus microcarpa* with occasional Yellow Box *E. melliodora*. The understorey shrub layer is consistently sparse with occasional Fragrant Saltbush *Rhagodia parabolica*, Tree Violet *Melicytus dentatus*, Golden Wattle and Lightwood. The ground layer includes native graminoids and herbs such as Wallaby Grasses, Spear Grasses, Finger Rush *Juncus subsecundus*, Black Anther Flax-lily *Dianella revoluta*, Kidney Weed *Dichondra repens* and Grassland Wood-sorrel *Oxalis perennans*. Green Rock Fern *Cheilanthes austrotenuifolia* also occurs on dry well-drained soils that typify this EVC. This EVC is floristically and structurally similar to EVC 803 but has a lower cover of chenopods and less bare ground and bryophyte cover. **Weeds:** Weed cover is variable and dominated by annual species such as Annual Veldt-grass *Ehrharta longiflora*, Rat's-tail Fescue *Vulpia myuros* and Hair-grass *Aira* sp. Perennial high threat species have a moderate cover and include Serrated Tussock, Galenia *Aizoon pubescens* var. pubescens, African Box-thorn *Lycium ferocissimum*, Prickly Pear *Opuntia* sp. and Horehound *Marrubium vulgare*.	This habitat type is frequented by macropods, a diverse range of woodland bird species and provides habitat for bats, reptiles, frogs, possums and other mammals and invertebrates.	A contiguous patch of habitat embedded in EVC 803 in the north-west part of the project area. Occurs on areas of outcropping granite and well-drained granitic outwash soils.

Values of State significance	Values of National significance	Photo
Western Basalt Plains (River Red Gum) Grassy Woodland, which is threatened under the FFG Act, is generally affiliated with the Plains Grassy Woodland EVC. However, all patches of this EVC within the project area are highly modified and lack the clearly-recognisable open canopy of River Red-gum. While there are no minimum patch size or strict condition thresholds for this community, the patches are too fragmented and highly modified to match the description of this community.	When River Red-gum is the dominant canopy species, Plains Grassy Woodland (EVC 55) has affinities with Grassy Eucalypt Woodland of the Victorian Volcanic Plain, which is listed as critically endangered under the EPBC Act. However, all patches of this EVC recorded within the project area are less than 0.5 ha and highly fragmented, meaning they do not meet the size or condition thresholds to qualify as this community (TSSC, 2009). This EVC may be visited by the vulnerable Grey-headed Flying-fox when trees are in flower.	 **Plate B5.1** **EVC 55 Plains Grassy Woodland**
This EVC does not represent an FFG Act listed community.	This EVC does not represent an EPBC Act listed TEC as associated riparian vegetation does not fit the key landscape setting and floristic diagnostics of any listed woodland or wetland community. Growling Grass Frog terrestrial habitat is associated with this vegetation type in the project area. This EVC may be visited by the vulnerable Grey-headed Flying-fox when trees are in flower. The EVC also provides habitat for Latham's Snipe.	 **Plate B5.2** **EVC 68 Creekline Grassy Woodland**
This habitat type is synonymous with the FFG Act listed Victorian Temperate Woodland Bird Community. This community is defined by a group of bird species which are totally or largely restricted to temperate woodland habitats and commonly associated with Box Iron-Bark, Yellow Box, Cypress Pine (and other) woodland tree species. A large percentage of the species recorded in the Grey Box Woodland in the north of the study area are included within this community.	The treed areas of the project area woodland represent the Grey Box Woodland TEC, listed as endangered under the EPBC Act listed. This area provides habitat for the critically endangered Swift Parrot and the vulnerable Grey-headed Flying Fox.	 **Plate B5.3** **EVC 71 Hills Herb-rich Woodland**

EVC (cont.)	Vegetation description (cont.)	Fauna values (cont.)	Location (cont.)
Plains Grassland EVC 132	**Structure:** Typically a low growing treeless vegetation community dominated by grasses and herbs. Scattered trees and shrubs are often present. Dominant tussock-forming grass species vary across seasons, soil types and according to disturbance history. **Character species:** Dominant C3 grasses include Wallaby Grasses and Spear Grasses. Dominant C4 grasses include Silky Blue-grass *Dichanthium sericeum* subsp. *sericeum*, Red-leg Grass *Bothriochloa macra*, Windmill Grass *Chloris truncata*, Kangaroo Grass *Themeda triandra*, Rigid Panic *Walwhalleya proluta* and Hairy Panic *Panicum effusum*. Commonly encountered herbs include Lemon Beauty-heads *Calocephalus citreus*, Blue Devil *Eryngium ovinum*, and Bindweed *Convolvulus* spp. **Weeds:** Annual and perennial grass weeds dominate the weed flora in grassland vegetation and include Rat-tail Grass *Sporobolus africanus*, Paspalum *Paspalum dilatatum*, Cocksfoot *Dactylis glomerata*, Toowoomba Canary-grass *Phalaris aquatica*, Kikuyu *Cenchrus clandestinus*, Couch *Cynodon dactylon*, Chilean Needle-grass, Serrated Tussock, Brome-grasses *Bromus* spp., Wimmera Rye-grass *Lolium rigidum* and Oat *Avena* spp. Woody and herbaceous weeds include Artichoke Thistle *Cynara cardunculus* subsp. *flavescens*, Ribwort *Plantago lanceolata*, Buck's-horn Plantain *Plantago coronopus*, Ox-tongue *Helminthotheca echioides*, African Box-thorn, Galenia, Clover *Trifolium* spp., Medic *Medicago* spp. and Peppercress *Lepidium* spp.	Plains Grassland provides habitat for a broad range of reptiles, birds and mammals. It is important habitat for reptiles and invertebrates. This area generally represents ideal habitat for GSM, but the species has not been recorded within this habitat type in the project area. Tussock Skink was recorded broadly across the project area during the tile grid checks. The species was recorded in Plains Grassland habitat both airside and landside. The Plains Grassland present within the project area appears to be providing good habitat for the species.	Plains Grassland is the dominant native vegetation community throughout the project area. It is predominantly found in areas where some form of active land management or disturbance is occurring, i.e. grazing or slashing in landside area and slashing only in airside areas.
Plains Woodland EVC 803 (treed condition state)	**Structure:** Open woodland with variable shrub cover, including restored areas. **Character species:** Overstorey is dominated by Grey Box,with very occasional Yellow Box on well-drained soils and River Red-gum in seasonally inundated areas. The understorey varies in species richness and weed cover but generally includes a medium shrub layer of Golden Wattle, Gold-dust Wattle and Hedge Wattle. Chenopods such as Ruby Saltbush *Enchylaena tomentosa*, Berry Saltbush and Nodding Saltbush dominate the ground layer with occasional herbs, grasses and sedges including Rough Spear-grass *Austrostipa scabra* subsp. *falcata*, Wallaby Grasses, Kidney Weed, Grassland Wood-sorrel, Knob Sedge *Carex inversa*, Wattle Mat-rush *Lomandra filiformis* subsp. *coriacea* and New Holland Daisies *Vittadinia* spp. Bare ground and bryophyte cover is high in places, reflective of local climatic and soil conditions. Restored areas support a higher diversity of planted small trees and medium shrubs including Sweet Bursaria *Bursaria spinosa*, Drooping She-oak *Allocasuarina verticillata* and Sticky Hop-bush *Dodonaea viscosa*. **Weeds:** Weed cover is highly variable with core areas of the woodland having low weed cover and edges supporting higher weed cover. Key high threat species include Galenia, Bridal Creeper Asparagus asparagoides, Serrated Tussock, Chilean Needle-grass, African Box-thorn and Horehound.	This habitat type is frequented by macropods, a diverse range of woodland bird species and provides habitat for mammals (including bats and possums), reptiles, frogs and invertebrates.	Occurs on the transition between granitic outwash soils and heavy basalt-derived clays with gilgai micro-relief. A contiguous patch of habitat in the north-west part of the project area.

Values of State significance	Values of National significance (cont.)	Photo (cont.)
All Plains Grassland within the project area represents Western (Basalt) Plains Grassland, which is a threatened community under the FFG Act. There are no minimum patch size or condition thresholds for this community.	Approximately 56% of the Plains Grassland within the impact area meets the key diagnostic characteristics and condition thresholds for the Natural Temperate Grassland TEC, which is listed as critically endangered under the EPBC Act. Other areas do not meet the size or condition thresholds.	 **Plate B5.4** **EVC 132 Plains Grassland**
		 **Plate B5.5** **EVC 132 Plains Grassland**
This habitat type is synonymous with the FFG Act listed Victorian Temperate Woodland Bird Community. This community is defined by a group of bird species which are totally or largely restricted to temperate woodland habitats and commonly associated with Box Iron-Bark, Yellow Box, Cypress Pine (and other) woodland tree species. A large percentage of the species recorded in the Grey Box Woodland in the north of the study area are included within this community.	The treed areas of the Airport woodland represent the Grey Box Woodland TEC, listed as endangered under the EPBC Act listed. This area provides habitat for the critically endangered Swift Parrot and the vulnerable Grey-headed Flying Fox. Disturbed small patches of regenerating Wattles such as Lightwood to the west and south of the Airport Woodland do not represent this community as they do not meet the size or condition thresholds that define the community.	 **Plate B5.6** **EVC 803 Plains Woodland, treed condition state (intact and high quality old growth woodland)**
		 **Plate B5.7** **EVC 803 Plains Woodland, treed condition state (restored woodland)**

EVC (cont.)	Vegetation description (cont.)	Fauna values (cont.)	Location (cont.)
Plains Woodland EVC 803 (derived grassland condition state)	**Structure:** The derived grassland condition state of Plains Woodland has less than 10% tree cover with occasional scattered remnant trees and slashed Grey Box saplings. There are also tree stumps present in these areas, indicating the historical woodland structure. The vegetation structure is a low grassland dominated by native graminoids, scattered herbs and slashed shrubs. **Character species:** Grey Box occurs as scattered trees and the understorey is dominated by Silky Blue-grass, Red-leg Grass, Windmill Grass, Wallaby Grasses, Spear Grasses, Black-anther Flax-Lily and Wattle Mat-rush Lomandra filiformis. A number of shrub species are present, including Gold-dust Wattle, Golden Wattle and Common Eutaxia. Herb species include Lemon Beauty-headsand Tufted Bluebell Wahlenbergia communis s.l. **Weeds:** Dominant weeds include Paspalum, Serrated Tussock, Chilean Needle-grass and Ribwort.	Provides habitat for a broad range of reptiles, birds and mammals. It is important habitat for reptiles and invertebrates. This area generally represents habitat for GSM, but the species has not been recorded within this habitat type in the project area.	Occurs in the airside land management zone to the south and east of Radar Hill, in a transitional zone between Plains Grassland and Plains Woodland/Hills Herb-Rich Woodland.
Riparian Woodland EVC 641	**Structure:** An open Eucalypt woodland community with an understorey of native shrubs and woody weeds, and a grassy/sedgy ground layer. **Character species:** The dominant canopy species is River Red-gum. Understorey species include Blackwood *Acacia melanoxylon*, River Bottlebrush *Callistemon sieberi*, Club-rush, Cumbungi, Common Reed, Hollow Rush, Streaked Arrowgrass *Triglochin striata*, Little Club-sedge, Common Tussock-grass and Kangaroo Grass. Herbs include *Verbena* sp., Water Pepper *Persicaria hydropiper*, Small-leaved *Clematis Clematis microphylla* and Angled Lobelia *Lobelia anceps*. **Weeds:** Common weeds include Willow *Salix* spp., Rat-tail Grass, Cocksfoot, Toowoomba Canary-grass, Serrated Tussock, Panic Veldt-grass, Drain Flat-sedge *Cyperus eragrostis*, Spiny Rush, Common Blackberry *Rubus anglocandicans* and Blue Periwinkle *Vinca major*.	Provides habitat for a range of common fauna species such as possums, birds, macropods, bats, reptiles, and amphibians. Significant species likely to utilise this habitat include GGF. Migratory waterbird species, including Latham's Snipe, may occasionally use this habitat.	Riparian Woodland occurs on the western boundary of the project area in the riparian zone of major creeks and waterways such as Deep Creek, the Maribyrnong River and their tributaries.
Escarpment Shrubland EVC 895	**Structure:** Due to the high level of modification of this EVC within the project area, its structure and composition is simplified and now dominated by a small suite of hardy native species. Woody weeds dominate the structure and plant diversity with the remaining small areas. **Character species:** The dominant species found within the project area include *Eucalyptus* spp., wattles *Acacia* spp., Tree Violet, Berry Saltbush, Nodding Saltbush and Wallaby Grasses and Spear Grasses. **Weeds:** Dominant weeds include Chilean Needle-grass, Serrated Tussock, Artichoke Thistle, Boneseed *Chrysanthemoides monilifera* and African Box-thorn.	Provides habitat for common reptile and bird species.	On steep slopes of incised gullies and tributaries leading down to Deep Creek and Maribyrnong River in the west of the project area.

Values of State significance (cont.)	Values of National significance (cont.)	Photo (cont.)
This EVC does not represent an FFG Act listed community.	The derived grassland areas represent the Grey Box Woodland TEC, listed as endangered under the EPBC Act.	 **Plate B5.8** **EVC 803 Plains Woodland, derived grassland condition state**
This EVC does not represent an FFG Act listed community.	This EVC does not represent a TEC listed under the EPBC Act as associated riparian vegetation does not fit the key landscape setting and floristic diagnostics of any listed woodland or wetland community. Growling Grass Frog terrestrial habitat is associated with this vegetation type in the project area. This EVC may be visited by the vulnerable Grey-headed Flying-fox when trees in flower. It also provides habitat for Latham's Snipe.	 **Plate B5.9** **EVC 641 Riparian Woodland**
This EVC does not represent an FFG Act listed community.	This EVC does not represent a TEC listed under the EPBC Act as associated escarpment vegetation does not fit the key landscape setting and floristic diagnostics of any listed shrubland or woodland community.	 **Plate B5.10** **EVC 895 Escarpment Shrubland**

EVC (cont.)	Vegetation description (cont.)	Fauna values (cont.)	Location (cont.)
Aquatic Herbland EVC 653	**Structure:** Aquatic Herbland occupies open, semi-permanent pools where water depth and seasonality limits the dominance of Bulrush and Common Reed. This community is typically treeless with occasional over hanging trees from adjacent EVCs. **Character species:** Common species include low densities of Bulrush and Common Reed, Loose-flower Rush *Juncus pauciflorus*, Club Sedge *Isolepis* spp., Small Loosestrife *Lythrum hyssopifolia*, Water Milfoil *Myriophyllum* spp., Swamp Lily *Ottelia ovalifolia* subsp. *ovalifolia* Streaked Arrowgrass and Duckweed *Lemna* spp. **Weeds:** Dominant weeds include Willow *Salix* spp., Jointed Rush *Juncus articulatus* subsp. *articulates*, Water Couch, Water Buttons *Cotula coronopifolia*, Panic Veldt-grass, Cocksfoot and Toowoomba Canary-grass.	Significant species likely to utilise this habitat include GGF. Migratory waterbird species, including Latham's Snipe, may occasionally use this habitat.	Aquatic Herbland occurs as very small patches along Arundel Creek and is a transitional zone between Tall Marsh and Creekline Grassy Woodland or Riparian Woodland.
Tall Marsh EVC 821	**Structure:** Occurs as reed beds to 2 m tall in slow flowing or still waterbodies where water depth reaches 1 m. Trees are typically absent, although plants trees may be present. **Character species:** Dominated by large graminoids, including Bulrush and Common Reed. Open areas have similar structure and floristics to Aquatic Herbland described above. **Weeds:** Common weeds include Water Couch, Cocksfoot, Toowoomba Canary-grass, Drain Flat-sedge, and Spiny Rush, Panic Veldt-grass and Aster-weed *Symphyotrichum subulatum*.	Significant species likely to utilise this habitat include GGF. Migratory waterbird species, including Latham's Snipe, may occasionally use this habitat	Scattered throughout the central and southern parts of the project area as small patches. Associated with Arundel Creek and modified drainage systems.
Scattered trees	Scattered remnant trees occur as isolated individuals and mostly include River Red-gum, Grey Box, Lightwood and dead trees. The understorey associated with these trees is predominantly introduced vegetation with the occasional disturbance-tolerant native species, such as Nodding Saltbush and Berry Saltbush.	Scattered trees within the project area provide habitat for a broad range of bird species and mammals, such as possums and bats.	Throughout the project area.

Values of State significance (cont.)	Values of National significance (cont.)	Photo (cont.)
This EVC does not represent an FFG Act listed community.	This EVC does not represent a TEC listed under the EPBC Act as associated wetland vegetation does not fit the key landscape setting and floristic diagnostics of Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains critically endangered community. This is due to Aquatic Herbland occurring in creek systems (and not as a depressional wetland) and the lack of wetland grass and herb species. Growling Grass Frog habitat is associated with this vegetation type in the project area. It also provide habitat for Latham's Snipe.	 **Plate B5.11** **EVC 653 Aquatic Herbland**
This EVC does not represent an FFG Act listed community.	This EVC does not represent a TEC listed under the EPBC Act as associated wetland vegetation does not fit the key landscape setting and floristic diagnostics of Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains critically endangered community. This is due to Tall Marsh being dominated by 'contra-indicator species' (tall native graminoids) and occurring in creek systems, not as depressional wetlands. Growling Grass Frog habitat is associated with this vegetation type, where it is located along Moonee Ponds Creek and Arundel Creek in the project area. These areas also provide habitat for Latham's Snipe.	 **Plate B5.12** **EVC 831 Tall Marsh**
Scattered trees do not represent an FFG Act listed community.	Scattered trees do not represent a TEC listed under the EPBC Act as they do not meet key diagnostic characteristics or required condition thresholds, particularly size thresholds. Swift Parrot and Grey-headed Flying Fox may occasionally visit scattered trees.	 **Plate B5.13** **Scattered tree**

EVC (cont.)	Vegetation description (cont.)	Fauna values (cont.)	Location (cont.)
Planted vegetation	Tree plantings are a mix of non-indigenous native species, such as Sugar Gum Eucalyptus cladocalyx, Lemon-scented Gum *Corymbia citriodora* subsp. *citriodora*, Spotted Gum Corymbia maculata, native shrubs, introduced conifers and ornamental species.	Planted vegetation provides habitat for common reptiles, amphibians, birds and mammals. Flowering eucalypts that are not indigenous to the study area offer foraging habitat for a range of fauna, including the EPBC Act listed Swift Parrot and Grey-headed Flying-fox. However, planted vegetation is unlikely to provide significant habitat for threatened fauna species.	Mostly occurs landside, in association with old buildings, grazing paddocks and farm infrastructure.
Predominantly introduced vegetation	Approximately 52% of the project area supports predominantly introduced vegetation. Native vegetation in these areas consists of scattered individuals, such as Spear Grasses and Wallaby Grasses. Dominant weed species include Serrated Tussock and Chilean Needle-grass.	Chilean Needle-grass is a known food source for GSM, which is listed as vulnerable under the EPBC Act. Occupied GSM habitat occurs across 12.68 hectares of predominantly introduced vegetation in the northern section of the project area, south of Sunbury Road.	Predominantly introduced vegetation occurs throughout the project area, commonly associated with historic land disturbance, such as grazing.

Values of State significance (cont.)	Values of National significance (cont.)	Photo (cont.)
This EVC does not represent an FFG Act listed community.	Planted vegetation does not represent a TEC listed under the EPBC Act.	 **Plate B5.14** **Planted vegetation**
Predominantly introduced vegetation does not represent an FFG Act listed community.	Predominantly introduced vegetation does not represent a TEC listed under the EPBC Act.	 **Plate B5.15** **Predominantly introduced vegetation**

B5.5.2
Native vegetation extent

The project area supports 268.47 hectares of native vegetation cover from the nine EVCs described above (reduced from the 424.54 hectares originally proposed in the exposure draft MDP). Of the 268.47 hectares of native vegetation in the project area, 247.96 hectares is located within the impact area (reduced from 403.86 hectares) and is therefore not currently subject to an existing approval.

A summary of native vegetation extents in the project and impact areas is provided in Table B5.11 and Figure B5.17. The impact proposed under the previous footprint from the initial impact assessment area is included in Table B5.11 to demonstrate the reduction achieved by refining the project design.

The reduced impacts have occurred primarily through the redesign of ancillary infrastructure (such as realigning communication trenches and the realignment of construction/access tracks). As a result, large areas of Natural Temperate Grassland and Grey Box Woodland have been retained. These areas are shown in Figure B5.18.

B5.5.3
Threatened species

No threatened flora species were recorded within the project area. Nine threatened fauna species were recorded within the project area during the current or previous assessments. Of these nine fauna species, four are listed as threatened under the EPBC Act.

Growling Grass Frog and Golden Sun Moth (both listed as vulnerable under the EPBC Act) were recorded within the project area during the current assessment. Swift Parrot (critically endangered under the EPBC Act) and Grey-headed Flying-fox (vulnerable under the EPBC Act) have previously been recorded in the project area (Steele & Peter, 2019; Ecology and Infrastructure International, 2018). Striped Legless Lizard (vulnerable under the EPBC Act) was not detected during the assessment and is considered unlikely to occur within the project area.

In addition, two threatened fauna species, one of which is listed as threatened under the EPBC Act, are known to occur adjacent or immediately downstream of the project area. The Australian Grayling (vulnerable under the EPBC Act) is known to occur directly downstream outside of the project area in the Maribyrnong River (Biosis, 2015).

The 11 threatened fauna species recorded within, immediately adjacent to or downstream of the project area are summarised in Appendix B5.C and described in more detail in the following sub-sections of this chapter.

The following sub-sections outline the results of the current targeted surveys for threatened fauna species and additional background information for those species that were not subject to current surveys in this assessment, but where impact assessments were undertaken. Habitat for EPBC Act-listed threatened fauna species within the project area and across the broader Melbourne Airport site is shown in Figure B5.19 and Figure B5.20.

Table B5.11
Summary of native vegetation extent within the project and impact area

Vegetation type	Project area (ha)	Current impact area (ha)	Initial impact assessment area (ha)
Aquatic Herbland (EVC 653)	0.01	0.01	0.01
Creekline Grassy Woodland (EVC 68)	1.33	1.33	1.33
Escarpment Shrubland (EVC 895)	1.37	1.37	1.37
Hills Herb-rich Woodland (EVC 71)	10.89	10.89	43.45
Plains Grassland (EVC 132)	180.97	161.36	216.56
Plains Grassy Wetland (EVC 125)	0.01	0.01	0.00
Plains Grassy Woodland (EVC 55)	0.25	0.25	0.25
Plains Woodland (EVC 803)	70.98	70.98	130.35
Riparian Woodland (EVC 641)	1.26	1.26	1.26
Tall Marsh (EVC 821)	0.49	0.49	0.49
Total	267.56	247.95	395.07

Figure B5.17
Native vegetation in the impact area of the Melbourne Airport Third Runway

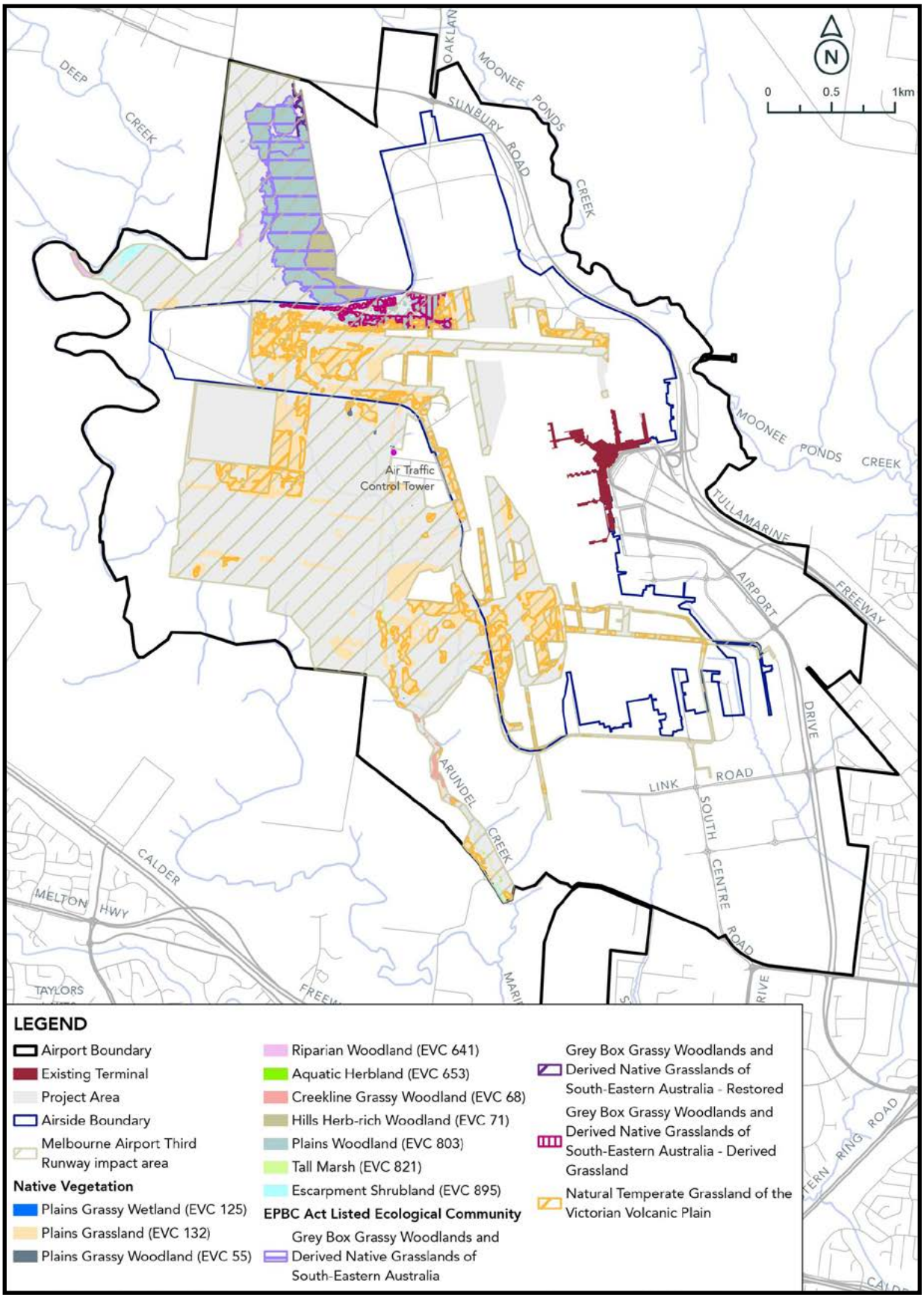


Figure B5.18
Extent of impact associated with the initial impact assessment area

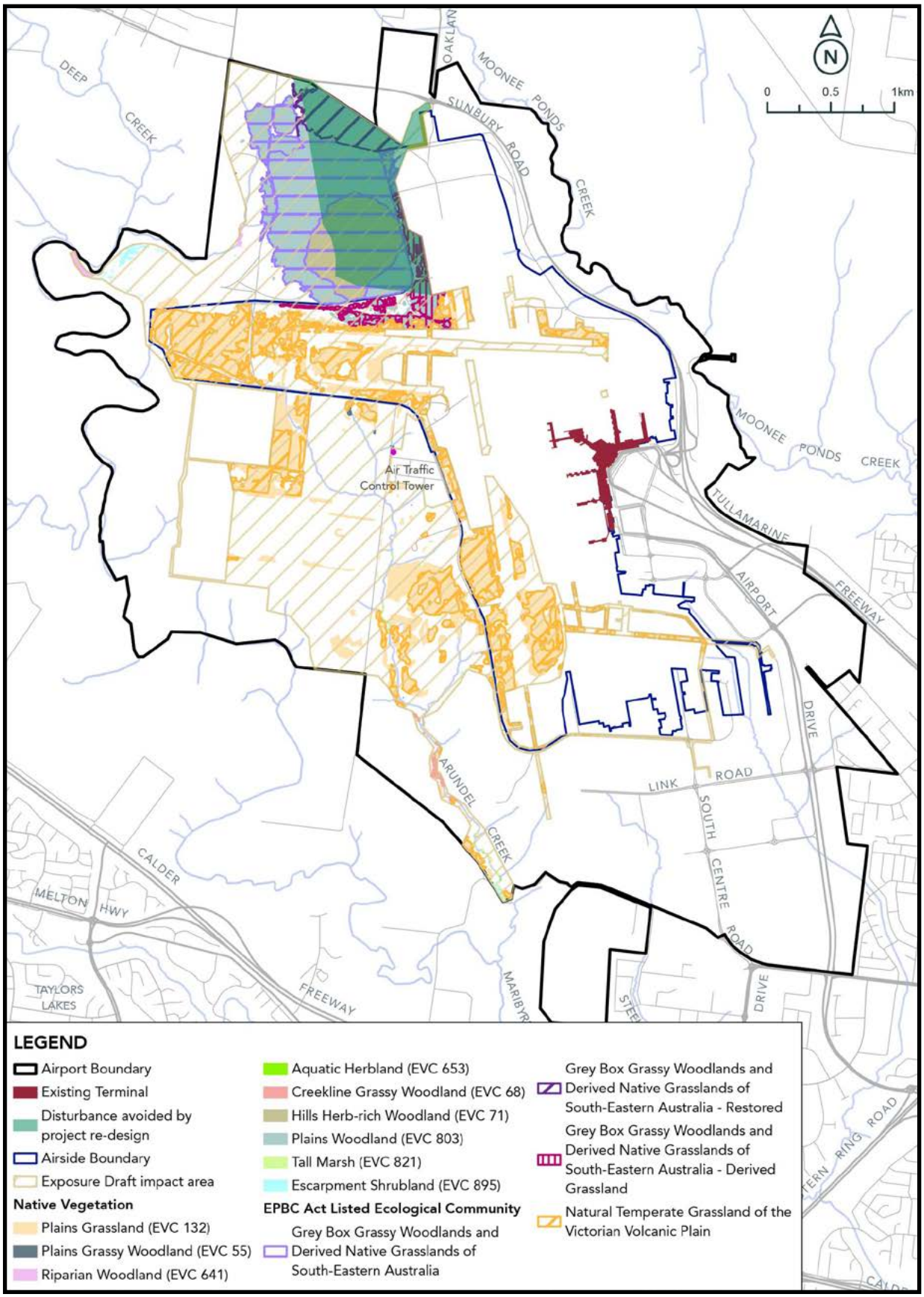


Figure B5.19
EPBC Act listed species habitat in the project area for the Melbourne Airport Third Runway

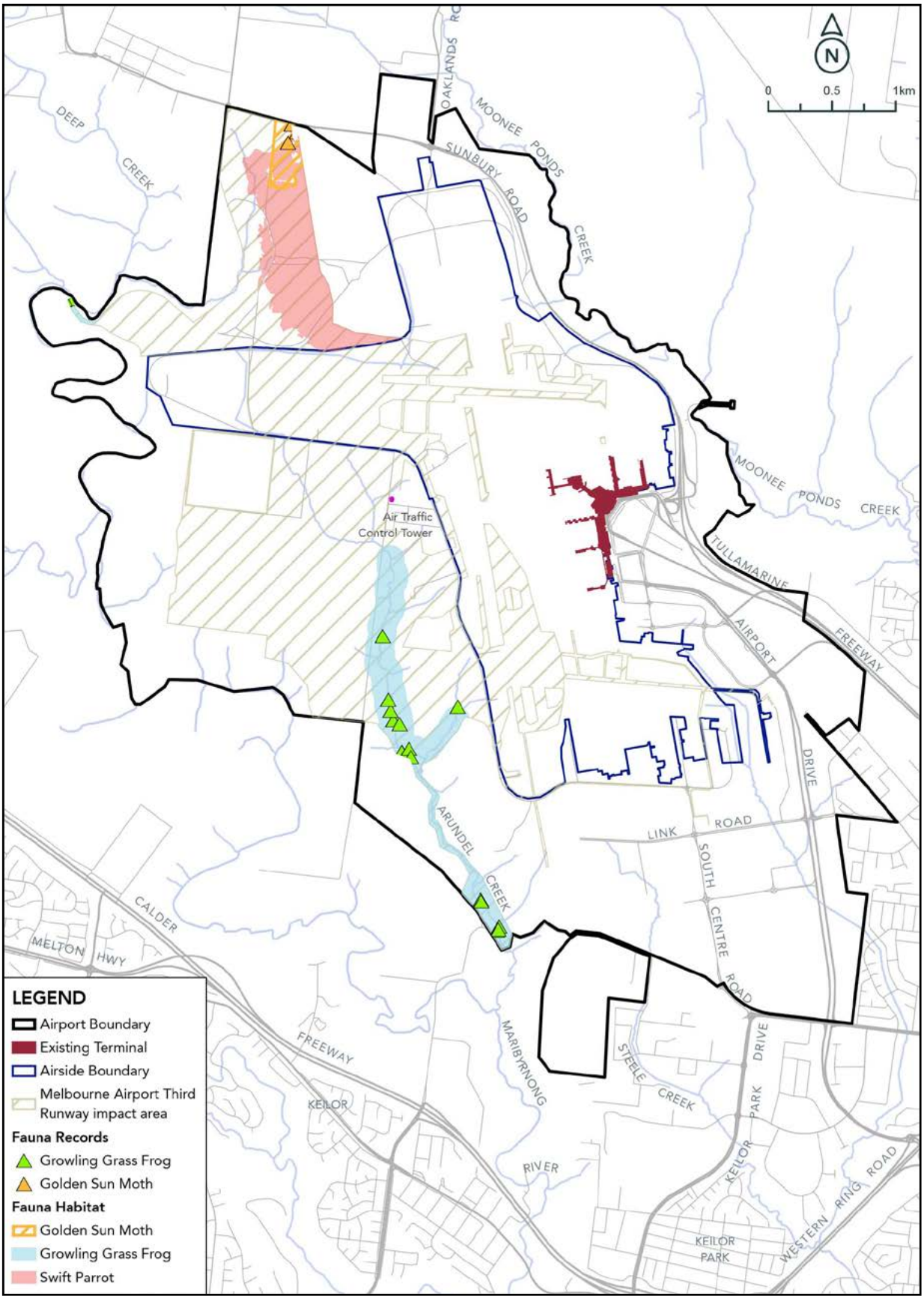
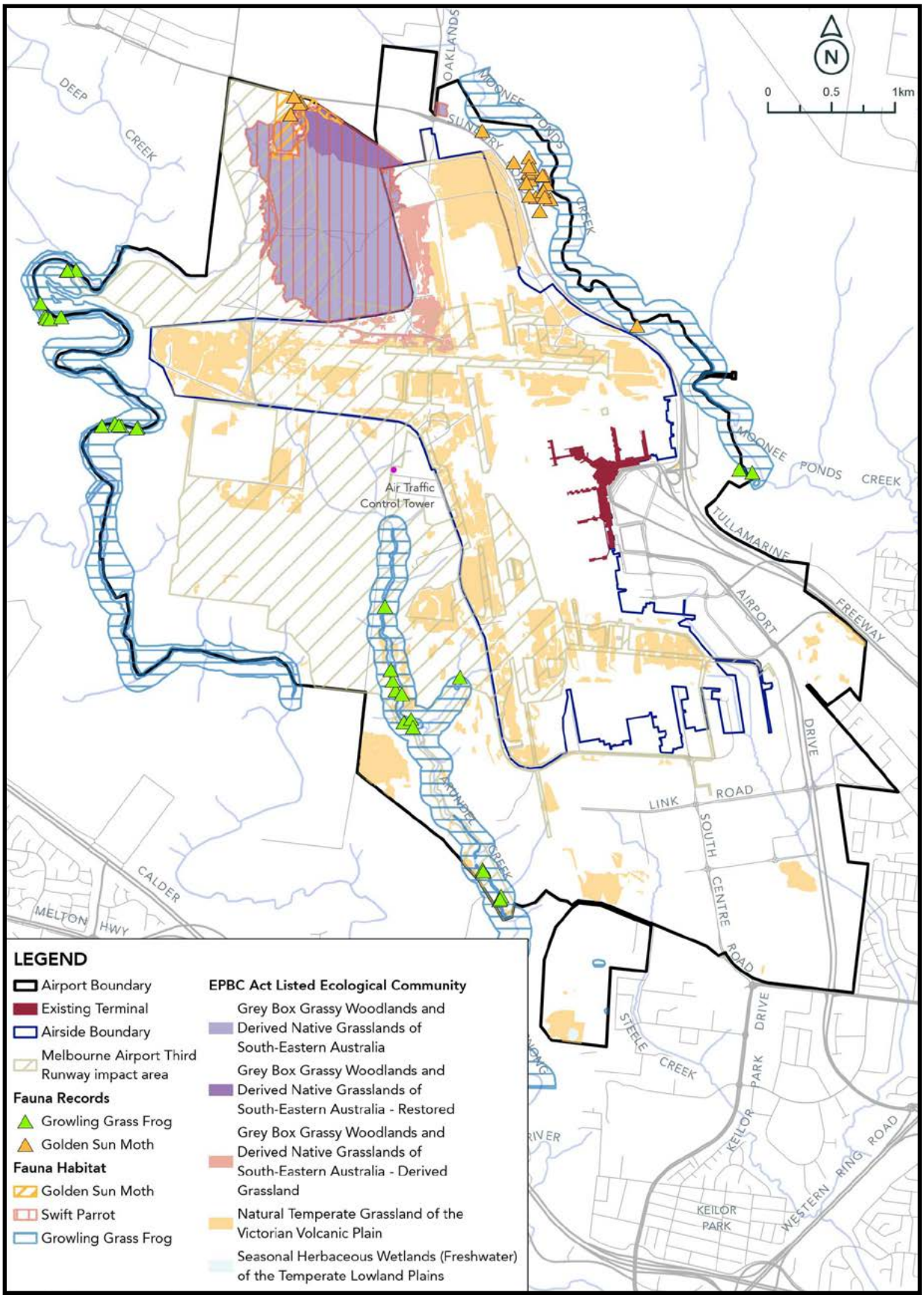


Figure B5.20
EPBC Act listed species and ecological communities within the impact area and across the broader Melbourne Airport site



B5.5.3.1 Growling Grass Frog

Targeted survey

Growling Grass Frog was recorded in Deep Creek, Arundel Creek, the quarry lake near Deep Creek, and the dam adjacent to the Golf Course within or adjacent to the project area (**Figure B5.18**). Sub-juvenile Growling Grass Frog were recorded in Arundel Creek and Deep Creek in 2019; small adults (juveniles) were recorded in the Arundel Creek dams in 2020.

Seven other non-threatened frog species were observed during the surveys across all waterways. They included: Eastern Common Froglet *Crinia signifera,* Eastern Banjo Frog *Limnodynastes dumerilii*, Striped Marsh Frog *Limnodynastes peronii*, Spotted Marsh Frog *Limnodynastes tasmaniensis*, Southern Brown Tree Frog *Litoria ewingii*, Southern Stony-creek Frog *Litoria lesueuri* and Whistling Tree Frog *Litoria verreauxii verreauxii*.

Habitat survey

Waterways and adjacent farm dams, quarries and drainage lines were assessed for habitat values for Growling Grass Frog. **Appendix B5.C** outlines the classification system used to define Growling Grass Frog habitat types.

There are 64.34 hectares of Growling Grass Frog habitat within the impact area. They include 57.07 hectares of terrestrial habitat, 4.05 hectares of breeding habitat and 3.21 hectares of aquatic habitat. A map depicting the habitat values for Growling Grass Frog from this assessment is shown in **Figure B5.20**. A description of each waterway within or adjacent to the project area and their value for Growling Grass Frog is described in further detail below.

Arundel Creek

The lower reaches and middle section of Arundel Creek, particularly the two large water storage dams, offer important breeding habitat for Growling Grass Frog.

The lower reach of Arundel Creek on Airport land, specifically 200 Arundel Road, contains deeper pools, slow-moving water, and abundant emergent and fringing vegetation with presence of logs/branches above the water. The middle section of Arundel Creek includes two large, constructed water storage dams.

These waterbodies can be classified as deep permanent open freshwater wetlands using the Victorian wetland classification framework (DELWP, 2016). They are more than two metres deep and would typically retain water for longer than 12 months, although they can have periods of drying. They are fringed by emergent aquatic vegetation and basalt boulders.

The upper section of Arundel Creek between the two dams and McNabs Road provides aquatic habitat for the species but at the time of assessment there were no pools suitable for breeding. North of McNabs Road, where Arundel Creek is diverted under the road, there was no suitable aquatic, terrestrial or breeding habitat for Growling Grass Frog at the time of assessment. The upper reaches of Arundel Creek in this area are likely to be used by the species during dispersal only. There is no connected habitat in the vicinity of the upper reaches of Arundel Creek and these upper reaches are unlikely to provide any important habitat for Growling Grass Frog.

The large dam located adjacent to the golf course is connected to Arundel Creek by dried-out drainage lines. These drainage lines do not provide habitat for Growling Grass Frog. However, it is likely the species has moved up the drainage line into the dam where one individual Growling Grass Frog was recorded.

The majority of the section of Arundel Creek located within the properties of 270 and 300 Arundel Road is terrestrial habitat or a movement corridor only. This section does not provide permanent aquatic habitat for the species, and has been subject to direct access by cattle with the surrounding terrestrial habitat heavily pugged and damaged. There were some areas within this property that did contain small pools, and the area closer to the outflow point above 200 Arundel Road held water at the time of assessment.

Moonee Ponds Creek

At the time of assessment, Moonee Ponds Creek was relatively dry with the occasional pool of water along the creek. It dries out regularly, leaving pools of water in its deeper sections.

Historically, Moonee Ponds Creek was known as Moonee Moonee Chain of Ponds, which is descriptive of this waterway. Moonee Ponds Creek is used as aquatic habitat by Growling Grass Frog and the remaining pools of water are likely to be utilised as breeding habitat. At the time of assessment, the remaining pools were drying out and unsuitable as breeding habitat. However, this is likely to vary from year to year and the creek is considered breeding and aquatic habitat.

Growling Grass Frog were not detected in Moonee Ponds Creek itself. However the species was heard calling in an adjacent quarry lake outside Melbourne Airport land.

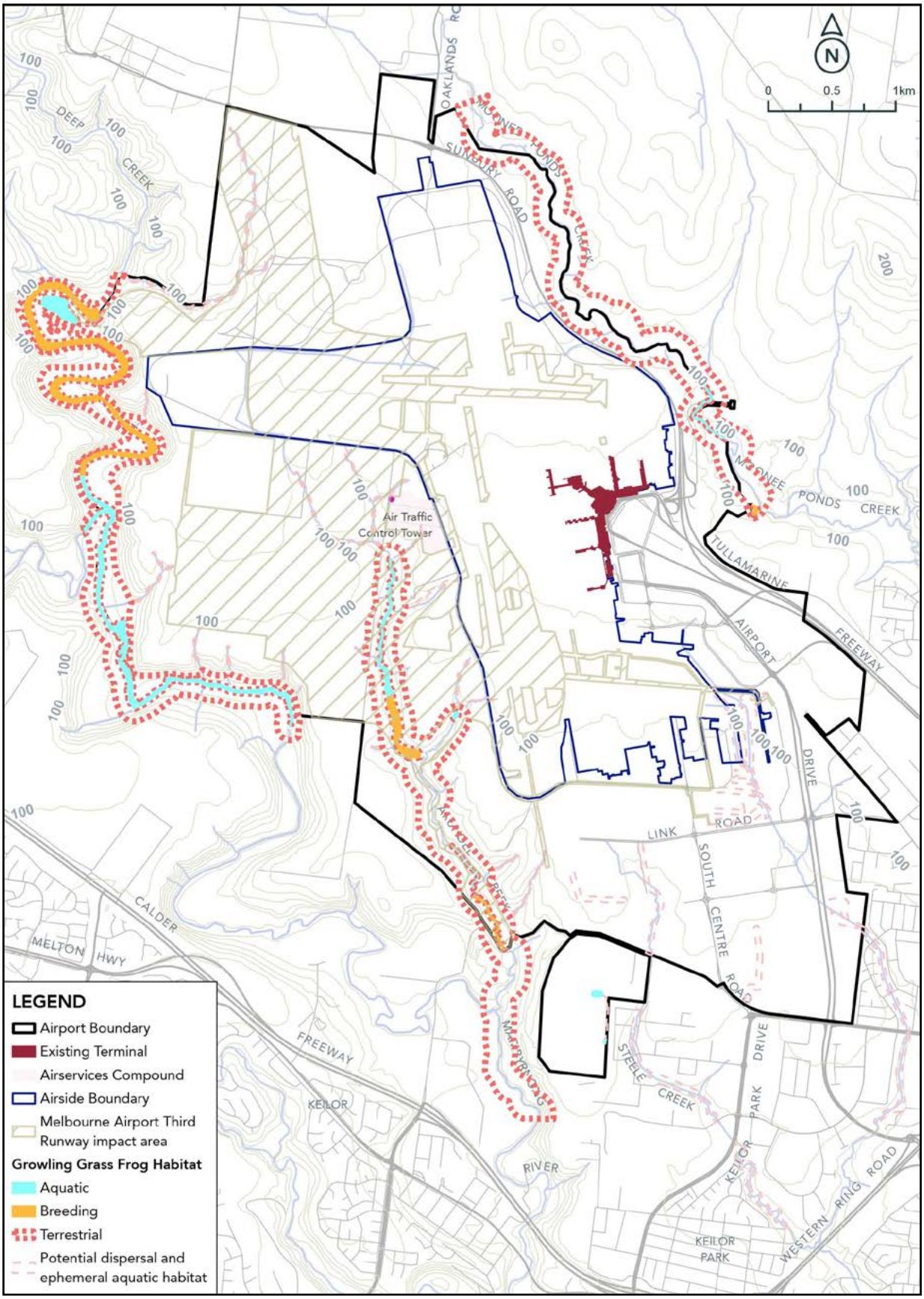
Deep Creek

The section of Deep Creek located adjacent to the project area contains high quality Growling Grass Frog habitat. The majority of Deep Creek is lined with basalt rocks, which is an ideal habitat feature for Growling Grass Frog. A total of 12 Growling Grass Frogs were found in this section of Deep Creek, where the creek contained permanent waterbodies with floating aquatic vegetation. A single Growling Grass Frog was recorded in the large quarry dam towards the north of Deep Creek. Several Common Long-necked Turtles *Chelodina longicollis* and two Murray River Turtles were also found in the quarry dam.

Maribyrnong River

The Maribyrnong River is wide and fast-flowing, and its extremely steep banks make access difficult. For this reason, it is likely that Growling Grass Frogs would

Figure B5.21
Growling Grass Frog habitat within and adjacent to the Melbourne Airport Third Runway project area



use this section only as a dispersal corridor rather than breeding habitat. Maribyrnong River was not surveyed for Growling Grass Frog due to this poor access.

Other waterways, drainage lines and farm dams

Figure B5.20 depicts the habitat value for other waterbodies within Melbourne Airport land. Many of these smaller drainage lines and farm dams are an unsuitable aquatic or breeding habitat for Growling Grass Frog.

Most of the drainage lines were dry and contained little to no water. The dams are located in paddocks with livestock access, resulting in highly turbid water, pugged embankments and little to no aquatic vegetation. Although these areas have not been considered habitat for Growling Grass Frog some were mapped as 'potential dispersal and ephemeral aquatic habitat'. Impacts to these areas are to be considered for possible indirect impacts to the Growling Grass Frog further downstream (due to sedimentation and altered hydrology).

B5.5.3.2 Golden Sun Moth

Targeted surveys for the Golden Sun Moth confirmed the presence of this species in the north of the project area only (the northern survey area), where eight males were recorded in one of the four surveys (Appendix B5.C). Before the targeted surveys began, one single male was recorded within the project area on the 6 December 2019, flying in the northern survey area.

Golden Sun Moths were recorded flying within Chilean Needle-grass habitat north of the Grey Box Woodland. This area is characterised by Chilean Needle-grass ground cover with scattered occurrences of native Wallaby Grass and Spear Grass. The Golden Sun Moth habitat is bounded by Sunbury Road to the north and the Grey Box Woodland to the south, east and west. The north-west section of the Golden Sun Moth habitat is bounded by a pasture-improved paddock (dominated by Toowoomba Canary-grass, which is not a known food plant for Golden Sun Moth).

Golden Sun Moth records and habitat within the project area can be viewed in Figure B5.20. Golden Sun Moth habitat was classified as all suitable habitat for the species connected to where the moths were recorded. The broader contiguous patch of Golden Sun Moth habitat is 12.68 hectares, of which 9.74 hectares is within the impact area.

The Golden Sun Moth was not recorded in any other survey area. Due to the extent and previous effort (Figure B5.10) of Golden Sun Moth surveys, it is highly unlikely to be present within these areas.

B5.5.3.3 Striped Legless Lizard

The Striped Legless Lizard was not detected within the project area during targeted surveys (Appendix B5.C). This is despite the substantial survey effort within suitable habitat during at a time when known nearby populations were observed to be active.

There has been a substantial survey effort for Striped Legless Lizard at Melbourne Airport. A total of 62 tile grids and 52 pit-fall traps have been surveyed over approximately 840 hectares of potential habitat to date with no record of the species being detected. It is therefore considered unlikely that the species is present within the project area.

There are records of the species within five kilometres south of Melbourne Airport, and recent records within five kilometres north of Melbourne Airport (Biosis, 2020 unpublished). It is probable that potential habitat at Melbourne Airport would have once been occupied by the species.

It is also possible that the long history of agricultural land use - including pasture improvement, cropping, stocking and, more recently, small block farming (in the Barbiston Road area) - have caused a local extinction of the species in the area. There is also the possibility that the species was never historically present within the area.

B5.5.3.4 Swift Parrot

There are 68.02 hectares of suitable foraging habitat for the Swift Parrot located within the impact area (Table B5.20). The broader Grey Box Woodland at Melbourne Airport is 154 hectares in size and represents a large, intact area of key tree species (Grey Box), which provide both nectar and lerp foraging opportunities for Swift Parrot. The entire 154 hectares of Grey Box Woodland was included within the previous footprint from the initial impact assessment area in the exposure draft MDP. The proposed impact on potential Swift Parrot habitat has since been reviewed and significantly reduced.

Five Swift Parrots were recorded within the Grey Box Woodland in April 2019 (Steele & Peter, 2019). Targeted surveys for the species occurred fortnightly between March and April, and weekly between April and May 2019. Previously, only one other individual had been recorded within the Grey Box Woodland in 1991 (Beardsell, 1991). Previous survey effort within the Grey Box Woodland at Melbourne Airport included targeted surveys of varying durations and efforts over the following years: 1990, 1991 (one individual detected), 1994/95, 1997, 1998, 1999, 2001/02, 2009, 2014 (Grey Box Woodland and Barbiston Road), 2015, 2016, 2019 (five individuals detected).

Across the broader landscape over the last 10 years, there have been regular records of Swift Parrots from Bulla, Woodlands Historic Park and Keilor (Birddata, 2020).

B5.5.3.5 Australian Grayling

Historic records exist south of the project area in the Maribyrnong River from 2002 (Victorian Biodiversity Atlas, recorded by Tarmo Raadik) and in 2015 in the Maribyrnong River (Victorian Biodiversity Atlas, recorded by Frank Amtstaetter). Suitable habitat for the species is present throughout the Maribyrnong River and its tributaries.

B5.5.3.6
Grey-headed Flying-fox

There are 68.02 hectares of suitable foraging habitat for the Grey-headed Flying-Fox located within the Grey Box Woodland in the impact area. The broader Grey Box Woodland at Melbourne Airport is 154 hectares in size and represents a large, intact area of foraging habitat when in flower between March and May.

Most Grey-headed Flying-fox that forage at Melbourne Airport would be coming from the Yarra Bend camp, located approximately 20 kilometres south-east of the project area and 22 kilometres south-east of Melbourne Airport Grey Box Woodland. A direct flight from the Yarra Bend camp to the Grey Box Woodland at Melbourne Airport would cross Melbourne Airport airfield and potentially also active aircraft flight paths. Grey-headed Flying-fox is currently considered a high-risk species for aircraft wildlife collisions, with 22 strikes reported in the last five years at Melbourne Airport (Biosis 2021). Several of these collisions have occurred at the northern end of the airfield, suggesting there could be an association with the Grey Box Woodland.

A 2018 assessment by Ecology and Infrastructure International recorded a total of 20 Grey-headed Flying Fox over four of the six survey nights across Melbourne Airport land. There was no consistent or predictable stream of movement of Grey-headed Flying-fox entering the same section of airspace each night. The report confirmed that the species visits flowering trees planted within the airport boundary and the Grey Box Woodland.

B5.5.3.7
Gang-gang Cockatoo

There are 68.02 hectares of suitable foraging habitat for Gang-gang Cockatoo located within the Grey Box Woodland in the impact area.

Gang-gang Cockatoo is a seasonal altitudinal migrant and spends the winter months in drier woodlands and forest types and the summer months in sub-alpine and montane forests (DAWE, 2022). The species is capable of occupying vegetation throughout this range and utilises a range of vegetation types and habitats.

No targeted surveys have been undertaken for Gang-gang Cockatoo within Melbourne Airport. However, recent database records indicate that the project area is within the distribution of the species and the species is known to regularly use suburban habitat (DAWE, 2022). While there are no confirmed records of Gang-gang Cockatoo from the Grey Box Woodland at Melbourne Airport, it is expected to be a regular visitor to this site.

B5.5.3.8
FFG Act listed species

Four species listed under the FFG Act were detected during the current survey (**Appendix B5.C**). Another five species were either recorded within the project area during previous surveys or exist within database records. They include:

- Swift Parrot (previous assessment)
- Grey-headed Flying-fox (previous assessment)
- Growling Grass Frog (current assessment)
- Golden Sun Moth (current assessment)
- Hooded Robin (database record)
- Speckled Warbler (database record)
- Little Eagle (database record)
- Tussock Skink (current assessment)
- Murray River Turtle (current assessment).

Habitat for Swift Parrot, Grey-headed Flying-fox, Growling Grass Frog and Golden Sun Moth in the project area is described in detail above, because these species are also listed as threatened under the EPBC Act.

Hooded Robin and Speckled Warbler

There is one database record each for Hooded Robin and Speckled Warbler within the Grey Box Woodland.

Little Eagle

There are a number of recent and historical records of Little Eagle across a range of habitat types at Melbourne Airport, including open grassland areas, woodland areas and riparian corridors.

Tussock Skink

Tussock Skink was recorded broadly across the project area during the tile grid checks. The species was recorded in Plains Grassland habitat both airside and landside. The Plains Grassland present within the project area appears to be providing good habitat for the species, with seventeen individuals recorded during the tile checks.

Murray River Turtle

One Murray River Turtle was recorded within the quarry dam at the north-western boundary of the project area, near Deep Creek. The species is native to the Murray River and its tributaries in Northern Victoria. It is thought that there is a local naturalised population around Melbourne, which has established from pet release. Habitat at Melbourne Airport is outside of this species' native range and unlikely to provide critical habitat for the species.

Platypus

While there are no records of Platypus from the project area, there are recent records from adjacent waterways and potential habitat present along Arundel Creek within the impact area. The recent database records and potential habitat within the impact area mean that potential impacts on the species warrant consideration.

B5.5.4
Threatened ecological communities

Two EPBC Act-listed TECs and two FFG Act-listed TECs were recorded in the project area and will be impacted by the development. These are described below. The results of the assessments against condition thresholds and EVC benchmarks are in Appendix B5.D.

B5.5.4.1
Grey Box (Eucalyptus microcarpa) Grassy Woodland and Derived Native Grassland of South-eastern Australia

Community background

Grey Box Woodland is listed as an endangered ecological community under the EPBC Act.

Although this community may occur on a range of substrates it typically occurs in landscapes of low relief on productive soils derived from alluvial or colluvial materials. It also occurs where the original tree canopy has been cleared but the native ground layer is intact, resulting in a derived-native-grassland condition state.

It is found along the transitional landscape zone between the temperate woodlands and forests of the lower slopes and tablelands, and the semi-arid communities further inland. Outliers occur in rainshadow areas of southern Victoria. The community is generally dominated by Grey Box with a sparse shrub layer, and a species-rich ground layer of grasses and herbs.

The community provides valuable habitat for fauna including resident and transient visitors particularly birds.

The main ongoing threats to this community are incremental clearing for a variety of purposes (cropping, infrastructure and maintenance); inappropriate grazing regimes; fragmentation into small remnants; loss or decline of mature trees; lack of natural regeneration; invasive exotic species; salinity; misuse of herbicides; firewood collection; and the addition of fertilisers to develop pastures (TSSC, 2010). There is no adopted or prepared recovery plan for this ecological community.

In southern Victoria, large intact examples of the Grey Box Woodland community (i.e. those >50 hectares in size) are now restricted to three remnant stands: Eynesbury Woodland, Pinkerton Forest and Melbourne Airport. The Grey Box Woodlands at Eynesbury and Pinkerton are within 2 kilometres of each other and are 23 kilometres south-west of the Melbourne Airport Grey Box Woodland. The remaining occurrences of Grey Box near Melbourne are isolated trees along road or rail corridors, and highly modified small patches.

Occurrence in the project area

The Grey Box Woodland threatened community aligns with Hills Herb-rich Woodland (EVC 71) and Plains Woodland (EVC 803).

These EVCs were recorded as large stands of remnant and restored woodland in the north of the project area (landside) and as derived grassland between the existing runways and woodland remnants (airside). Grey Box is the dominant canopy species in treed remnants; there is strong evidence of suppressed Grey Box recruitment in regularly-slashed derived native grassland areas.

The listing advice and supporting policy statement for the community describe it in two condition states: an intact woodland form, and a derived native grassland form where tree cover has been historically removed (TSSC, 2010).

The community was recorded in both these condition states and restored along the northern boundary of the project area. A summary of the results used to verify community occurrence is provided in Table B5.12. All ground-layer cover-plot data and woodland-tree demographic data used to verify assigning woodland stands to the TEC are provided in Appendix B5.D. In accordance with the listing advice, only samples from the highest-quality areas were used to define whether a larger patch of functional woodland habitat qualified as the community (TSSC, 2010, page 10).

Some restored and naturally regenerated woodland habitat occurs north of the main stands of Hills Herb-rich Woodland and Plains Woodland in the project area. It is contiguous with remnant woodland vegetation and functions as part of the larger patch of habitat supporting native flora, woodland birds, mammal, reptiles, frogs and invertebrates.

This area is structurally different from the old-growth remnant woodland as it generally lacks large trees and tree spacing is closer. However, native shrubs occur in the understorey; and the ground layer supports native grasses, herbs, cryptogams and a well-developed litter layer. Natural processes such as native plant recruitment also occur in this restored area.

The restored area was sampled to identify whether it qualifies as the listed TEC. This approach was used because the advice in the TEC policy statement (DSEWPaC, 2012a, pages 17 and 63) states diagnostic and condition assessments of woodland patches should also include areas that have naturally regenerated or have been restored or revegetated. Results from restored-area samples were aggregated with other results for the overall determination of TEC presence because the restored areas are now considered to be part of a larger patch of functional woodland habitat.

The current assessment recorded a total patch size of 154 hectares of the treed condition state (extending beyond the project area) of which 68.02 hectares is in the impact area; and 15.68 hectares of the derived native-grassland condition state, of which 10.72 hectares is in the impact area (Figure B5.19).

Table B5.12
Verification for presence of the Grey Box Woodland TEC

Criteria	Thresholds	Results
Tree cover	If tree crown cover is at least 10%, the 'treed' condition state is present. If tree crown cover is less than 10%, the 'derived grassland' condition state is present.	Aerial imagery and on-ground observations indicate that tree crown cover is >10% in EVC 71 and most patches of EVC 803. Four patches of EVC 803 have tree crown cover <10%, but have evidence that Grey Box was once dominant and are therefore derived grassland.
Dominant tree species	For treed patches, Grey Box must be the dominant or co-dominant tree species in the canopy layer. For derived grassland, there must be evidence that the vegetation was once woodland dominated or co-dominated by Grey Box.	Grey Box is the dominant tree species in all patches of EVC 803 and EVC 71, including restored areas and areas in the derived grassland condition state. Only minor occurrences of River Red-gum and Yellow Box are present. The presence of regenerating but slashed Grey Box, large Grey Box stumps, slashed woodland shrub species, nearby treed Grey Box Woodland and historical aerial imagery showing tree cover >10% support the conclusion that the areas of derived grassland once had a canopy dominated by Grey Box.
Patch size	Patch must be greater than 0.5 ha to firstly qualify as the community and then different native cover and diversity thresholds apply based on a 2 ha threshold for patches in the 'treed' condition states	All derived grassland patches are greater than 0.5 ha. All treed 'patches' are greater than 2 ha and are considered contiguous functional examples of the ecological community despite minor fragmentation caused by roads, tracks and fences. Functioning of the ecological community relates to wildlife movement, water and nutrient cycling and recruitment processes. Therefore, the condition threshold is met.
Weediness	The vegetation cover of non-grass weeds in the ground layer is less than 30% at any time of the year. Any site that has >30% cover of non-grass weeds in the ground layer is not the community.	Point intercept transect results for treed patches and cover estimates for derived grassland indicate that total vascular plant cover (i.e. native and non-native plants excluding cryptogams and bare ground) in treed areas is 36% and in derived grassland areas is 69%. Of this plant cover, non-grass weeds occupy 4.3% cover in treed areas and 12.5% in derived grassland. Therefore, non-grass weeds proportionally occupy less than 30% of all plant cover (i.e. 12% non-grass weeds in treed areas and 18% in derived grassland). Therefore, the condition threshold is met and on average treed and derived grassland areas are not dominated by non-grass weeds.
Tree stem size and density	For treed patches ≥2 ha in size there must be at least 8 trees/ha that are >60 cm DBH or hollow-bearing. For treed patches ≥2 ha in size that do not meet the large tree and hollow tree density requirements above there must be at least 20 live trees/ha that are >12 cm DBH	All treed patches of EVC 803 and EVC 71 are >2 ha. Tree sampling undertaken (n=31 x 1 ha samples) indicates a mean density of 15 trees/ha that are >60 cm DBH. Hollow tree sampling undertaken (n=31 x 1 ha samples) indicates a mean density of 11 hollow-bearing trees/ha. Therefore, the condition threshold is met. The second threshold test for this criterion is not relevant.
Species richness/ diversity	For treed patches <2 ha there must be at least 8 perennial native species in the mid and ground layers For derived grassland patches there must be at least 12 perennial native species in the ground layer.	All treed patches of EVC 71 and EVC 803 are >2 ha so this test does not apply. All derived grassland patches contain at least 19 perennial native species in the ground layer.
Perennial native species cover	For treed patches ≥2 ha with at least 8 trees/ha that are >60 cm DBH or hollow-bearing, perennial native grasses must make up ≥10% perennial native grass cover in the ground layer. For all other patches (derived grassland, treed patches <2 ha in size or treed patches ≥2 ha in size with at least 20 live trees/ha that are >12 cm DBH), perennial native species must make up ≥50% of total perennial ground layer vegetation cover.	Point intercept transect results for treed patches with grass cover (all of which are >2 ha) indicate that total vascular plant cover (i.e. native and non-native plants excluding cryptogams and bare ground) in treed areas is 35% and in derived grassland areas is 68%. Of this plant cover, perennial native grasses occupy 5.4% cover in treed areas and 37% in derived grassland. Therefore, perennial native grass cover proportionally occupies at least 10% of all plant cover (i.e. 15% perennial native grass cover in treed areas and 54% in derived grassland areas). Therefore, the condition threshold is met. Cover estimates for derived grassland indicate that total vascular plant cover (i.e. native and non-native plants excluding cryptogams and bare ground) is 69%. Of this plant cover, perennial native species occupy 49% cover. Therefore, perennial native grass cover proportionally occupies at least 50% of all plant cover (i.e. 71% perennial native species cover in derived grassland). Therefore, the condition threshold is met for derived grassland.

Table B5.13
Verification for presence of Natural Temperate Grassland of the Victorian Volcanic Plain TEC

Criteria	Thresholds	Results
Location	With limited exceptions, the grassland patch must be associated with Quaternary basalt soils within the Victorian Volcanic Plain bioregion.	Most (if not all) NTGVVP patches within the project area occur on basalt-derived soils of the Victorian Volcanic Plain. Geology maps position most of the project area within Quaternary Newer Volcanics geology (Qvn; DNRE 1997), with the exception of watercourses and Radar Hill.
Perennial native flora cover	Native flora must make up ≥50% of total vegetation cover, excluding introduced annuals, within the grassland patch.	Vegetation cover within all NTGVVP patches is ≥50% native, allowing for some small-scale disturbances. Plains Grassland was not mapped as NTGVVP if native flora made up <50% of total vegetation cover.
Dominant grass genera	Grasses in the genera *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* make up ≥50% of total native species cover.	*Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* make up ≥50% of total native species cover in all NTGVVP patches within the project area, although *Themeda* and *Poa* are rare.
Weediness	For grassland patches where *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* are the dominant native genera, one of the following thresholds must be met • *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* must also make up ≥50% of total perennial tussock cover or • Perennial non-grass weeds must be <30% of total vegetation cover.	All NTGVVP patches within the project area meet one or both of these thresholds. One NTGVVP patch within the project area does not meet the first of these thresholds, but nevertheless meets the second threshold. Three NTGVVP patches within the project area do not meet the second of these threshold, but nevertheless meet the first threshold. All other NTGVVP patches meet both thresholds.
Native forb cover	For grassland patches where *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* are not the dominant native species, native forbs must make up ≥50% of total vegetation cover during spring-summer (September to February).	Native forbs make up <50% of total vegetation cover in all NTGVVP patches. However, *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* make up ≥50% of total native species cover in all NTGVVP patches within the project area, meaning this condition threshold is not applicable.
Patch size	For a native vegetation remnant ≤1 ha, the grassland patch must be ≥0.05 ha and the crown cover of shrubs/trees >1 m tall must be ≤5%. For a native vegetation remnant >1 ha, the grassland patch must be ≥0.5 ha and there must be <2 mature trees per ha.	All NTGVVP patches within the project area satisfy this size threshold. No NTGVVP patches are <0.05 ha. Where NTGVVP patches are part of a native vegetation remnant >1 ha, the NTGVVP patch is ≥0.5 ha.

B5.5.4.2 Natural Temperate Grassland of the Victorian Volcanic Plain

Community background

The NTGVVP is listed as a critically endangered ecological community under the EPBC Act. It generally occurs in low-lying areas on soils of volcanic origin – typically heavy grey to red cracking clays with poor drainage. Remnant patches of this community are mostly small and fragmented in a landscape impacted by ongoing clearing.

This TEC is dominated by one or more of the following native tussock-forming grass genera: Kangaroo Grass *Themeda* spp., Wallaby Grass *Rytidosperma* spp., Spear Grass *Austrostipa* spp. and/or Tussock Grass *Poa* spp. (TSSC, 2008). Native herbs often have a scattered or mosaic presence among the native grasses, while trees and large woody shrubs are sparse to absent.

The NTGVVP community is complex and variable where the composition and appearance of species are influenced by seasonal weather patterns and land management practices (TSSC, 2008).

There is no adopted or prepared recovery plan for this ecological community.

Occurrence in the project area

The NTGVVP community is associated with Heavier-soils Plains Grassland (EVC 132_61) which was recorded throughout the project area, particularly in locations with a history of active land management (e.g. grazing, slashing and mowing).

To some extent, past and present management regimes including regularly slashing and mowing are likely to have maintained NTGVVP in a similar way to fire – by reducing biomass accumulation from introduced species, particularly weedy grasses. However, these management regimes are also likely to have influenced the composition of NTGVVP across the project area. For example, NTGVVP in the project area is generally species poor and dominated by Wallaby Grass and/or Spear Grass. Kangaroo Grass and native herbs are rare and scattered, certainly not dominant. A summary of the results used to justify community occurrence is provided in Table B5.13.

The Heavier-soils Plains Grassland areas that did not satisfy the key diagnostic characteristics or condition thresholds of NTGVVP were dominated either by other native grasses (such as Silky Blue-Grass and Red-leg Grass) or by high-threat weeds (including Galenia, Chilean Needle-grass and Serrated Tussock).

The total of 90.49 hectares of NTGVVP proposed to be lost from within the impact area includes patches extending beyond the impact area that, despite being retained, would no longer meet the size threshold requirements to qualify as NTGVVP.

B5.5.4.3
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains

No vegetation corresponding to this TEC occurs within the project area. Wetland EVCs within the project area (e.g. Tall Marsh EVC 821) do not meet the condition thresholds for this EVC due to one or both of the following:

- Absence of native wetland graminoids and/or native wetland forbs characteristic of the TEC
- Significant cover (greater than 25 per cent vegetative cover) of contra-indicative species (e.g. Cumbungi *Typha* spp.) and hydrological features of contra-indicative EVCs (e.g. Tall Marsh EVC 821, which is characterised by a near permanent waterbody within the project area).

B5.5.4.4
FFG Act Listed Communities

B5.5.4.4.1
Victorian Temperate Woodland bird community

This community is defined by a group of bird species totally or largely restricted to temperate woodland habitats, and which are commonly associated with Box Iron-bark, Yellow Box, Cypress Pine (and other) woodland tree species (SAC 2001).

The full list of bird species associated with this community is provided within the Final Recommendation on Nomination for Listing (SAC 2001). It includes a large percentage of the species recorded in the woodland by current and previous assessments.

Many other species associated with this community are likely to utilise the woodland within Woodlands Historic Park to the immediate north of the project area, increasing the likelihood that they may visit the Grey Box Woodland at Melbourne Airport.

This FFG Act listed community corresponds directly with the EPBC Act listed Grey Box Woodland TEC in its treed condition state, as described above in **Section B5.5.4.1**. This means that there are 68.02 hectares of the Victorian Temperate Woodland Bird Community within the impact area. Listed woodland birds within this community that have been recorded or may occur are Swift Parrot, Speckled Warbler, Jacky Winter and Hooded Robin.

B5.5.4.4.2
Western (Basalt) Plains Grassland

The Western (Basalt) Plains Grassland Community is an open-grassland community found mainly on undisturbed, poorly-drained heavy clay soils on the basalt plains of western Victoria. The soils are usually waterlogged in winter; and very hard, dry and cracking in summer. Vegetation is characteristically dominated by perennial native grasses with very few eucalypts and shrubs.

There are no minimum patch size or condition thresholds for this community; its presence is generally considered to be affiliated with the presence of Plains Grassland (EVC 132). This FFG Act listed community corresponds directly with all Plains Grassland (EVC 132) mapped within the project area. This means that there are 161.37 hectares of the Western (Basalt) Plains Grassland community within the impact area. Better quality examples of this community correspond with the NTGVVP TEC described above in **Section B5.5.4.2**.

B5.5.5
Listed migratory bird species

No listed migratory bird species were recorded during the current ecological assessment. Rufous Fantail and White-throated Needletail have previously been recorded from within the project area.

B5.6
ASSESSMENT OF POTENTIAL IMPACTS

This significant impact self-assessment details the extent of impacts on threatened species, ecological communities, listed migratory species and relevant ecological features on and outside Commonwealth land, resulting from M3R. The significant impact self-assessment is a vital step in any EPBC Act assessment.

Potential impacts on significant ecological values were assessed in accordance with the significant impact assessment framework outlined in **Section B5.4**.

In order to assess the likely impacts of the M3R project on ecological values, it is assumed that all vegetation and fauna habitat within the impact area will be removed either temporarily for construction or permanently for the proposed infrastructure.

B5.6.1
Description of proposed impacts

The impacts from the proposed construction of M3R have been assessed for the disturbance/removal of native vegetation and habitat for the majority of the project area but excluding those areas subject to existing approvals (**Figure B5.1**).

The development of M3R will result in a new three-kilometre-long north-south runway with associated taxiways and other ancillary infrastructure. This impact assessment reviews the potential impacts likely to occur within the impact area for only the M3R project. Native vegetation and fauna habitat located within the Taxiway Zulu and Northern Access project impact area have not been included in this impact assessment.

Project impacts on ecological values include:

- Removal and modification of native vegetation and habitats

Table B5.14
Native vegetation, TECs and threatened fauna habitat in the impact area (Figure B5.19 and Figure B5.20)

Ecological value	Impact area (hectares)
Native vegetation (EVC)	
Aquatic Herbland (EVC 653)	0.02
Creekline Grassy Woodland (EVC 68)	1.33
Escarpment Shrubland (EVC 895)	1.37
Hills Herb-rich Woodland (EVC 71)	10.89
Plains Grassland (EVC 132)	161.37
Plains Grassy Woodland (EVC 55)	0.25
Plains Woodland (EVC 803)	70.98
Riparian Woodland (EVC 641)	1.26
Tall Marsh (EVC 821)	0.49
EPBC Act listed TEC (subset of EVCs above)	
Grey Box Grassy Woodlands and Derived Grasslands of South-eastern Australia – treed condition state (EVC 71 and parts of EVC 803)	68.02
Grey Box Grassy Woodlands and Derived Grasslands of South-eastern Australia – derived native grassland (treeless EVC 803)	10.72
Natural Temperate Grassland of the Victorian Volcanic Plain (total) (EVC 132)	90.49
FFG Act listed TEC (subset of EVCs above)	
Victorian Temperate Woodland Bird Community	68.02
Western (Basalt) Plains Grassland	161.37
EPBC Act and FFG Act listed fauna habitat (associated with EVCs above and non-native vegetation)	
Habitat suitable for Golden Sun Moth	9.75
Breeding and dispersal habitat for Growling Grass Frog	64.34
Woodland habitat suitable for: • Swift Parrot • Grey-headed Flying-fox • Gang-gang cockatoo	68.02
FFG listed fauna habitat (associated with EVCs above and non-native vegetation)	
Native and introduced grassland habitat suitable for Tussock Skink	594.29
Woodland habitat suitable for: • Hooded Robin • Grey Goshawk • Eastern Bent-wing Bat • Powerful Owl • Turquoise Parrot • Brush-tailed Phascogale • Speckled Warbler • Yellow-bellied Sheathtail Bat	68.02
Permanent watercourses (including Arundel Creek and large water storage dams along Arundel Creek), providing suitable habitat for: • Platypus • Australian Mudfish	7.27
Large water storage dams along Arundel Creek, providing suitable habitat for: • Freckled Duck • Common Sandpiper • Musk Duck • Hardhead • Marsh Sandpiper • Blue-billed Duck • Common Greenshank	2.42*
Permanent watercourses (including Arundel Creek and large water storage dams along Arundel Creek) and farm dams, providing suitable habitat for: • Little Egret • Murray River Turtle • Eastern Great Egret • Plumed Egret • White-bellied Sea-Eagle	7.59*
Aerial space above all vegetated and aquatic areas that provide suitable habitat for: • Black Falcon • Little Eagle	688.46

**Note: Habitat estimates marked with an asterisk are the minimum area of habitat that is likely to be present at any given time. These areas would vary depending on the amount of water in the landscape. In wet conditions, when grassland environments become temporarily inundated, there would potentially be a much larger area of suitable habitat for these species within the impact area.*

- Likely significant impact on Golden Sun Moth, Growling Grass Frog and Swift Parrot
- Likely significant impact on NTGVVP and Grey Box Woodland TECs
- Likely significant impact on the environment on Commonwealth land.

The project will require the removal of 247.96 hectares of native vegetation, which is significantly less the initially proposed 403.86 hectares of native vegetation.

This native vegetation supports threatened species habitat, and represents two EPBC Act-listed TECs in places.

Other areas of non-native vegetation and waterways also support threatened species habitat. **Table B5.14** gives a summary of native vegetation, TECs (as a subset of this vegetation) and habitat within the impact area. These numbers form the basis for the impact assessments of the project.

Table B5.15
Landscape and soils significant impact criteria assessment

Criteria	Likelihood of significant impact	Justification
Is there a real chance or possibility that the action will:		
Substantially alter natural landscape features	Almost certain	Grey Box Woodland The project would result in removal of almost half of the Grey Box Woodland at Melbourne Airport (68.02 ha of 154 ha). This is a substantial reduction from what was originally proposed in the exposure draft MDP (154 ha of 154 ha). It is now proposed to retain Radar Hill and the higher quality eastern portion of the Grey Box Woodland. The western half of the woodland will be levelled through earthworks, resulting in changes to vegetation cover, topography and underlying geology. The Grey Box Woodland is a significant landscape geologically and ecologically. It is one of the southernmost extents of the Grey Box Woodland community in Victoria, occurring on and around an outlier of the Central Victorian Uplands bioregion. It is one of the only three examples of this community located south of the Great Dividing Range (the others being Eynesbury Woodland and Pinkerton Forest) and its presence in the landscape has been noted on historical maps and plans dating back to 1840 (e.g. Kemp, 1840). While removal of 68.02 ha of the Grey Box Woodland is a better outcome than complete removal of the woodland and Radar Hill, it will still alter the natural landscape features of the project area. Arundel Creek Arundel Creek flows from north to south through the middle of the project area. Arundel Creek is a narrow waterway and is interspersed with small farm dams and two large water storage dams. Arundel Creek is a tributary of the Maribyrnong River. The natural landscape within the project area is characterised by Deep Creek to the west, Maribyrnong River to the south, Moonee Ponds Creek to the east and Arundel Creek through the middle. Arundel Creek is the catchment for a large area within the project area, predominantly the existing hard surface areas associated with the runway and taxiways. It is highly modified and does not provide connectivity between waterways that would otherwise be isolated. The creek is approximately 6 km long, of which 4.5 km would be impacted during construction (including the upper tributaries and drainage lines within the impact area). Whilst Arundel Creek is already a modified feature in the landscape, the further modification of sections of this waterway could be considered as significantly altering the landscape features within the project area.
Cause subsidence, instability or substantial erosion	Not applicable	Not assessed in this chapter
Involve medium or large-scale excavation of soil or minerals	Not applicable	Not assessed in this chapter

Table B5.16
Coastal landscapes and process significant impact criteria assessment

Criteria	Likelihood of significant impact	Justification
Is there a real chance or possibility that the action will result in one or more of the following?		
Alter coastal processes, including wave action, sediment movement or accretion, or water circulation patterns	Rare	The impact area is not located within the vicinity of coastal environments and no works are proposed within tidal, estuarine or sand dune environments. All waterways within the impact area eventually discharge into Port Phillip Bay however water flows and sedimentation loads will not exceed current base levels (Beca, 2020) it is therefore unlikely that any measurable indirect impacts to Port Phillip Bay would occur as a result of the project.
Permanently alter tidal patterns, water flows or water quality in estuaries		
Reduce biological diversity or change species composition in estuaries		
Extract large volumes of sand or substantially destabilise sand dunes		

Table B5.17
Ocean forms, ocean processes and ocean-life significant impact criteria assessment

Criteria	Likelihood of significant impact	Justification
Is there a real chance or possibility that the action will result in one or more of the following?		
Reduce biological diversity or change species composition on reefs, seamounts or in other sensitive marine environments	Rare	The impact area is not located within the vicinity of coastal environments. An Environmental Management Plan (EMP) will be developed and will include mitigation measures to include sediment control where necessary and include a plan for management of spills from machinery to ensure potential spills are localised and minimal. No impacts to marine environments are expected to occur as a results of the project. All waterways within the impact area eventually discharge into Port Phillip Bay however water flows and sedimentation loads will not exceed current base levels (Beca, 2020) it is therefore unlikely that any measurable indirect impacts to Port Phillip Bay would occur as a result of the project.
Alter water circulation patterns by modification of existing landforms or the addition of artificial reefs or other large structures		
Substantially damage or modify large areas of the seafloor or ocean habitat, such as sea grass		
Release oil, fuel or other toxic substances into the marine environment in sufficient quantity to kill larger marine animals or alter ecosystem processes		
Release large quantities of sewage or other waste into the marine environment		

Table B5.18
Water Resources Significant Impact Criteria Assessment

Criteria	Likelihood of significant impact	Justification
Is there a real chance or possibility that the action will result in one or more of the following?		
Measurably reduce the quantity, quality or availability of surface or ground water.	Likely	Impacts on Arundel Creek will include modifying the catchment area, upper reaches and dams of Arundel Creek, stabilisation of the banks, new sedimentation and retarding basins. Outflow and sediment rates into the remainder of the creek will be highly managed and remain at baseline levels (Beca, 2020). It is likely that surface water in the upper reaches of Arundel Creek and the existing dams will be reduced in quantity and quality during construction. The long term impacts will include the modification of the upper reaches of Arundel Creek.
Channelise, divert or impound rivers or creeks or substantially alter drainage patterns, or measurably alter water table levels?	Likely	

B5.6.2
Impacts on the environment on Commonwealth land

For actions on Commonwealth land, such as Melbourne Airport, impacts on the environment as a whole must be considered. This section assesses the likelihood of M3R having a significant impact on the environment as a whole on Commonwealth land for criteria relevant to ecology and biodiversity only and has been assessed in accordance with the Significant Impact Guidelines 1.2 (DSEWPaC, 2013).

B5.6.2.1
Impacts on landscapes and soils

In considering impacts on landscapes and soils, the following criteria are relevant (Table B5.15).

B5.6.2.2
Impacts on coastal landscapes and process

In considering impacts on coastal landscapes and process, the following criteria are relevant (Table B5.16).

B5.6.2.3
Impacts on ocean forms, ocean processes and ocean life

In considering impacts on ocean forms, ocean processes and ocean life, the following criteria are raised in Table B5.17.

B5.6.2.4
Impacts on water resources

In considering impacts on water resources, the following criteria are raised in Table B5.18.

Table B5.19
Plants Significant Impact Criteria Assessment

Criteria	Likelihood of significant impact	Justification
Is there a real chance or possibility that the action will result in one or more of the following?		
Involve medium or large-scale native vegetation clearance.	Almost certain	The project will result in the large-scale permanent removal of 247.96 ha of native vegetation, of which 176.64 ha belongs to one of two EPBC Act listed TECs and 237.32 ha belongs to one of two FFG Act listed TECs on Commonwealth land (there is an overlap of 158.51 ha between the EPBC Act and FFG Act TECs).
Involve any clearance of any vegetation containing a listed threatened species which is likely to result in a long-term decline in a population or which threatens the viability of the species.	Unlikely	No listed threatened plants are present within the impact area and no impacts on listed threatened plant species are expected.
Introduce potentially invasive species.	Possible	A number of invasive species are already established within the project area and local area. For example, infestations of Serrated Tussock and Chilean Needle-grass are currently common in the local area. Nevertheless, there is potential for invasive species, particularly novel high threat weeds not previously recorded within the project area, to be introduced during construction and operation of the project. There is also the potential for construction activities to further spread established weeds. During construction, this potential will be minimised by adopting a vehicle and machinery hygiene procedure, to ensure all vehicles and machinery that arrive at the project area are free of soil and other material that may contain weed propagules. During operation of the third runway, there is a risk of novel high threat weeds arriving via aircraft, management vehicles or maintenance machinery and becoming established. Ongoing vigilance and prompt treatment of any newly established invasive species is the main control against this operational risk. There is therefore a real possibility that the project may introduce invasive species into the project area.
Involve the use of chemicals which substantially stunt the growth of native vegetation.	Rare	There will be no use of chemicals which will impact plants.
Involve large-scale controlled burning or any controlled burning in sensitive areas, including areas which contain listed threatened species.	Rare	The proposed impact does not include burning.

B5.6.2.5
Impacts on plants

In considering impacts on plants, the following criteria are raised in Table B5.19.

B5.6.2.6
Impacts on animals

In considering impacts on animals, the following criteria are raised in Table B5.20.

B5.6.3
Impacts on threatened species and ecological communities

The following tables present the significant impact assessments for threatened species and ecological communities located within the impact area. Where there are specific significant impact guidelines published for a species or TEC, these are used in place of the generic Significant Impact Guidelines 1.1.

Table B5.20
Animals Significant Impact Criteria Assessment

Criteria	Likelihood of significant impact	Justification
Is there a real chance or possibility that the action will result in one or more of the following?		
Cause a long-term decrease in, or threaten the viability of, a native animal population or populations, through death, injury or other harm to individuals.	Almost certain	The removal of 247.96 hectares of native vegetation including woodland, grassland and riparian habitat, as well as removal of non-native vegetation and modification of waterways, is likely to reduce available habitat for native wildlife, including mammals, woodland birds, waterbirds, reptiles, frogs and invertebrates. Local wildlife populations will lose important habitat and refuge sites in a rapidly urbanising landscape on the fringe of Melbourne and this will further jeopardise local abundance and diversity of fauna. The project will create a potential physical and functional barrier to species that use woodland and riparian habitats and will limit movement for breeding and foraging activities. For EPBC Act listed species, there will be significant impacts on Swift Parrot, Growling Grass Frog and Golden Sun Moth as a result of habitat loss and alteration of waterways (**Section B5.6.3**).
Displace or substantially limit the movement or dispersal of native animal populations.	Almost certain	
Substantially reduce or fragment available habitat for native species.	Almost certain	
Reduce or fragment available habitat for listed threatened species, which is likely to displace a population, result in a long-term decline in a population or threaten the viability of the species.	Almost certain	While there are no formal significant impact criteria for FFG Act listed species, a most of the impact area represents known and potential habitat for one or more FFG Act listed species. This habitat is quantified in **Table B5.14.** Of the FFG Act listed threatened species that are known or likely to be affected by the project, Tussock Skink (listed as endangered under the FFG Act) is likely to be most affected. The removal of 594.29 ha of native and introduced grassland habitat is a substantial reduction in habitat for this species. Of this habitat, the removal and fragmentation of 161.37 ha of Plains Grassland (of which 90.49 ha is Natural Temperate Grassland) represents a reduction in habitat at a landscape scale. Whilst a relatively widespread species across Victoria, the lowland, western volcanic plains population that is present within the impact area is restricted to grassy, treeless areas. It is generally accepted that the best quality examples of this habitat type (which corresponds with Natural Temperate Grassland) has declined in extent by more than 98% since European arrival in Victoria (TSSC, 2008). In the early 2000s, it was estimated that 5000 ha of Natural Temperate Grassland remained (Barlow and Ross, 2002). If anything, the extent of this TEC is likely to be less now. It can therefore be considered that the removal of 161.37 hectares of Plains Grassland from within the impact area is likely to have a substantial impact on the species. It is difficult to quantify the precise impact on the population of Tussock Skink, as very little population data exists for Melbourne Airport and surrounds. It can be inferred that the proportion of habitat removed is likely to have a proportional impact on the local population of Tussock Skink. The area of good quality habitat (Plains Grassland) is approximately 541.56 ha within Melbourne Airport. The impact area of 161.37 ha of Plains Grassland constitutes approximately 29.80% of total available habitat. A similar reduction in the local population of Tussock Skink is therefore expected.
Introduce exotic species which will substantially reduce habitat or resources for native species.	Rare	The proposed works will not result in the introduction of exotic fauna species.
Undertake large-scale controlled burning or any controlled burning in areas containing listed threatened species.	Rare	The proposed impact does not include burning.

B5.6.3.1
Threatened species

Golden Sun Moth

A significant impact on Golden Sun Moth is considered likely, based on the assessment in Table B.5.21. Species-specific significant impact criteria applied to Golden Sun Moth when it was listed as critically endangered under the EPBC Act (DEWHA, 2009). The EPBC Act listing status for Golden Sun Moth was changed from critically endangered to vulnerable in December 2021 and the species-specific significant impact guidelines are therefore no longer current. The assessment in Table B.5.21 instead relies on the Significant Impact Guidelines 1.1 for vulnerable species (DoE, 2013) and the updated conservation advice for Golden Sun Moth (DAWE, 2021).

Table B5.21
Significant impact assessment for the vulnerable Golden Sun Moth

Significant Impact Criteria	Likelihood of significant impact	Justification
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following (DoE, 2013):		
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. Disrupt the breeding cycle of an important population.	Rare	There are no important populations specified in the conservation advice for GSM. The Significant Impact Guidelines 1.1 (DoE, 2013) and GSM conservation advice (DAWE, 2021) suggest that an important population would include one or more of the following: • Key source populations for breeding or dispersal • Populations that are necessary for maintaining genetic diversity • Populations near the limit of the species' range. • Large sub-populations • Small well-connected sub-populations occurring in high quality habitat (i.e. medium to large sites with abundant Wallaby Grasses and Spear Grasses (i.e. larval food), low weed cover, inter-tussock spaces and consistent land-use/ management). Targeted surveys detected 8 males across 12.68 ha of contiguous habitat, dominated by Chilean Needle-grass, in the northern part of the project area. This is considered to be a small sub-population in moderate quality habitat. The small sub-population is not at the limit of the species' range and unlikely to be a key breeding or dispersal source. It is unlikely to be an important population.
Adversely affect habitat critical to the survival of a species.	Almost certain	The conservation advice for GSM states that habitat critical to the survival of GSM is likely to include all native grassland and open grassy woodland habitat across the species' range. All occupied habitat is important for the breeding activity of the associated sub-population and the recovery of the species because the species has specialised habitat requirements and a fragmented distribution (DAWE, 2021). While the GSM habitat in the north of the project area is not native grassland, it is occupied GSM habitat. This area is therefore likely to be critical to the survival of the species. The project would result in the removal of 9.75 hectares of the 12.68 hectares of contiguous GSM habitat that is present. This would be an adverse effect on critical habitat and therefore a significant impact on the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Almost certain	The GSM habitat located within the project area is likely to be critical to the survival of the species. The species is therefore likely to decline as a result of removal of this habitat.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Rare	The potential introduction of invasive species, such as invasive grasses, will be addressed by adopting a vehicle and machinery hygiene procedure, to ensure all vehicles and machinery that arrive at the project area are free of soil and other material that may contain weed propagules.
Introduce disease that may cause the species to decline.	Rare	The vehicle and machinery hygiene procedure will reduce the risk of disease introduction. The project is unlikely to introduce disease that may cause any impact on the species.
Interfere substantially with the recovery of the species.	Almost certain	The conservation advice for GSM states that all occupied habitat is important for the breeding activity of the associated sub-population and the recovery of the species (DAWE, 2021). This is because the species has specialised habitat requirements and a fragmented distribution. The removal of 9.75 hectares of GSM habitat is therefore likely to substantially interfere with the recovery of the species.

Grey-headed Flying-fox

A significant impact is considered unlikely on Grey-headed Flying-fox based on the assessment in Table B5.22.

Table B5.22
Significant impact assessment for the vulnerable Grey-headed Flying-fox

Significant Impact Criteria	Likelihood of significant impact	Justification
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following (DoE, 2013):		
Lead to a long-term decrease in the size of an important population of a species.	Rare	The closest camp of Grey-headed Flying-fox is located in Yarra Bend Park, approximately 20 km south-east of the project area. Grey-headed Flying-fox have been recorded foraging in trees in the Grey Box Woodland and in planted trees at Melbourne Airport, including in the golf course (Ecology and Infrastructure International, 2018). However, the number of the individuals recorded were low (20 over 6 survey nights) and it is not expected that the habitat is a critical food source for the survival of the species. Although the scale of tree removal proposed in the Grey Box Woodland is large, it is unlikely that this would lead to a long-term decrease in the size of any population, reduce the area of occupancy or fragment any population. There is a large expanse of suitable food trees for the species in the broader area and the Yarra Bend population is not reliant on potential food sources located within Melbourne Airport alone. It is likely that there will be an increased number of collisions with aircraft will be proportionate to the number of increased flights. However, the strike risk to Grey-headed Flying-fox may decrease as a result of the M3R project removing half of the available habitat within the Grey Box Woodland.
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.	Rare	Whilst the species may visit the project area on occasion, the Grey Box Woodland and other trees located within the project area are unlikely to provide habitat critical to the survival of the species, given the large extent of other available food sources for the species in the local area.
Disrupt the breeding cycle of an important population.	Rare	No breeding population occurs within the project area.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Rare	The potential habitat located within the project area is not critical to the survival of the species. Removal of Grey Box trees within the project area is therefore unlikely to cause a decline in the species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Rare	The potential introduction of invasive species will be addressed by adopting a vehicle and machinery hygiene procedure, to ensure all vehicles and machinery that arrive at the project area are free of soil and other material that may contain weed propagules.
Introduce disease that may cause the species to decline.	Rare	The project will not introduce disease that may cause any impact on the species.
Interfere substantially with the recovery of the species.	Rare	The potential habitat located within the project area is not subject to any recovery plan for the species.

Swift Parrot

A significant impact is considered likely to occur on Swift Parrot based on the assessment in Table B5.23.

Growling Grass Frog

For assessment of the project against the significant impact criteria, it is essential to define a significant population of Growling Grass Frog and understand whether the population present within the project area is 'important'.

The Significant Impact Guidelines for Growling Grass Frog state that (DEWHA, 2009b):

'Any viable population is considered to be 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 the opportunity to interact with other nearby populations or has the ability to establish new populations when water bodies fill and become available'.

Table B5.23
Significant impact assessment for the critically endangered Swift Parrot

Significant Impact Criteria	Likelihood of significant impact	Justification
An action is likely to have a significant impact on a critically endangered species if there is a real chance or possibility that it will result in one or more of the following (DoE, 2013):		
Lead to a long-term decrease in the size of a population.	Possible	The Swift Parrot occurs as a single, migratory population (Saunders & Tzaros, 2011). The Recovery Plan states that 'the clearance of nesting, roosting or foraging habitat may have a significant impact on the population. Such impact are most likely to be significant where a proposal or activity may result in loss of habitat in, or adjacent to priority foraging, nesting and roosting sites' (Saunders & Tzaros, 2011). The Grey Box Woodland is not a priority habitat listed in the recovery plan. However, it does have phenological characteristics likely to be of importance to Swift Parrot. For example, it is a large, intact area of key tree species (Saunders & Tzaros, 2011). Therefore, key threats to the species that are a direct or indirect result of the project are addressed below. The below list of key threats is listed in the Recovery Plan for the species (Saunders & Tzaros, 2011). Each of the identified threats to Swift Parrot has the potential to compromise long-term survival of the species, and when more than one threat is present, the cumulative effect is likely to be substantially greater than the sum of individual threats (Saunders & Tzaros, 2011). Habitat loss Whilst the habitat present within the impact area constitutes approximately 0.0011% of the species' range using the full extent of occurrence estimated as 57,000 km2 on mainland Australia (Garnett et al., 2011)) the use of other available habitat is dependent on prevailing climatic conditions and corresponding food availability (Saunders & Tzaros, 2011). The project proposes to remove 68.02 ha of Swift Parrot habitat from one of the southernmost examples of the species' available habitat on mainland Australia. There is also a growing risk that in any one year, large-scale intense bushfires could reduce a large proportion of available habitat for the species. Whilst the habitat present in the impact area comprises only a small area of total available habitat for the species, it is unknown whether this habitat may represent a critical food source for the species under differing environmental conditions. Climate change Loss of nesting trees and large areas of foraging habitat due to increased wildfires across the species' range, stochastic flowering of eucalypts as a result of drought and as a direct result of climate change, induced by anthropogenic emissions of greenhouse gases, is likely to pose a significant threat to Swift Parrot. Increased air traffic as a result of the construction of the third runway is likely to contribute to increased emissions of greenhouse gases. Collision mortality The risk of collision with aircraft is likely to be reduced if approximately half of the suitable habitat surrounding the airport is removed (i.e. removal of 68.02 hectares of the 154 hectare Grey Box Woodland). No Swift Parrot deaths have been recorded at Melbourne Airport as a result of collision with aircraft to date. It is unlikely that there would be increased collision mortality as a result of the project.

Significant Impact Criteria (cont.)	Likelihood of significant impact (cont.)	Justification (cont.)
An action is likely to have a significant impact on a critically endangered species if there is a real chance or possibility that it will result in one or more of the following (DoE, 2013):		
Reduce the area of occupancy of the species.	Almost certain	68.02 hectares of suitable habitat will be removed. This constitutes approximately 0.0011% of the species' range, using the full extent of occurrence estimated as 57,000 km2 on mainland Australia (Garnett et al., 2011).
Fragment an existing population into two or more populations.	Rare	The Swift Parrot occurs as a single, migratory population (Saunders & Tzaros, 2011) and, as such, removal of habitat in the project area cannot fragment the population.
Adversely affect habitat critical to the survival of a species.	Possible	Habitat critical to the survival of Swift Parrot includes: those areas of priority habitat for which the Swift Parrot has a level of site fidelity or are of habitat that possess phenological characteristics likely to be of importance to Swift Parrot or are otherwise currently identified by the recovery team. Whilst the habitat present within the project area is not a priority habitat site listed within the recovery plan, it includes a large patch of mainland foraging habitat dominated by a key tree species (Grey Box) and the species has been confirmed as using the site on multiple occasions. Habitat within the project area therefore possesses the phenological characteristics likely to be of importance to the Swift Parrot.
Disrupt the breeding cycle of a population.	Rare	No breeding population occurs within the project area or the adjacent larger Grey Box Woodland. All breeding habitat for the species is located in Tasmania.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Possible	As per the first criterion.
Result in invasive species that are harmful to a critically endangered species becoming established in the critically endangered species' habitat.	Rare	The potential introduction of invasive species into the remaining area of habitat at Melbourne Airport (the retained Grey Box Woodland) will be addressed by adopting a vehicle and machinery hygiene procedure, to ensure all vehicles and machinery that arrive at the project area are free of soil and other material that may contain weed propagules.
Introduce disease that may cause the species to decline.	Rare	The project will not introduce disease that may cause any impact on the species.
Interfere with the recovery of the species.	Likely	The removal of Swift Parrot habitat from the impact area is not aligned with Recovery Action 2.1 of the Swift Parrot recovery plan, which relates to managing and protecting nesting and foraging habitat.

The Growling Grass Frog populations in Arundel Creek, Deep Creek, the Maribyrnong River and Moonee Ponds Creek are considered viable populations and therefore important populations for the purposes of assessment under the EPBC Act.

No impacts on Moonee Ponds Creek or the terrestrial habitat surrounding it is expected as a result of the project. The significant impact assessment has been undertaken for the Arundel Creek and Deep Creek/ Maribyrnong River populations of Growling Grass Frog.

A significant impact is considered likely to occur on Growling Grass Frog for the population present within Arundel Creek; however, it is unlikely a significant impact would occur on the population in Deep Creek/ Maribyrnong River based on the assessment in Table B5.24.

Table B5.24
Significant impact assessment for the vulnerable Growling Grass Frog

Ecological element affected	Impact threshold	Comment
Significant impact guidelines for the vulnerable Growling Grass Frog (Litoria raniformis)		
Habitat degradation in 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 m of a water body in temperate regions, or 350 m of a water body in semi-arid regions, that results in the loss of dispersal or overwintering opportunities for an important population. • Alteration of aquatic vegetation diversity or structure that leads to a decrease in habitat quality. • 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.	• 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 and 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.
Isolation and fragmentation of populations.	Net reduction in the number and/or diversity of water bodies available to an important population. Removal or alteration of available terrestrial or aquatic habitat corridors (including alteration of connectivity during flood events). Construction of physical barriers to movement between water bodies, such as roads or buildings.	• 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.

	Arundel Creek		Deep Creek / Maribyrnong River	
	Assessment	**Justification**	**Assessment**	**Justification**
Significant impact guidelines for the vulnerable Growling Grass Frog (DEWHA, 2009b) (cont.)				
	Almost certain	• 64.34 ha of GGF habitat (including 7.27 ha of aquatic/breeding habitat and 57.05 ha of terrestrial habitat) will be lost or modified within or adjacent to Arundel Creek as a result of the project. • The GGF habitat is located along 3.3 km of Arundel Creek. Along the northern (upstream) 1.7 km, all aquatic/breeding and terrestrial habitat would be permanently lost by construction of M3R. Along the southern (downstream) 1.6 km, all aquatic and some terrestrial habitat would be temporarily affected by construction of water treatment infrastructure. It has been assumed that all unaffected terrestrial habitat in the southern 1.6 km would continue to provide terrestrial foraging and dispersal opportunities for the species in the long term. While the aquatic habitat in the southern 1.6 km has been assumed lost, it may ultimately continue to provide some habitat for the species and/or be re-colonised after construction. • Downstream impacts will be managed in line with Melbourne Water requirements to maintain baseline outflow and sedimentation rates through mechanical controls. Downstream (offsite) impacts are therefore unlikely. • Strict hygiene protocols are to be established to ensure Chytrid fungus is not introduced downstream.	Rare	• There is 1.18 ha of terrestrial habitat located within the impact area. • There will be no impacts to aquatic habitat. • Impacts to terrestrial habitat adjacent to Deep Creek and the quarry are likely to include temporary disturbance through the upgrade of an existing road. The road, once complete, will not fragment habitat or act as a barrier to movement.
	Almost certain	There will be no fragmentation as the entire northern section of the Arundel Creek, extending from its headwaters to 1.7 km downstream, is proposed for modification to the extent that is unlikely to constitute suitable habitat post-construction. However, there will be a net reduction in the number of waterbodies and diversity of waterbodies available to an important population.	Rare	The upgrade of an existing road may temporarily isolate individuals located within the quarry from Deep Creek. However, this will only be temporary during the construction phase.

Australian Grayling

A significant impact is considered unlikely on Australian Grayling, based on the assessment in Table B5.25.

White-throated Needletail

A significant impact is considered unlikely on White-throated Needletail, based on the assessment in Table B5.26.

Table B5.25
Significant impact assessment for the vulnerable Australian Grayling

Significant Impact Criteria	Likelihood of significant impact	Justification
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following (DoE, 2013)		
Lead to a long-term decrease in the size of an important population of a species.	Rare	There is no population of the species present within the impact area. This assessment addresses downstream impacts to the species which is present within the Maribyrnong River. The effects on downstream waterways will be controllable and during a relatively short-term construction period only. Permanently altered run-off and water quality will be managed by design and relevant permit conditions to ensure integrity of adjacent waterways as habitat for the species. No breeding population occurs within the project area and downstream impacts are to be managed through the implementation of a Construction Environment Management Plan (CEMP), so that outflow and sediment rates remain at base levels. The potential introduction of invasive species or disease will be addressed by adopting a vehicle and machinery hygiene procedure, to ensure all vehicles and machinery that arrive at the project area are free of soil and other material that may contain weed propagules. It is likely that pest species present within Arundel Creek will already by occupying the Maribyrnong River. Introduction of new pest species is therefore unlikely to occur through the removal of a portion of Arundel Creek. The potential habitat located within the project area is not subject to any recovery plan for the 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, 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.		
Interfere substantially with the recovery of the species.		

Table B5.26
Significant impact assessment for the vulnerable White-throated Needletail

Significant Impact Criteria	Likelihood of significant impact	Justification
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following (DoE, 2013):		
Lead to a long-term decrease in the size of an important population of a species.	Rare	The species occurs at numerous and widespread sites in eastern Australia. It is likely that the species utilises all of the airspace at Melbourne Airport with the airspace above the woodland providing preferable habitat. There is an incidental record of the species from 2010 (Birdlife Australia) over Sky Road in Melbourne Airport and other records surrounding the airport. The species is known to have a preference for foraging above wooded areas and is known to roost in the canopy and hollows of trees in forests and woodlands. Potential impacts on this species include: • Increased risk of collision with aircraft as a result of increased air traffic. • Removal of preferable foraging and potential roosting areas within and above the Grey Box Woodland. White-throated Needletail spends its non-breeding time in Australia and when in Australia the species is widespread and numerous. Potential impacts as a result of M3R are not expected to have a significant impact on this 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, 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.		
Interfere substantially with the recovery of the species.		
Draft EPBC Act referral guidelines for 14 birds listed migratory under the EPBC Act (DoE, 2015)		
Is the proposed activity within the species range (maps, page 10, Department of Energy 2015).	Almost certain	The project area is located within the core non-breeding range for the species in Australia.
Is the proposed activity likely to substantially modify, destroy or isolate an area if important habitat for the species.	Rare	Important habitat is described as (DoE, 2015): *'Non-breeding habitat only: Found across a range of habitats, more often over wooded areas, where it is almost exclusively aerial. Large tracts of native vegetation, particularly forest, may be a key habitat requirement for species. Found to roost in tree hollows in tall trees on ridge-tops, on bark or rock faces. Appears to have traditional roost sites.'* Whilst the Grey Box Woodland is a relatively large example of wooded vegetation, Grey Box trees are relatively small compared to tall forest trees. With limited records of the species in the local area, it is unlikely that the woodland provides significant roosting habitat for the species.
Seriously disrupt the lifecycle of an ecologically significant proportion of the population.	Rare	The nationally significant proportion of the population is 10 individuals and globally significant proportion of the population is 100 individuals. Given how sparingly the species has been recorded at Melbourne Airport and surrounds, the potential increased collision risk as a result of the project is unlikely to disrupt the lifecycle of an ecologically significant proportion of the population.

Gang-gang Cockatoo

A significant impact is considered unlikely to occur on Gang-gang Cockatoo based on the assessment in Table B5.27. Gang-gang Cockatoo is a seasonal altitudinal migrant and spends the winter months in drier woodlands and forest types and the summer months in sub-alpine and montane forests (DAWE, 2022). The species is capable of occupying vegetation throughout this range and utilises a range of vegetation types and habitats including urban areas. The conservation advice for this species (DAWE, 2022) states that habitat critical for the survival of Gang-gang Cockatoo includes all foraging habitat during breeding and non-breeding seasons. This implies that the removal of any foraging trees or shrubs, regardless of species, location and extent, would be considered as removal of critical habitat and therefore result in a significant impact. For the purposes of this assessment, critical habitat is considered as habitat critical for breeding, such as hollow bearing trees in montane and sub-alpine areas and large trees in adjoining areas.

Table B5.27
Significant impact assessment for the endangered Gang-gang Cockatoo

Significant Impact Criteria	Likelihood of significant impact	Justification
An action is likely to have a significant impact on a endangered species if there is a real chance or possibility that it will result in one or more of the following (DoE, 2013):		
Lead to a long-term decrease in the size of a population.	Rare	Gang-gang Cockatoo is a transient avian species that could visit the study area on occasion to forage. The most suitable habitat in the project area is the Grey Box Woodland. The impact area includes the removal of 68.02 ha of Grey Box Woodland that may be utilised by Gang-gang Cockatoo on occasion. However, as this species is highly mobile and this species breeds in alpine areas, the project works are unlikely to impact directly on breeding populations of Gang-gang Cockatoo. The project works will not lead to a long-term decrease in the size of any Gang-gang Cockatoo populations as the species is likely to utilise the study area vegetation only to forage and then return to higher-altitude breeding habitat during summer.
Reduce the area of occupancy of the species.	Rare	Gang-gang Cockatoo is a seasonal altitudinal migrant and spends the winter months in drier woodlands and forest types and the summer months in sub-alpine and montane forests (DAWE, 2022). The species is capable of occupying vegetation throughout this range and utilises a range of vegetation types and habitats. While suitable foraging habitat will be removed by the project, there will be areas of suitable habitat retained at Melbourne Airport and the overall area of occupancy of the species will remain unchanged.
Fragment an existing population into two or more populations.	Rare	Gang-gang Cockatoo is capable of dispersing between summer habitat in the Australian alpine area and winter habitat at lower elevations (DAWE, 2022). It is also capable of dispersing and foraging within urban environments. As such, the construction and operation of the project will not act as a barrier to this highly mobile avian species.
Adversely affect habitat critical to the survival of a species.	Rare	As Gang-gang Cockatoo breed in alpine areas and the study area provides occasional foraging habitat for the species, it is unlikely that the removal of 68.02 ha of Grey Box Woodland will adversely affect habitat critical for the species' survival.
Disrupt the breeding cycle of a population.	Rare	As Gang-gang Cockatoo breed in alpine areas, it is unlikely that the removal of 68.02 ha of Grey Box Woodland in the project area will result in the disruption of the breeding cycle of this species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Rare	The removal of 68.02 ha of Grey Box Woodland within the project area is unlikely to reduce the availability or quality of habitat that would lead to a decline in the species.
Result in invasive species that are harmful to a critically endangered species becoming established in the critically endangered species' habitat.	Rare	The potential introduction of invasive species will be addressed by adopting a vehicle and machinery hygiene procedure, to ensure all vehicles and machinery that arrive at the project area are free of soil and other material that may contain weed propagules.
Introduce disease that may cause the species to decline.	Rare	The project will not introduce disease that may cause any impact on the species.
Interfere with the recovery of the species.	Rare	As Gang-gang Cockatoo are reliant on vegetation within alpine areas and will only occasionally visit the study area to forage, it is unlikely that the project will interfere with the recovery of the species.

B5.6.3.2
Threatened ecological communities

Grey Box Woodland

There are 78.74 hectares of this community in the impact area that would be removed for construction of M3R (68.02 hectares in a treed condition state and 10.72 hectares in a derived grassland condition state). Based on the extent and condition of this community in the project area and the proposed impacts, it is concluded that the project is likely to result in a significant impact on the Grey Box Woodland endangered ecological community. An assessment and justification for this decision is provided in Table B5.28

Table B5.28
Significant impact assessment for endangered Grey Box Woodland

Significant Impact Criteria	Likelihood of significant impact	Justification
An action is likely to have a significant impact on an endangered ecological community if there is a real chance or possibility that it will result in one or more of the following (DoE, 2013):		
Reduce the extent of an ecological community.	Almost certain	Grey Box Woodlands are widespread across inland Victoria and NSW with outliers north and west of Melbourne. Impacts will occur on a southern outlier of this community. The Melbourne Airport woodland is one of three large patches of this community left in southern Victoria. More broadly, it is estimated that only 10% to 15% of its original extent remains (DSEWPaC, 2012). The removal of up to 68.02 ha out of 154.00 ha of woodland and 10.72 ha out of 15.68 ha of derived grassland is likely to significantly reduce the extent of the Grey Box community in Victoria.
Fragment or increase fragmentation of an ecological community.	Almost certain	Reducing the total extent of the Grey Box Woodland community from 169.68 ha to 90.94 ha (removing 78.74 ha) will reduce the total area of habitat available in the area. The edge to interior ratio will increase, potentially changing the properties of the remaining habitat. At a landscape scale in southern Victoria, the reduction in size of this example of the community will increase functional fragmentation for vagrant species such as woodland birds that are an important component of the community. The reduction in size of the woodland will further reduce opportunity for dispersal of plant propagules to other woodland sites within the broader landscape.
Adversely affect habitat critical to the survival of an ecological community.	Possible	There is no adopted or made recovery plan for this ecological community and no critical habitats have been formerly identified by the Australian Government. However, removal of 78.74 ha of the community is likely to increase serious or long-term impacts on habitat critical to the survival of the community in a broader context in Victoria and southern Australia.
Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.	Almost certain	Removal of 78.74 ha of the community is likely to result in long term disturbance to soil and topography in the local area.
Cause a substantial change in the species composition of an occurrence of an ecological community, including a decline or loss of functionally important species, for example through regular burning or flora and fauna harvesting.	Possible	Clearing almost half of the Grey Box Woodland and associated derived grassland will reduce community integrity and functionality (e.g. reduction in habitat for small native mammals and woodland birds, reduced flora species richness, potential reduced genetic exchange across the community in southern Victoria due to fragmentation). The project will not introduce disease that may cause any impact on the species.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to: - Assisting invasive species establishment - 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.	Likely	Fragmentation of the woodland will increase the edge effects on the remaining 90.94 ha by reducing the interior area. It is well documented that fragmentation and increased edge effects assist the establishment of invasive species further into the core of large habitat patches.
Interfere with the recovery of an ecological community.	Likely	There is no adopted or made recovery plan for this ecological community and therefore recovery priorities (actions and locations) have not been formerly articulated by the Australian Government. The action of clearing almost half of this community at Melbourne Airport will cause a significant loss of opportunity to protect and manage one of the last remaining large (>100 ha) Grey Box Woodland remnants in southern Victoria.

Natural Temperate Grassland of the Victorian Volcanic Plain

It is estimated that 90.49 hectares of Natural Temperate Grassland would need to be removed for the project, which is likely to constitute a significant impact on this TEC. A justification for this conclusion is provided as part of the significant impact self-assessment in Table B5.29.

Table B5.29
Significant impact assessment for critically endangered Natural Temperate Grassland

Significant Impact Criteria	Likelihood of significant impact	Justification
An action is likely to have a significant impact on a critically endangered ecological community if there is a real chance or possibility that it will result in one or more of the following (DoE, 2013):		
Reduce the extent of an ecological community.	Almost certain	It is inherently difficult to estimate the extent of treeless threatened ecological communities at landscape scales. Nevertheless, it is generally accepted that Natural Temperate Grassland has declined in extent by more than 98% since European arrival in Victoria (TSSC, 2008). In the early 2000s, it was estimated that 5000 ha of Natural Temperate Grassland remained (Barlow and Ross, 2002). If anything, the extent of this TEC is likely to be less now. Removal of 90.49 ha of Natural Temperate Grassland from the project area amounts to removal of at least 2% of the estimated remaining extent of this TEC, near the eastern limit of the TEC's distribution. In the context of the historical decline in Natural Temperate Grassland, this impact is highly likely to be considered significant.
Fragment or increase fragmentation of an ecological community.	Almost certain	It is estimated that more than 95% of known patches of Natural Temperate Grassland are less than 10 ha in size, as a result of fragmentation by clearing and modification of the TEC over time (TSSC, 2008). The project would result in the fragmentation of at least six patches of Natural Temperate Grassland greater than 10 ha in size. On a broader landscape scale, it would result in complete removal of three patches greater than 10 ha in size. The project would therefore cause the fragmentation of a TEC, which is highly likely to be considered a significant impact.
Adversely affect habitat critical to the survival of an ecological community.	Almost certain	No recovery plan has been prepared or adopted for this TEC and no critical habitats have been formally identified by the Australian Government. However, given that less than 2% of the TEC is estimated to still exist, most areas that continue to support the TEC are likely to be considered critical habitat, particularly if those areas support moderate to high quality examples of the TEC. The project would result in permanent removal of 90.49 ha of Natural Temperate Grassland with a weighted average condition score of 47.24 out of 100 and therefore adversely affect habitat that is likely to be critical to the survival of the TEC, given the broader context.
Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.	Almost certain	Construction of a new runway, taxiways and ancillary infrastructure is likely to result in long term disturbance to soil, topography and hydrology necessary for persistence of the TEC across most of the project area.
Cause a substantial change in the species composition of an occurrence of an ecological community, including a decline or loss of functionally important species, for example through regular burning or flora and fauna harvesting.	Almost certain	Decline of Natural Temperate Grassland typically involves the sequential loss of the following functionally important species or floristic groups: loss of warm-season grasses (e.g. Kangaroo Grass), followed by decline in native forb diversity, followed by loss of cool-season grasses (e.g. Tussock Grass, Wallaby Grass and Spear Grass). Various stages of this decline are noticeable with the project area. For example, Kangaroo Grass is rare and native forb diversity is low. Permanent removal of Natural Temperate Grassland within the project area would result in loss of all remaining functionally important species from this occurrence of the TEC. Any Natural Temperate Grassland that persists or regenerates within the project area is likely to have reduced species richness and be subject to more intensive management regimes (e.g. mowing) post-construction, thereby resulting in permanently reduced flora and fauna assemblages.

Significant Impact Criteria (cont.)	Likelihood of significant impact (cont.)	Justification (cont.)
Significant Impact Guidelines for critically endangered / endangered community) (DoE, 2013) (cont.)		
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to: *- Assisting invasive species establishment* *- 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.*	Almost certain	Construction of the project will result in fragmentation of Natural Temperate Grassland within the local area. Fragmentation is likely to increase the susceptibility of remaining Natural Temperate Grassland to weed invasion.
Interfere with the recovery of an ecological community.	Likely	No recovery plan has been prepared or adopted for this TEC and therefore recovery priorities (actions and locations) have not been formally articulated by the Australian Government. However, the action of clearing at least 2% of the estimated remaining area of this TEC, particularly at the eastern edge of the TEC's distribution, is likely to interfere with the TEC's recovery.

Table B5.30
Significant impact assessment for listed migratory species

Species	Significant Impact Criteria	Likelihood of significant impact	Justification
Draft EPBC Act referral guidelines for 14 birds listed migratory under the EPBC Act (DoE, 2015)			
Fork-tailed Swift	Is the proposed activity within the species range (maps, page 10, DoE, 2015)?	Almost certain	The project area is located within the core range for the species in Australia.
	Is the proposed activity likely to substantially modify, destroy or isolate an area if important habitat for the species?	Rare	Important habitat for the species includes all aerial habitats. Potential impacts on the species as a result of the project includes risk of collision with aircraft. The increased risk of collision with aircraft is unlikely to substantially modify, destroy or isolate an area of important habitat.
	Would the proposed activity seriously disrupt the lifecycle of an ecologically significant proportion of the population?	Rare	Potential impacts unlikely to disrupt the lifecycle of an ecologically significant proportion of a population for any of the species. A nationally ecologically significant proportion of Fork-tailed Swift is 100 individuals (DoE, 2015). With less than 7 records in the broader region in the past 20 years reduction in the population by 100 individuals is highly unlikely.
Significant impact to Fork-tailed Swift is unlikely			
Rufous Fantail	Is the proposed activity within the species range (maps, page 13, DoE, 2015)?	Almost certain	The project area is located within the core range for the species in Australia.
	Is the proposed activity likely to substantially modify, destroy or isolate an area if important habitat for the species?	Rare	Important habitat for the species is defined as (DoE, 2015): 'Moist, dense habitats, including mangroves, rainforest, riparian forests and thickets, and wet eucalypt forests with a dense understorey. When on passage a wider range of habitats are used including dry eucalypt forests and woodlands and Brigalow shrublands.' There will be no substantial modification, removal, destruction or isolation of habitat within the project area.
	Would the proposed activity seriously disrupt the lifecycle of an ecologically significant proportion of the population?	Rare	A nationally ecologically significant proportion of Rufous Fantail is 4,800 individuals (DoE, 2015). Potential impacts are unlikely to disrupt the lifecycle of an ecologically significant proportion of a population for any of the species.
Significant impact to Rufous Fantail is unlikely			

Species (cont.)	Significant Impact Criteria (cont.)	Likelihood of significant impact (cont.)	Justification (cont.)
Draft EPBC Act referral guidelines for 14 birds listed migratory under the EPBC Act (DoE, 2015) (cont.)			
Satin Flycatcher	Is the proposed activity within the species range (maps, page 12, DoE, 2015)?	Almost certain	The project area is located within the core range for the species in Australia.
	Is the proposed activity likely to substantially modify, destroy or isolate an area if important habitat for the species?	Rare	Important habitats for the species are described as (DoE, 2015): *'Eucalypt forest and woodlands, at high elevations when breeding. They are particularly common in tall wet sclerophyll forest, often in gullies or along water courses. In woodlands they prefer open, grassy woodland types. During migration, habitat preferences expand, with the species recorded in most wooded habitats except rainforests. Wintering birds in northern Qld will use rainforest - gallery forests interfaces, and birds have been recorded wintering in mangroves and paperbark swamps.'* The increased risk of collision with aircraft or the removal of habitat is unlikely to substantially modify, destroy or isolate an area of important habitat.
	Would the proposed activity seriously disrupt the lifecycle of an ecologically significant proportion of the population?	Rare	A nationally ecologically significant proportion of Satin flycatcher is 1,700 individuals (DoE, 2015). Potential impacts are unlikely to disrupt the lifecycle of an ecologically significant proportion of a population for any of the species.
Significant impact to Satin Flycatcher is unlikely			
White-throated Needletail	Refer to **Table B5.26**		
Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (DoEE, 2017)			
Latham's Snipe	Will there be a loss of important habitat?	Rare	The project area is not identified as internationally important for the species and no individuals have been recorded at Melbourne Airport. It is therefore unlikely that habitat within the project area would support more than 18 individuals. A significant impact on the species is unlikely.
	Will there be degradation of habitat leading to a substantial reduction in numbers?		
	Will there be increased disturbance leading to a substantial reduction in numbers?		
Significant impact to Latham's Snipe is unlikely			

B5.6.3.3
Listed migratory species

A significant impact is considered unlikely on listed migratory species, based on the assessment in Table B5.29.

B5.7
AVOIDANCE, MANAGEMENT AND MITIGATION MEASURES

B5.7.1.1
Pre-construction avoidance and minimisation of impacts

The key measure for reducing M3R's impacts on ecological values within the project area is to minimise the removal of native vegetation and fauna habitat wherever possible (given the size and scale of the project, complete avoidance of impacts to ecological values is not possible.)

Refinement of the project area has significantly minimised impacts proposed to native vegetation and fauna habitat. The project will require the removal of 247.96 hectares of native vegetation – a significant reduction from the initially proposed 403.86 hectares. This results in retaining 155.90 hectares of native vegetation and associated fauna habitat initially proposed for removal.

B5.7.1.2
Construction phase management and mitigation measures

Measures to mitigate and manage impacts on ecological values will be detailed in a Construction Environment Management Plan (CEMP) prepared before construction in accordance with the *Environmental Management Plan Guidelines* (DoE, 2014), the Melbourne Airport Environmental Management Plan (APAM 2021), and the Melbourne Airport PFAS Management Framework (APAM 2022).

General details on management and mitigation measures during construction can be found in Chapter A5: Project Construction. Further details on measures to mitigate and manage impacts on ecological values can be found in **Chapter E2: Environment Management Framework** and will be included in the project-specific CEMP.

The CEMP will document all processes and management strategies to minimise and/or prevent impacts on ecological values. Implementation of the CEMP will limit impacts to the impact area, and all downstream impacts will be considered negligible. The CEMP will include detail on the following mitigation and management strategies:

- Protection of EPBC Act listed communities (NTGVVP and Grey Box Woodland) and other areas of native vegetation that are to be retained within and adjacent to the project area. Exclusion fencing will be erected to protect these areas and identified with appropriate signage such as 'Environmental Protection Area' or 'No-go zone' at regular intervals along the fence line. Access to and from the project area will be restricted to the impact footprint identified within this assessment. Traversing native and introduced grasslands outside of this impact footprint will be strictly prohibited.
- Locating all material stockpiles, vehicle parking and machinery storage within cleared areas or areas proposed for clearing, and not in areas of retained native vegetation. Stockpiles will be placed in appropriate areas inside the impact footprint.
- Ensuring that all employees and contractors complete environmental inductions prior to undertaking works within the project area.
- Implementation of strict hygiene protocols that reduces the risk of establishment of novel and/or high threat weeds or disease. High threat weeds are already established within the project area The establishment of new high threat weeds, introduction of disease or spread of existing weeds from or around the project area will be mitigated through vehicle washdown procedures incorporated into the CEMP.
- Incorporating measures for weed control, erosion control and surface water management into the project specific CEMP.
- A monitoring strategy will be developed to monitor rehabilitation outcomes post construction and monitor for establishment of new and emerging weeds within and adjacent to the impact area.
- Development of a fauna management plan, particularly for works conducted within the Grey Box Woodland ecological community. The fauna management plan will outline the steps taken to minimise impacts on fauna, the process and steps involved in animal salvage as well as detailing emergency processes should an animal become injured during habitat removal and construction activities.
- Continue to implement an ongoing surface water quality and stream health monitoring program to monitor whether there has been any negative impact on the health of waterways impacted by instream or riparian works associated with the project.

B5.7.1.3 Post-construction rehabilitation and adaptive management

Post-construction rehabilitation of the development footprint will focus on establishing an erosion-resistant ground condition. This will require a program of revegetation, erosion control, targeted weed management and ongoing monitoring.

Further details on post-construction rehabilitation and adaptive management will be found in **Chapter E2: Environment Management Framework** and be included in the project-specific CEMP.

Ongoing monitoring will include an assessment of the following:

- New weed infestations (particularly consisting of existing high threat species) and the establishment of new weed species.
- Success of rehabilitation strategies designed to achieve ecological outcomes, such as connecting fauna habitats or areas of native vegetation. The assessment will address the success rates of revegetation programs to ensure suitable species are used and planting densities are maintained.
- Effectiveness of weed control programs implemented.
- Effectiveness of erosion control measures implemented.

With regard to potential ongoing impacts from lighting, designs for ancillary buildings will be developed with reference to the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (DoEE, 2020).

B5.7.1.4 Offsets

The provision of appropriate offsets in accordance with the EPBC Act Environmental Offsets Policy (DSEWPaC, 2012b) will be established and secured for any residual impacts to significant ecological values that cannot be eliminated by avoidance, minimisation and other management measures. The key ecological values proposed to be offset include:

- Loss of 90.49 hectares of Natural Temperate Grassland of the Victorian Volcanic Plain TEC
- Loss of 68.02 hectares of Grey Box Grassy Woodland (treed condition state) TEC
- Loss of 10.72 hectares of Grey Box Grassy Woodland (derived native grassland) TEC
- Loss of 9.75 hectares of Golden Sun Moth habitat

- Loss of 64.34 hectares of Growling Grass Frog habitat (including 7.27 hectares of aquatic/breeding habitat and 57.05 hectares of terrestrial habitat)
- Loss of 68.02 hectares of Swift Parrot foraging habitat.

The proposed offset management strategy is detailed in **Chapter E3: Offset Management Strategy**. By offsetting the large-scale and significant native vegetation removal for the project, the proposed offset strategy will contribute conservation gains that will mitigate significant impacts to the environment as a whole on Commonwealth land.

Although offsets for the removal of native vegetation or species-specific offsets are not triggered under the P&E Act, those offsets secured under the EPBC Act Environmental Offsets Policy will substantially secure habitat for the Victorian FFG Act-listed species that are likely to occur or which do occur within the impact area – along with native vegetation offsets that are potentially proportionate to what would be required under the P&E Act if it were applicable.

B5.8 CONCLUSION

Refined design efforts have greatly reduced the impact area and subsequently the impact on native vegetation and fauna habitat initially associated with M3R.

The project is highly likely to result in a significant impact to the following EPBC Act and FFG Act-listed threatened species and ecological communities:

- NTGVVP
- Grey Box Woodland (treed and derived grassland condition states)
- Swift Parrot
- Growling Grass Frog
- Golden Sun Moth.

It is also considered highly likely the project will result in a significant impact on the environment on Commonwealth land due to large-scale clearing of native vegetation; the removal of threatened ecological communities; removal of habitat for threatened species; loss of habitat for local wildlife populations; and substantial alteration to landscape features through removal of the majority of Arundel Creek and approximately half the Grey Box Woodland.

Although other EPBC Act-listed threatened species and migratory species may occasionally use the project area – and in some cases will do so regularly, for example the Grey-headed Flying-fox – significant impacts are not expected to occur to these species as a result of the project.

Table B5.30 summarises the ecological values that would be impacted by the project through direct loss of native vegetation and impacts on threatened species habitat.

Measures to mitigate and manage impacts to ecological values will be detailed in a CEMP. This will contain a requirement for the monitoring of impact – in addition to reviews of mitigation measures and their effectiveness during construction – to ensure that the full extent of impacts is accurately documented, and that the nominated offsets meet the legislative requirements outlined in the offset management strategy for the project.

Residual impacts to EPBC Act-listed threatened species and ecological communities are to be offset as per the EPBC Act Environmental Offsets Policy (DSEWPaC, 2012b). The proposed offset management strategy is detailed in **Chapter E3: Offset Management Strategy**.

By offsetting the large-scale and significant native vegetation removal for the project, the proposed offset strategy will contribute conservation gains that will mitigate significant impacts to the environment as a whole on Commonwealth land.

A summary of the potential impacts associated with the project and proposed mitigation and management measures (in accordance with the significance assessment framework) is contained in **Table B5.31**.

Table B5.31
Native vegetation, threatened ecological communities and threatened fauna habitat in the impact area (Figure B5.19 and Figure B5.20)

Ecological value	Impact area (hectares)
Native vegetation (EVC)	
Aquatic Herbland (EVC 653)	0.02
Creekline Grassy Woodland (EVC 68)	1.33
Escarpment Shrubland (EVC 895)	1.37
Hills Herb-rich Woodland (EVC 71)	10.89
Plains Grassland (EVC 132)	161.37
Plains Grassy Woodland (EVC 55)	0.25

Ecological value (cont.)	Impact area (hectares) (cont.)
Plains Woodland (EVC 803)	70.98
Riparian Woodland (EVC 641)	1.26
Tall Marsh (EVC 821)	0.49
EPBC Act listed TEC (subset of EVCs above)	
Grey Box Grassy Woodlands and Derived Grasslands of South-eastern Australia – treed condition state (EVC 71 and parts of EVC 803)	68.02
Grey Box Grassy Woodlands and Derived Grasslands of South-eastern Australia – derived native grassland (treeless EVC 803)	10.72
Natural Temperate Grassland of the Victorian Volcanic Plain (total) (EVC 132)	90.49
FFG Act listed TEC (subset of EVCs above)	
Victorian Temperate Woodland Bird Community	68.02
Western (Basalt) Plains Grassland	161.37
EPBC Act and FFG Act listed fauna habitat (associated with EVCs above and non-native vegetation)	
Habitat suitable for Golden Sun Moth	9.75
Breeding and dispersal habitat for Growling Grass Frog	64.34
Woodland habitat suitable for: • Swift Parrot • Grey-headed Flying-fox • Gang-gang cockatoo	68.02
FFG listed fauna habitat (associated with EVCs above and non-native vegetation)	
Native and introduced grassland habitat suitable for Tussock Skink	594.29
Woodland habitat suitable for: • Hooded Robin • Powerful Owl • Speckled Warbler • Brush-tailed Phascogale • Grey Goshawk • Turquoise Parrot • Yellow-bellied Sheathtail Bat • Eastern Bent-wing Bat	68.02
Permanent watercourses (including Arundel Creek and large water storage dams along Arundel Creek), providing suitable habitat for: • Platypus • Australian Mudfish	7.27
Large water storage dams along Arundel Creek, providing suitable habitat for: • Freckled Duck • Hardhead • Blue-billed Duck • Musk Duck • Common Sandpiper • Marsh Sandpiper • Common Greenshank	2.42*
Permanent watercourses (including Arundel Creek and large water storage dams along Arundel Creek) and farm dams, providing suitable habitat for: • Little Egret • Plumed Egret • Eastern Great Egret • Murray River Turtle • White-bellied Sea-Eagle	7.59*
Aerial space above all vegetated and aquatic areas that provide suitable habitat for: • Black Falcon • Little Eagle	688.46

**Note: Habitat estimates marked with an asterisk are the minimum area of habitat that is likely to be present at any given time. These areas would vary depending on the amount of water in the landscape. In wet conditions, when grassland environments become temporarily inundated, there would potentially be a much larger area of suitable habitat for these species within the impact area.*

Table B5.32
Impact assessment summary

Environment aspect & baseline condition	Assessment of original impact					
	Original Impact	Mitigation inherent in design/practice	Significance			
			Duration	Severity	Likelihood	Impact
Natural Temperate Grassland 90.49 ha of a critically endangered TEC within the impact area.	Direct removal of 90.49 ha of this TEC, which also corresponds with higher quality areas of the FFG Act Western (Basalt) Plains Grassland community.	Minimise permanent removal where possible.	Permanent	Major	Almost certain	Extreme
Grey Box Woodland (treed state) 68.02 ha of this vulnerable TEC within the impact area.	Direct removal of 68.02 ha of this EPBC Act TEC, which also corresponds with the FFG Act Temperate Woodland Bird Community.	Minimise permanent removal where possible.	Permanent	Major	Almost certain	Extreme
Grey Box Woodland (derived grassland state) 10.72 ha of this vulnerable TEC within the impact area.	Direct removal of 10.72 ha of this TEC.	Minimise permanent removal where possible.	Permanent	Major	Almost certain	Extreme
Golden Sun Moth habitat 9.75 ha of habitat within the impact area	Direct removal of 9.75 ha of habitat	Minimise permanent removal where possible.	Permanent	Major	Almost certain	Extreme
Growling Grass Frog habitat 64.34 ha of terrestrial and aquatic habitat within the impact area.	Direct removal of 64.34 ha of habitat within the impact area (including 7.27 ha of aquatic/ breeding habitat and 57.05 ha of terrestrial habitat).	Minimise permanent removal where possible.	Permanent	Major	Almost certain	Extreme
Swift Parrot habitat 68.02 ha of habitat within the impact area.	Direct removal of 68.02 ha of foraging habitat within the impact area.	Minimise permanent removal where possible.	Permanent	Major	Almost certain	Extreme
Grey-headed Flying Fox habitat Foraging habitat present in the form of planted trees, scattered native trees and woodland EVCs.	Direct removal of planted trees, scattered trees and 68.02 ha of Grey Box Woodland habitat that represents potential foraging habitat.	Minimise permanent removal where possible.	Permanent	High	Almost certain	Extreme
Gang-gang Cockatoo Foraging habitat present in the form of planted trees, scattered native trees and woodland EVCs.	Direct removal of planted trees, scattered trees and 68.02 ha of Grey Box Woodland habitat that represents potential foraging habitat.	Minimise permanent removal where possible.	Permanent	High	Almost certain	Extreme

Mitigation and/or management measures	Assessment of residual impact				
	Residual Impact	Duration	Significance		
			Severity	Likelihood	Impact
Mitigation The following mitigation will be implemented (refer to Section B5.7): • Conduct environmental inductions for all workers and contractors. • Install No-Go Zones. • Develop a project specific CEMP. • Manage surface water runoff, erosion and weeds. • Develop a fauna management plan. • Ecological monitoring. **Management measures** Adequate offsite offsets secured in line with EPBC Act Offsets Policy.	Any residual impact proposed to be compensated by permanent protection of a greater area of this community offsite.	Permanent	Minor	Almost certain	Medium
	Any residual impact proposed to be compensated by permanent protection of a greater area of this community offsite.	Permanent	Minor	Almost certain	Medium
	Any residual impact proposed to be compensated by permanent protection of a greater area of this community offsite.	Permanent	Minor	Almost certain	Medium
	Any residual impact proposed to be compensated by permanent protection of a greater area of habitat offsite.	Permanent	Minor	Almost certain	Medium
	Any residual impact proposed to be compensated by permanent protection of a greater area of habitat offsite.	Permanent	Minor	Almost certain	Medium
	Any residual impact proposed to be compensated by permanent protection of a greater area of habitat offsite.	Permanent	Minor	Almost certain	Medium
Mitigation The following mitigation will be implemented (refer to Section B5.7): • Conduct environmental inductions for all workers and contractors. • Install No-Go Zones. • Develop a project specific CEMP. • Manage surface water runoff, erosion and weeds. • Develop a fauna management plan. • Ecological monitoring. **Management measures** Impact is not a significant impact as defined under EPBC Act and does not require offsets. However, offsets obtained for Grey Box Woodland are expected to also benefit this species.	Permanent removal of potential foraging habitat compensated by securing offsets for Grey Box Woodlands.	Permanent	Minor	Almost certain	Medium
	Permanent removal of foraging habitat compensated by securing offsets for Grey Box Woodland.	Permanent	Minor	Almost certain	Medium

Environment aspect & baseline condition (cont.)	Assessment of original impact (cont.)						
	Original Impact (cont.)	Mitigation inherent in design/practice (cont.)	Significance (cont.)				
			Duration (cont.)	Severity (cont.)	Likelihood (cont.)	Impact (cont.)	
Listed migratory species Five migratory fauna species have medium to high potential to occur in the project area.	Direct removal of native vegetation and fauna habitat that is occupied or utilised on occasion by migratory species	Minimise permanent removal where possible.	Permanent	High	Almost certain	Extreme	
Plants (native vegetation) Total of 247.96 ha of native vegetation within the impact area, belonging to seven EVCs.	Direct removal of 247.96 ha of native vegetation, of which 176.64 ha belongs to one of two EPBC Act listed TECs and 237.32 ha belongs to one of two FFG Act listed TECs on Commonwealth land (overlap of 158.51 ha between the EPBC Act and FFG Act TECs).	Minimise permanent removal where possible.	Permanent	Major	Almost certain	Extreme	
Plants (FFG Act listed communities) 229.39 ha of native vegetation within the impact area (subset of total native vegetation), belonging to two FFG Act threatened communities.	Direct removal of 229.39 ha of native vegetation that corresponds with one of two Victorian FFG Act listed communities: Western (Basalt) Plains Grassland community and Victorian Temperate Woodland Bird Community.	Minimise permanent removal where possible.	Permanent	Major	Almost certain	Extreme	

Mitigation and/or management measures (cont.)	Assessment of residual impact (cont.)					
	Residual Impact (cont.)	Significance (cont.)				
		Duration (cont.)	Severity (cont.)	Likelihood (cont.)	Impact (cont.)	
Mitigation The following mitigation will be implemented (refer to Section B5.7): • Conduct environmental inductions for all workers and contractors. • Install No-Go Zones. • Develop a project specific CEMP. • Manage surface water runoff, erosion and weeds. • Develop a fauna management plan. • Ecological monitoring. **Management measures** Impact is not a significant impact as defined under EPBC Act and does not require offsets. However, offsets obtained for the project are expected to also benefit these species.	Permanent removal of potential habitat compensated by securing offsets for Grey Box Woodland, Natural Temperate Grassland and Growling Grass Frog habitat.	Permanent	Minor	Almost certain	Medium	
Mitigation The following mitigation will be implemented (refer to Section B5.7): • Conduct environmental inductions for all workers and contractors. • Install No-Go Zones. • Develop a project specific CEMP. • Manage surface water runoff, erosion and weeds. • Develop a fauna management plan. • Ecological monitoring. **Management measures** Adequate offsite offsets secured in line with EPBC Act Offsets Policy.	Any residual impact proposed to be compensated by permanent protection of a greater area of this community offsite.	Permanent	Minor	Almost certain	Medium	
Mitigation The following mitigation will be implemented (refer to Section B5.7): • Conduct environmental inductions for all workers and contractors. • Install No-Go Zones. • Develop a project specific CEMP. • Manage surface water runoff, erosion and weeds. • Develop a fauna management plan. • Ecological monitoring. **Management measures** Values mostly correspond to those that will be offset in accordance with EPBC Act listed communities.	Any residual impacts to be mitigated through offsets provided for corresponding EPBC Act communities.	Permanent	Minor	Almost certain	Medium	

Environment aspect & baseline condition (cont.)	Assessment of original impact (cont.)					
	Original Impact (cont.)	Mitigation inherent in design/practice (cont.)	Significance (cont.)			
			Duration (cont.)	Severity (cont.)	Likelihood (cont.)	Impact (cont.)
Water resources (Arundel Creek and associated tributaries) Highly disturbed waterways within an agricultural environment containing habitat for species of state and national significance.	Modification of approximately 4.5 km of streamline and alteration to hydrological and ecological features.	Down stream flows are proposed to be maintained, with no predicted alterations to flow volumes.	Permanent	High	Almost certain	Extreme
Animals (FFG Act listed species) Known or potential habitat for at least 30 fauna species listed as threatened under the FFG Act.	In addition to removal of habitat for five species also listed under the EPBC Act, direct removal of known or potential habitat for a further 25 fauna species listed under the FFG Act, with the most notable being removing of 594.29 ha of occupied Tussock Skink habitat.	Down stream flows are proposed to be maintained, with no predicted alterations to flow volumes.	Permanent	Major	Almost certain	Extreme

Mitigation and/or management measures (cont.)	Assessment of residual impact (cont.)					
	Residual Impact (cont.)	Duration (cont.)	Significance (cont.)			
			Severity (cont.)	Likelihood (cont.)	Impact (cont.)	
Mitigation The following mitigation will be implemented (refer to Section B5.7): • Conduct environmental inductions for all workers and contractors. • Install No-Go Zones. • Develop a project specific CEMP. • Manage surface water runoff, erosion and weeds. • Develop a fauna management plan. • Undertake biological and physicochemical monitoring of waterways to be impacted. • Ecological monitoring. **Management measures** Offset measures implemented as compensatory measures for GGF will improve ecological values of an offsite wetland for significant species.	Modification of approximately 4.5 km of streamline and major alteration to hydrological and ecological features, with improvement to similar waterway off site.	Permanent	Minor	Almost certain	Medium	
Mitigation The following mitigation will be implemented (refer to Section B5.7): • Conduct environmental inductions for all workers and contractors. • Install No-Go Zones. • Develop a project specific CEMP. • Manage surface water runoff, erosion and weeds. • Develop a fauna management plan. • Ecological monitoring. **Management measures** Compensatory offsets for MNES are expected to also benefit the broad range of fauna species that may be affected by the project.	Permanent removal of known and potential habitat compensated by securing offsets for Grey Box Woodland, Natural Temperate Grassland, Golden Sun Moth, Swift Parrot and Growling Grass Frog.	Permanent	Minor	Almost certain	Medium	

B5.9
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APPENDIX B5.A
DETAILED SURVEY METHODS

This appendix describes the:

- Detailed native vegetation survey methods
- Detailed threatened ecological community assessment methods
- Detailed targeted fauna survey methods for:
  - Golden Sun Moth
  - Growling Grass Frog
  - Striped Legless Lizard.

Detailed native vegetation survey methods

Vegetation assessments followed a three-step approach:

- Identifying and mapping all native vegetation using the Victorian EVC classification system
- Identifying and mapping all areas of native vegetation that satisfy the criteria for a TEC listed under the EPBC Act
- Assessing the quality of all TECs present.

Native vegetation patches and scattered trees were identified and mapped using the ArcGIS Collector app on a GPS-enabled tablet.

This mapping relied on definitions provided in the Victoria Planning Provisions (VPP) (DELWP, 2020) and Guidelines for the Removal, Destruction or Lopping of Native Vegetation (DELWP, 2017). Key definitions are outlined in Table B5.A.1. Patches of native vegetation were assigned to appropriate Ecological Vegetation Classes (EVCs) with reference to EVC benchmarks for the appropriate bioregion (DSE, 2004a ; DSE, 2004b), NatureKit's EVC modelling (DELWP, 2020), maps dating back to 1840 (Kemp, 1840; DoL c.,1849; Hoddle, 1850; DoD, 1915; DoD, 1938; DCLS, 1946), geological mapping (Mines Department, 1970; Mines Department, 1973; DNRE, 1997; Senversa, 2020, unpublished) and previous studies (McDougall, 1987; Biosis, 2015; Biosis, 2019).

Vegetation patches were mapped at a scale of 10 square metres (0.001 hectares) for the following reasons:

- The EPBC Act Offset Assessment Guide (DSEWPaC 2012) requires a scale of at least 0.01 hectares for quantifying impacts on threatened ecological communities. Melbourne Airport's mapping, on a 0.001-hectare scale (i.e. one order of magnitude finer resolution), allows for accurate addition and rounding of impacts
- A scale of 0.001 hectares is the scale required to map 0.001 habitat hectares (assuming a perfect vegetation condition score) which is the scale required by DELWP's Native Vegetation Offset Register for securing offset sites in Victoria
- A scale of 10 square metres was approximately within the resolution of the error of the GPS-enabled tablet.

Table B5.A.1
Key definitions used for identifying and mapping native vegetation at Melbourne Airport

Term	Definition	Reference
Native vegetation	Plants that are indigenous to Victoria, including trees, shrubs, herbs, and grasses.	VPP, cl. 73.01
Patch of native vegetation	An area of vegetation where at least 25% of total perennial understorey plant cover is native or 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 (Note that the Current Wetlands Map has been excluded from this definition).	DELWP, 2017 p.6
Scattered tree	A native canopy tree that does not form part of a patch.	DELWP, 2017 p.6
Canopy tree	A mature tree (i.e. it is able to flower) greater than 3 metres in height and normally found in the upper layer of the relevant vegetation type (EVC).	DELWP, 2017 p.35
Ecological Vegetation Class (EVC)	A native vegetation type classified on the basis of a combination of its floristics, lifeforms and ecological characteristics.	DELWP 2017, p.35

Detailed Threatened Ecological Communities (TEC) assessment methods

Vegetation corresponding to a Threatened Ecological Communities (TEC) listed under the EPBC Act (a Matter of National Environmental Significance or MNES) was identified and mapped using ArcGIS Collector on a GPS-enabled tablet. EVC mapping helped identify the potential presence of TECs. The following TECs were identified and mapped within the project area:

- Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (endangered)
- Natural Temperate Grassland of the Victorian Volcanic Plain (critically endangered).

The specific methods used for these TECs are outlined below. When mapping TECs, the following considerations applied:

- Only naturalised flora species were considered. Planted vegetation was not considered as contributing to total vegetation cover
- Vegetation boundaries were mapped as they appeared on the ground at the time of the assessment. For example, the presence and cover of introduced annuals is not considered when mapping Natural Temperate Grassland of the Victorian Volcanic Plain. When introduced species that may have annual or perennial life histories (e.g. Ox-tongue Helminthotheca echioides) were encountered, only the life history traits that the plants appeared to be exhibiting at the time of the assessment were

considered. Therefore, if plants appeared to be one year old and persisting in favourable conditions (e.g. high-nutrient drainage lines) they were considered perennial. When there was doubt, it was assumed the plants were annual.

Natural Temperate Grassland of the Victorian Volcanic Plain

A field checklist was devised for determining the presence of this community (see the end of this section). It relied on the diagnostic characteristics and condition thresholds outlined in the listing advice (TSSC, 2008). Where the listing advice was unclear, clarity was sought from the Natural Temperate Grassland Information Sheet (DSEWPaC, 2011) and, if required, from guidance provided by the Commonwealth Government's Department of the Environment and Energy (and its predecessors).

The field checklist was used to identify the presence or absence of NTGVVP in areas mapped as suitable EVCs (e.g. Heavier-soils Plains Grassland). The checklist was also used in areas of predominantly introduced vegetation previously mapped as NTGVVP to confirm they no longer satisfied the key diagnostic characteristics and condition thresholds of the TEC. All field data for NTGVVP was collected between 18 November 2019 and 14 February 2020, and between 4 October 2021 and 17 October 2021 by Michael Goddard, Samantha Barron, Matt Dell, Jane Kenny, Jack Tate, Matt Gibson and Josh Howard.

The field checklist relies on accurate plant-cover estimates being obtained. To ensure that assessments were consistent and standardised, cover estimates were made with reference to predefined cover charts.

Where cover estimates were close to a condition threshold, gridded 1x1 metre quadrats were used to objectively sample plant covers within the grassland patch and confirm the veracity of the cover estimates.

The 1x1 metre quadrats were gridded with 10 horizontal and 10 vertical string lines, resulting in 100 intersection points at which flora species were recorded (allowing for an objective estimate of the percentage cover of each plant species across the square metre). Where the gridded 1x1 metre quadrats were used, patches were randomly sampled to avoid sampling bias.

The listing advice includes minimum contiguous size thresholds for a grassland patch to qualify as NTGVVP. It uses terms such as 'native vegetation remnant' and 'grassland patch' (TSSC, 2008 p.3).

For the purpose of assessing size thresholds, the 'grassland patch' was taken to be the NTGVVP patch rather than the (generally larger) Heavier-soils Plains Grassland patch. In addition, the 'native vegetation remnant' was taken to be the contiguous 'patch of native vegetation' as defined in **Table B5.A.1** rather than a contiguous area of one or more TECs. DAWE confirmed that this was an appropriate interpretation of the listing advice (J. Vranjic, DAWE, pers. comm., March 2020).

This literal interpretation of the NTGVVP Listing Advice size thresholds had the following implications for grassland patches that otherwise met all other key diagnostic characteristics and condition thresholds for NTGVVP:

- The grassland patch was not considered to be NTGVVP if the grassland patch was less than 0.05 hectares even if all other key diagnostic characteristics and condition thresholds were met
- Where the grassland patch was contiguous with other native vegetation that did not satisfy key diagnostic characteristics or condition thresholds for NTGVVP, together forming a native vegetation remnant of one hectare or less, the grassland patch was considered to be NTGVVP only if the grassland patch was at least 0.05 hectares
- Where the grassland patch was contiguous with other native vegetation that did not satisfy key diagnostic characteristics or condition thresholds for NTGVVP, together forming a native vegetation remnant of more than one hectare, the grassland patch was considered to be NTGVVP only if the grassland patch was at least 0.5 hectares.

This literal interpretation results in an anomaly whereby small patches of grassland (at least 0.05 hectares but less than 0.5 hectares) are considered to be NTGVVP when they are part of small native vegetation remnants (one hectare or less) but not when they form part of larger vegetation remnants (greater than one hectare). In effect, small patches of grassland with greater connectivity with surrounding native vegetation are less likely to meet the minimum size thresholds for NTGVVP. DAWE has confirmed that this anomaly is nevertheless the correct interpretation of the listing advice (J. Vranjic, DAWE, pers. comm., 19 March 2020).

Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

In order to determine if areas of Hills Herb-rich Woodland EVC 71 and Plains Woodland EVC 803 (both the treed and derived grassland condition states) met the key diagnostic characteristics and condition thresholds to qualify as the Grey Box Grassy Woodland TEC, a range of floristic, cover and structural data was collected. A field checklist was devised for determining the presence of this community (end of this section). The criteria to classify an area as the listed TEC include:

1. Dominant tree species (i.e. presence of Grey Box)
2. Patch size
3. Weediness
4. Tree cover
5. Tree stem size and density
6. Species richness/diversity
7. Perennial native species cover.

Criteria 1, 2, 4 and 6 can readily be addressed through simple observations, patch mapping, ground-based or aerial photograph interpretation of canopy cover estimates and floristic surveys of a patch. Criteria 3, 5 and 7 require collection of plant cover and lifeform type information, as well as collection of woodland demographic data.

To ensure a transparent and replicable approach to collecting data on plant cover, lifeforms and woodland demographics, a randomised method was applied to all areas of treed Hills Herb-rich Woodland EVC 71 and Plains Woodland EVC 803; while a holistic checklist approach was used for any derived grassland condition states (similar to the checklist approach for Natural Temperate Grassland). All field data collection was undertaken by Matt Looby, Michael Goddard, Jack Tate, Jane Kenny, Jack Fursdon and Imogen Merlo between 8 January and 10 February 2020.

Method for treed condition state:

Survey design and randomisation

All patches of EVC 71, EVC 803 and immediately surrounding areas (mostly contained within the Airport woodland and adjacent airside derived-native grassland areas) were overlaid with a 100-metre x 100 metre (one hectare) grid surface in a GIS environment. Within each grid square, a central point (centroid) was also allocated in the GIS. From this, 216 grid squares and 216 centroids were established with unique identifiers to assist with randomisation of survey effort. The grid and centroids were then loaded to handheld GPS-capable tablets running the Collector for ArcGIS app with aerial photography and topographic base maps.

Point intercept transects for cover data

For collecting ground-layer plant cover, a lifeform schema was developed for use with a 50-metre point intercept transect method. 'Ground-layer plant cover' was defined as a species observed as less than 1 metre tall. The lifeform schema and coding for point intercept field data collection included:

- N = native grass
- A = annual native forb
- F = perennial native forb
- S = native sub-shrub
- W = annual non-grass weed
- X = perennial non-grass weed
- G = annual grass weed
- P = perennial grass weed
- C = cryptogams
- L = litter/logs
- B = bare soil/rock
- R = rubbish.

A field-data-sheet template is provided at the end of this method statement.

The location of point intercept transects was randomised at two levels to determine where data would be collected:

- The grid centroid to be surveyed was selected using a random number generator application (e.g. grid 1 to 216).
- The degrees bearing for the transect direction was then generated using a random number generator (i.e. zero to 360).

Field method for point intercept transects

The following process was applied in the field for the 50-metre point intercept transects:

Each randomly selected survey point (i.e. grid centroid) was navigated to on foot or vehicle using Collector for ArcGIS.

A random compass bearing was generated and a measuring tape then pegged at the grid centroid and extended from the random bearing for 50 metres.

Meta-data on the survey site was firstly collected, such as:

- Recorders
- Date
- Time
- Grid/centroid ID
- Bearing (degrees)
- Transect (always 50 metres long)
- EVC.

Two operators (one observer and one scribe) then collected ground-layer cover data at one-metre intervals along the tape, starting at the one-metre mark and ending at the 50-metre mark (i.e. 50 cover hits along the transect).

Each hit was assigned to the codified life-form scheme described earlier in the data sheet template at the end of this method statement.

Analysis for point intercept transects

In total, 47 point intercept transects were completed across the two EVCs in treed and derived grassland condition states to objectively determine non-grass weed cover and native grass cover. This equates to 2350 data points across the contiguous patches of EVC 71 and EVC 803.

This data was entered into a spreadsheet and analysed to determine native ground-layer cover totals and native grass proportional cover from:

- Native grass cover
- Perennial native forb cover
- Annual native forb cover
- Native sub-shrub cover
- Introduced ground layer plant cover total and proportional cover from:
  - Annual non-grass weed cover
  - Perennial non-grass weed cover
  - Annual grass weed cover
  - Perennial grass weed cover
- Other ground layer cover totals from:
  - Cryptogam cover
  - Litter/log cover
  - Bare soil/rock cover
  - Rubbish cover
  - Total vascular plant (vegetative) cover.

Raw data results are provided in **Appendix B5.D**.
All samples were analysed to determine proportional cover of non-grass weeds. The samples with native grass cover present were analysed to determine proportional cover of perennial native grasses (as per TSSC 2010).

Woodland tree demographic data collection

Tree-size density data (Diameter at Breast Height, DBH) and the presence of hollows are important criteria for determining the presence of the TEC. Tree demographic data was collected in a randomised subset set of the one-hectare grid squares described above.

The large-tree DBH size threshold used in the EPBC TEC listing advice is greater than 60 centimetres DBH; the large-tree size threshold is greater than or equal to 70 centimetres DBH in the bioregional benchmarks for EVC 71 and EVC 803.

On this basis, all trees greater than 60 centimetres DBH (i.e. above 60.1 centimetres DBH) were measured in the randomly selected grid squares, and ground observations were used to determine whether a tree was hollow-bearing or not. Other tree variables such as health and stem morphology were also collected. The DBH data and additional variables were also used to determine large-tree density and health scores for VQA habitat hectares in EVC 71 and EVC 803.

Field method for woodland trees

The following process was applied in the field for tree data collection:

- Each randomly selected grid square was navigated to either on foot or vehicle using Collector for ArcGIS
- Every tree in the one-hectare grid square greater than 60 centimetres DBH was mapped as a point using a data-collection layer in Collector for ArcGIS. Tree variables measured included:
  - Species name
  - DBH in cm
  - Hollows present (Yes/No)
  - Multi-stemmed below DBH (Yes/No)
  - Canopy health (<30%, 30-70%, >70%)
  - Coordinates.
- Two operators (one measuring DBH and looking for hollows by eye or with binoculars, the other entering data) used the boundaries of the one-hectare grid square on the tablet to collected all tree data
- For derived grassland areas and fragmented woodland areas in the airside zone, all individual trees were mapped.

Analysis for woodland trees

In total, 31 grid squares were surveyed (31 hectares) to determine the mean tree and hollow density values per hectare. This data was entered into a spreadsheet and analysed to determine density values. A total of 457 trees with a DBH greater than 60 centimetres were mapped in the 31 grid plots, and used for analysis of mean large tree and hollow density per hectare.

Individuals trees mapped in derived grassland areas, and fragmented woodland areas in the airside zone, were excluded from the analysis of summary statistics. This data was used separately to test whether airside areas met the TEC condition thresholds.

Tree data results summaries are provided in **Appendix B5.D**.

Method for derived grassland condition state

The method for assessing the derived grassland condition state of Grey Box Woodland was the same as used for assess Natural Temperate Grassland. However, a separate field checklist was devised, based on the diagnostic characteristics and condition thresholds outlined in the Grey Box Woodland listing advice (TSSC, 2010, at the end of this section).

Cover estimates were made with reference to predefined cover charts. Where cover estimates were close to a condition threshold, gridded 1x1 metre quadrats were used to objectively sample plant covers within the grassland patch and to confirm the veracity of cover estimates.

Quality assessments

The quality of native vegetation corresponding to a TEC was assessed using the habitat hectare (vegetation quality assessment) methodology (DSE, 2004).

DAWE has endorsed the habitat hectare methodology as an appropriate means of assessing the condition of threatened ecological communities such as Natural Temperate Grassland and Grey Box Woodland in Victoria. The habitat hectare score comprised the following:

- A condition score (out of 75) incorporating values for understorey, lack of weeds, recruitment, organic litter and, where relevant, large trees, canopy cover and logs. The following qualifications should be noted:
    - Condition scores were determined with reference to relevant EVC benchmarks maintained by DELWP
    - Where components of the score were not relevant (e.g. values for large trees, canopy cover and logs are not part of the benchmark for Heavier-soils Plains Grassland) the condition score was standardised to provide a score out of 75
    - The condition score considered only the condition of native vegetation corresponding to the threatened ecological community. The condition of any contiguous vegetation of the same EVC was not considered. For example, where a patch of Natural Temperate Grassland TEC formed part of a broader patch of Heavier-soils Plains Grassland EVC, the condition score only considered what was present within the smaller Natural Temperate Grassland patch
    - In accordance with the habitat hectare methodology, vegetative life forms in the understorey were 'assessed according to their current appearance and height, not according to their predicted mature expression' (DSE, 2004 p.18) with reference to the life-form category definitions provided in Appendix 6 of the Vegetation Quality Assessment Manual (DSE, 2004 p.58). As a result, if a grass species (e.g. Spear Grass Austrostipa spp.) that would normally have an inflorescence more than one metre in height had been slashed to a height of 20 centimetres, it was recorded as a medium tufted graminoid rather than a large tufted graminoid. Similarly, if both woody and non-woody individuals of a species (e.g. Berry Saltbush *Atriplex semibaccata* or Ruby Saltbush *Enchylaena tomentosa* var. *tomentosa*) were observed, they were recorded in both shrub (woody) and herb (non-woody) life -orm categories.
- A landscape score (out of 25), incorporating values for patch size, percentage of native vegetation in the surrounding area (neighbourhood) and distance to core area. The following qualifications should be noted:
    - Patch size was taken to be the size of the entire contiguous patch of native vegetation (as defined in the table above) rather than the size of the threatened ecological community that may have been a subset of the broader patch of native vegetation. For example, where a patch of Natural Temperate Grassland TEC was part of a larger patch of contiguous Heavier-soils Plains Grassland EVC patch, patch size was taken to be the size of the broader Heavier-soils Plains Grassland patch. This means that threatened ecological communities, buffered by areas of native vegetation that did not meet the criteria of the threatened ecological community, nevertheless received slightly higher patch-size values than threatened ecological communities with no native vegetation buffers
    - Percentage of native vegetation in the neighbourhood was determined with reference to contemporary native vegetation mapping that had been completed in the surrounding area as part of the same project and, where areas of the neighbourhood had not been assessed, DELWP's 2005 EVC modelling via NatureKit.

Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) Field Checklist

	Habitat zone:	Date:	Recorder: MG / SMB / JDT / JK		
1.	Time since mowing/grazing/burning:	Days	Weeks	Months	
2.	Do native flora make up ≥50% of total vegetation cover, ex. introduced annuals? % cover of all native flora (incl. native annuals): % cover perennial weeds:				Y / N
3.1	Do *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* (circle genera that are present) make up ≥50% native cover AND ≥50% of total perennial tussock cover? % cover of *Themeda*/*Rytidosperma*/*Austrostipa*/*Poa*: % cover of all perennial tussocks (native and introduced):				Y / N
3.2	If total perennial tussock cover represented by *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* is <50%, then is ground cover of native forbs (wildflowers) ≥50% of total vegetation cover during spring-summer (September to February)? % cover of all vegetation (native and introduced, ex. moss, lichen and introduced annuals): % cover of native forbs:				Y / N
3.3	Do *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* (circle genera that are present) make up ≥50% native cover AND is cover of perennial non-grass weeds <30% of total vegetation cover at any time of the year? % cover of all vegetation (native and introduced, ex. moss, lichen and introduced annuals): % cover of perennial non-grass weeds:				Y / N
4.1	For native vegetation remnant of ≤1ha: is contiguous grassland patch ≥0.05ha AND do shrubs/trees >1m tall have % crown cover of ≤5%? Area (ha) of contiguous grassland patch: % crown cover of shrubs and trees >1m tall:				Y / N
4.2	For native vegetation remnant of >1ha: is contiguous grassland patch ≥0.5ha AND are there <2 mature (*not defined) trees/ha? Area (ha) of contiguous grassland patch: # mature trees within patch:				Y / N
5.	Is NTGVVP present (i.e. responded Y to 2, 3 and 4)? If Y, proceed to VQA.				Y / N

The following field checklists were used to assess the presence/absence of Natural Temperate Grassland and the derived grassland condition state of Grey Box Woodland.

Grey Box Grassy Woodland (GBW) and Derived Grasslands (DG) of South-Eastern Australia

	Habitat zone:	Date:	Recorder: MG / SMB		
	Time since mowing/grazing/burning:	Days	Weeks	Months	
1b.	Is Grey Box the (co-)dominant tree species in the canopy layer or is no canopy present?				Y / N
1c.	Do non-grass perennial weeds make up <30% of total perennial GL vegetation cover? Ground Layer (GL) is undefined but assumed to include all vascular plants <1m high. % cover of all perennial GL vegetation: % cover of perennial non-grass weeds in GL: % cover of perennial grass weeds in GL:				Y / N
1a.	Is the GBW or DG patch ≥0.5ha? Area (ha) of GBW or DG patch (may include small disturbances e.g. tracks):				Y / N
	If canopy is well developed (≥10% crown cover) and patch <2ha, proceed to 2. If canopy is well developed (≥10% crown cover) and patch ≥2ha, proceed to 3 and 4. If canopy is absent or less developed (<10% crown cover), proceed to 5.				
2a.	Do perennial native species make up ≥50% of total perennial GL vegetation cover? % cover of all perennial GL vegetation: % cover of all perennial native species in GL:				Y / N
2b.	Are there ≥8 perennial native species in the mid and ground layers? Mid Layer (ML) and GL include all vascular plants <4m high. Number of perennial native species in ML and GL:				Y / N
3a.	Are there ≥8 trees/ha that are hollow-bearing or have DBH ≥60cm? Number of trees that are hollow-bearing or have DBH ≥60cm:				Y / N
3b.	Do perennial native grasses make up ≥10% of the vegetative cover in the GL? % cover of all perennial GL vegetation: % cover of perennial native grasses in GL:				Y / N
4a.	Are there ≥20 trees/ha that have DBH ≥12cm? Number of trees that have DBH ≥12cm:				Y / N
4b.	Do perennial native species make up ≥50% of total perennial GL vegetation cover? % cover of all perennial GL vegetation: % cover of all perennial native species in GL:				Y / N
5a.	Does woodland density not meet criteria 3a or 4a OR is DG present (<10% crown cover) with evidence (presence of species from canopy/ML, tree stumps, logs, nearby GBW and/or historical records) that it was once woodland (co-)dominated by Grey Box?				Y / N
5b.	Do perennial native species make up ≥50% of total perennial GL vegetation cover? % cover of all perennial GL vegetation: % cover of all perennial native species in GL:				Y / N
5c.	Are there ≥12 perennial native species in the GL? Number of perennial native species in GL:				Y / N
6a.	Is GBW present (i.e. responded Y to all of 1 and all of 2, 3 or 4)? If Y, proceed to VQA.				Y / N
6b.	Is DG present (i.e. responded Y to all of 1 and all 5)? If Y, proceed to VQA.				Y / N

Point intercept transect method for ground layer

N = native grass, A = annual native forb, F = perennial native forb, S = native sub-shrub, W = annual non-grass weed, X = perennial non-grass weed, G = annual grass weed, P = perennial grass weed, C = cryptogams, O = litter/logs, B = bare soil/rock, R = rubbish

Recorders:	Date:	Time:	Site:
1 ha plot ID			
Bearing (degrees)			
Transect (m)			
1			
2			
3			
4			
5			
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Detailed targeted fauna survey methods

Golden Sun Moth

Previous surveys

A desktop review was undertaken of all previous Golden Sun Moth survey reports at the Melbourne Airport. These reports included:

- GAGIN, 2008. Habitat Assessment and Presence of Synemon plana (Golden Sun Moth), Melbourne Airport, Tullamarine. Report prepared for Australia Pacific Airports Melbourne
- GAGIN, 2009. Second Report Presence of the Golden Sun Moth Synemon plana Melbourne Airport 2008. Report prepared for Australia Pacific Airports Melbourne
- GAGIN, 2010. Survey for the Presence of Golden Sun Moth Synemon plana Melbourne Airport, Tullamarine 2009. Report prepared for Australia Pacific Airports Melbourne
- Biosis, 2015. Flora and fauna assessment of the Runway Development Program, Melbourne Airport: Existing conditions and impact assessment report. Authors: Kay K, Smales I & Byrne A, Biosis Pty Ltd, Melbourne
- Biosis, 2019. Melbourne Airport Golden Sun Moth habitat survey. Letter report to Australia Pacific Airports Melbourne. Author: Campbell, K, Biosis Pty Ltd, Melbourne.

This data was utilised to compile **Figure B5.10**, which outlines the previous surveys for the species. This information was then used to determine whether adequate survey effort existed for the species; and, if not, what the level of additional survey was to be.

It was determined there were no surveys undertaken within the Melbourne Airport's Third Runway project area in the last three years. Therefore an updated assessment for the entire project area was to occur.

Habitat assessment

Before the Golden Sun Moth's flight season between October and November, the entire project area was traversed by one zoologist experienced in Golden Sun Moth habitat surveys to determine the project area's habitat values.

The project area was subsequently classified as:

- Not habitat
  - Pasture-improved paddocks
  - Paddocks with no food plants
  - Degraded areas covered in fill with no food plants
  - Areas of infrastructure, roads, stockpiles etc.
- Potential habitat
  - Any areas where there was cover of known food plants.

All areas of potential habitat located within and immediately adjacent to the project area were subject to targeted surveys.

The areas of potential habitat were divided into five survey areas. Each was assessed four times during the targeted surveys. Targeted survey areas for Golden Sun Moth are shown in **Figure B5.10**.

A summary of the survey areas and habitat descriptions are provided in **Table B5.A.2** below.

Table B5.A.2
M3R Golden Sun Moth survey sites and details

GSM survey site	Site size (ha)	Transect type	Number of surveyors	Distance between transects	GSM survey site
GSM survey site Northern area	62.88	Walk	3	Approx. 100 meters	North of the woodland open Grey Box Woodland with mixed understory of Chilean Needle-grass *Nassella neesiana*, Blanket Weed *Galenia pubescens*, Serrated Tussock *Nassella trichotoma*, scattered Wallaby Grasses *Rytidosperma* spp. and Spear Grasses. *Austrostipa* spp. there are also some larger expanses of open Chilean Needle-Grass patches throughout. Area up the hill from Deep Creep tributary. Characterised by Serrated Tussock and Chilean Needle-Grass, Thistles and Blanket Weed. Sub-optimal habitat but scattered Wallaby Grasses present. Sunbury Road Paddock. A mix of Phalaris Phalaris aquatica, Turnips Brassica spp. and scattered occurrence of Chilean Needle-Grass and Wallaby Grasses.
GSM survey site McNabs Road West	178.81	All areas of native grassland walked. In some degraded areas transects were driven	2	Approx. 100 meters	Broad area that includes habitat ranging from high cover of Wallaby Grasses and optimal habitat to degraded areas with scattered occurrence of Wallaby Grass and paddocks dominated by Chilean Needle-Grass, Rye Grasses *Lolium* spp., Oats *Avena* spp., Phalaris and grazed by cattle in areas.
GSM survey site Arundel Creek	71.32	Walked/ driven were possible	2	Approx. 100 meters	Predominantly Phalaris, Oats, Blanket Weed, one square patch of Chilean Needle-Grass. Includes some areas dominated by Wallaby Grass.
GSM survey site Southern area	50.66	Walk	2	Approx. 100 Meters	Areas of native grassland dominated by Wallaby Grasses and other areas dominated by Phalaris with scattered occurrences of Chilean Needle-Grass, Turnips, Oat and Wallaby Grass.
GSM survey site Airside	172	Walk	2	Approx. 100 meters	Dominated by Wallaby Grass and Spear Grass throughout with scattered areas of Chilean Needle-Grass and Serrated Tussock.

Targeted surveys

Targeted surveys were conducted on 8, 17, 23, 24 and 29 December 2019. All the surveys were conducted on days of appropriate weather conditions as set out in the survey guidelines within the *Significant impact guidelines for the critically endangered golden sun moth* (*Synemon plana*) (DEWHA, 2009a). The weather conditions and results of the targeted surveys are in **Appendix B5.C**.

Adults of the species, especially males, can be observed during their diurnal flights. However, their flights are generally restricted to sunny days with little wind and when temperatures are above 20°C by 10 am. The capacity to detect the species is therefore limited to active searching when conditions are precisely appropriate.

To detect any Golden Sun Moths within the site, two or three ecologists experienced in Golden Sun Moth identification walked transects approximately 100 metres apart. Where possible, transects were driven across the survey sites.

Growling Grass Frog

Previous surveys

Targeted surveys for Growling Grass Frog were previously undertaken in Deep Creek, Moonee Ponds Creek, Arundel Creek and surrounding waterbodies located on Melbourne Airport land in 2019 (Biosis, 2019b). The current habitat values and distribution for the species are well known for Melbourne Airport.

Since the previous surveys undertaken in 2019, new land was acquired at 270 and 300 Arundel Road. This land had not been subject to previous surveys, and was surveyed in February 2020 to determine habitat values for Growling Grass Frog and presence/absence of the species.

Habitat assessment

Suitable habitat was identified during diurnal site investigations of Arundel Creek, Moonee Ponds Creek, Deep Creek and surrounding farm dams and drainage lines within Melbourne Airport in January 2019; and the section of Arundel Creel located at 270 and 300 Arundel Road in January 2020.

Particular attention was given to identifying sections of waterways considered to be high-value breeding habitat for Growling Grass Frogs. (Breeding habitat was defined as permanent, still or slow-moving waterbodies with floating and emergent aquatic vegetation and lined with basaltic rock.) Nocturnal targeted surveys for Growling Grass Frog were focused on these potential breeding habitats.

Access to the Maribyrnong River beyond the confluence of Jackson's Creek was not possible, the area being inaccessible due to heavy thistle infestations at the time with no visible access tracks to the area. A visual habitat assessment from the escarpment above the Maribyrnong River was made for this location.

It is important to have an understanding of Growling Grass Frog habitat and presence across all waterbodies at Melbourne Airport, not just in the sections of the waterways located within the impact area. Therefore the results for surveys across all waterbodies are included within this report.

Further information defining habitat classifications is set out in **Table B5.A.3**. Growling Grass Frog habitat at Melbourne Airport can be viewed in **Figure B5.18**.

Targeted surveys

Targeted surveys for adult Growling Grass Frogs were conducted over four nights: 22, 23, 24 and 31 January 2019; and the section of Arundel Creek located at 270 and 300 Arundel Road on the 30 January and 10 February 2020.

Two zoologists surveyed suitable waterbodies and streams within Melbourne Airport for the species by listening for the characteristic calls of adult males and using call playback (broadcasting recorded calls) to elicit response calls. Call playback points were established in sections of waterways considered to be breeding or aquatic habitat.

Spotlighting was undertaken to actively search for individuals of the species. Opportunistic listening for calls was undertaken during all visits to the project area. Waterbodies where Growling Grass Frog were not detected during the first survey were visited again for a second survey one week later; waterbodies where Growling Grass Frog were detected during the first survey were visited once.

Targeted surveys for Growling Grass Frogs followed the Growling Grass Frog survey protocol within the Survey guidelines for Australia's threatened frogs: Guidelines for detecting frogs listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (DEWHA, 2010).

Table B5.A.3
M3R Growling Grass Frog habitat classification

Growling Grass Frog habitat classification	Habitat value	Description of classification and rationale
Breeding	High	• Areas of habitat suitable for Growling Grass Frog to breed in. • Permanent, still or slow-moving waterbodies with floating and emergent aquatic vegetation and lined with basaltic rock.
Aquatic	High	• Areas of predominantly aquatic habitat that have been assessed by zoologists during targeted survey for the species. • Aquatic vegetation is diverse and of moderate to high abundance; hydroperiod likely to be constant; still or slow-moving water with low turbidity. • Growling Grass Frog records from the particular waterbody or those immediately adjacent.
Terrestrial	High	• Terrestrial habitat generally includes a 100-metre buffer around waterways known to support Growling Grass Frogs which is utilised for foraging/ movement during the active season. The 100-metre buffer has been further refined and reduced or expanded in areas of suitable adjacent habitat. For example, where a steep escarpment abuts a waterway, the top of an escarpment is not terrestrial habitat and the buffer from the waterway has been reduced following landforms and contours. In areas of low-lying flood plains, the 100-metre buffer has been expanded to incorporate the low-lying floodplain.
Potential dispersal and ephemeral aquatic habitat	Low	• Small waterways or tributaries that are unlikely to provide suitable long-term habitat for Growling Grass Frog but where an impact on these waterways is required to be assessed for its potential to have indirect impacts on breeding, aquatic or terrestrial habitat (above). • These waterways have little or no aquatic vegetation present, the period in which the waterbody contains water is intermittent; likely to be dry for extended periods and/or water level is generally low or absent. • Sections of waterbodies that were not suitable aquatic habitat for Growling Grass Frog during the FY19 targeted survey, however during periods of appropriate rainfall have the potential to become aquatic/ breeding habitat. During other times these waterways are predominately used as movement corridors. • The majority of this habitat type at Melbourne Airport does not provide connectivity to other waterbodies.

For each night of survey, weather data was recorded at the beginning, middle and end of the survey period (only the start and end temperatures were recorded for 2020) (Table B5.A.4).

Striped Legless Lizard

Previous surveys

Suitable potential habitat for Striped Legless Lizard is present within the project area. Potential habitat areas are tussock-forming grasslands, especially where growing on cracking soils.

Previous surveys for Striped Legless Lizard at Melbourne Airport failed to detect the species. A review of recent database records revealed a record on the Atlas of Living Australia from 2011 (ALA, 2020) approximately four kilometres south of the southern point of the project area. There is an additional record from 2017 within 10 kilometres of the project area in the Victorian Biodiversity Atlas database (Appendix B5.C).

A desktop assessment was undertaken of all previous reports where Striped Legless Lizard surveys had been undertaken at Melbourne Airport. These reports included:

- Biosis, 2014. Melbourne Airport Business Park: Striped Legless Lizard survey 2013. Draft report for Australia Pacific Airports (Melbourne). Author: I. Smales, Biosis Pty Ltd, Melbourne.
- Biosis, 2015. Flora and fauna assessment of the Runway Development Program, Melbourne Airport: Existing conditions and impact assessment report. Authors: Kay K, Smales I & Byrne A, Biosis Pty Ltd, Melbourne.

This data was utilised to compile Figure B5.9 which outlines previous survey effort for the species at Melbourne Airport. This information was then used to determine whether adequate survey effort existed for the species; and if not, what the level of additional survey should be. It was recommended that, due to the presence of suitable habitat that had not been subject to previous targeted surveys, additional surveys for Striped Legless Lizard were warranted.

Targeted survey

The artificial shelter (tile surveys) technique was used for targeted surveys because it is widely recognized as the most effective technique to survey for the species.

Twenty survey grids – each grid comprising 50 tiles set out at five-metre spacing between tiles, arranged in a grid of 10 x 5 tiles, giving a total of 1000 tiles – were placed in areas of suitable habitat within the project area. Landside on 12-13/8/2019 and airside on 19/8/2019, targeting areas of suitable habitat not subject to previous surveys. The tile grid locations can be seen in Figure B5.15.

All tiles were checked once a week by two zoologists from the 18/9/2019 until the end of December 2019; a total of 15 checks were undertaken for each tile grid during the targeted survey. A final check was conducted in conjunction with the decommissioning of the survey grids. All species detected during the surveys were recorded, along with weather details at the time of survey (Appendix B5.C).

Table B5.A.4
Weather information recorded during Growling Grass Frog surveys over four nights.

Survey date		Temperature (°C)	Cloud cover (%)	Wind speed (avg km/h)	Humidity (%)
22/1/2019	start	22.7	0	8	66
	mid	21	0	0	70
	end	20	0	3	70
23/1/2019	start	20.5	5	6.4	64
	mid	22	0	0	70
	end	18	0	0	74
24/1/2019	start	32	0	0	33
	mid	33	0	0	34
	end	31	0	0	30
31/1/2019	start	16.4	20	9	50.8
	mid	16.4	20	5	50
	end	16.4	25	1	51
30/1/2020	start	28	0	11	26
	end	18	0	6	31
10/2/2020	start	20.1	80%	22	88
	end	19	100%	12	89

APPENDIX B5.B
FLORA AND ECOLOGICAL COMMUNITIES

Summary

- Flora species recorded from the project area
- Significant flora with potential to occur in the project area
- Significant ecological communities with potential to occur in the project area

Flora species recorded from the project area

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)	Noxious weed status: SP - State prohibited species RP - Regionally prohibited species RC - Regionally controlled species R - Restricted species # - Native species outside natural range

The following flora species were recorded within the project area during native vegetation surveys.

Table B5.B.1
Flora species recorded from the project area

Status	Scientific Name	Common Name
Indigenous species		
P	*Acacia acinacea* s.s.	Gold-dust Wattle
	Acacia implexa	Lightwood
P	*Acacia mearnsii*	Black Wattle
	Acacia melanoxylon	Blackwood
	Acacia paradoxa	Hedge Wattle
P	*Acacia pycnantha*	Golden Wattle
	Acaena agnipila	Hairy Sheep's Burr
	Acaena echinata	Sheep's Burr
	Aizoaceae spp.	Ice Plant
	Allocasuarina verticillata	Drooping She-oak
	Anthosachne scabra s.s.	Common Wheat-grass
	Arthropodium minus	Small Vanilla-lily
P	*Asperula conferta*	Common Woodruff
	Atriplex semibaccata	Berry Saltbush
	Austrostipa bigeniculata	Kneed Spear-grass
	Austrostipa curticoma	Short-crown Spear-grass
	Austrostipa densiflora	Dense Spear-grass
	Austrostipa elegantissima	Feather Spear-grass
	Austrostipa gibbosa	Spurred Spear-grass
	Austrostipa mollis	Supple Spear-grass
	Austrostipa oligostachya	Fine-head Spear-grass

Status (cont.)	Scientific Name (cont.)	Common Name (cont.)
Indigenous species (cont.)		
	Austrostipa scabra subsp. *falcata*	Rough Spear-grass
	Austrostipa spp.	Spear Grass
	Barbula crinita	Dusky Beard-moss
	Bothriochloa macra	Red-leg Grass
	Bromus spp.	Brome
	Bursaria spinosa subsp. *spinosa*	Sweet Bursaria
	Callistemon sieberi	River Bottlebrush
P	*Calocephalus citreus*	Lemon Beauty-heads
	Carex breviculmis	Common Grass-sedge
	Carex inversa	Knob Sedge
P	*Cassinia longifolia*	Shiny Cassinia
P	*Cheilanthes austrotenuifolia*	Green Rock-fern
	Chloris truncata	Windmill Grass
	Clematis microphylla s.s.	Small-leaved Clematis
	Convolvulus angustissimus subsp. *angustissimus*	Blushing Bindweed
	Convolvulus spp.	Bindweed
	Crassula decumbens var. *decumbens*	Spreading Crassula
	Crassula sieberiana s.l.	Sieber Crassula

Status (cont.)	Scientific Name (cont.)	Common Name (cont.)
Indigenous species (cont.)		
	Cynoglossum suaveolens	Sweet Hound's-tongue
	Cyperus spp.	Flat Sedge
	Daucus glochidiatus	Australian Carrot
	Dianella revoluta s.l.	Black-anther Flax-lily
	Dichondra repens	Kidney-weed
	Dichanthium sericeum	Silky Blue-grass
	Einadia nutans	Nodding Saltbush
	Eleocharis acuta	Common Spike-sedge
	Enchylaena tomentosa var. *tomentosa*	Ruby Saltbush
	Enneapogon nigricans	Dark Bottle-washers
	Enteropogon acicularis	Spider Grass
	Epilobium billardiereanum subsp. *intermedium*	Variable Willow-herb
	Epilobium hirtigerum	Hairy Willow-herb
	Epilobium pallidiflorum	Showy Willow-herb
	Epilobium spp.	Willow Herb
P	*Eremophila deserti*	Turkey Bush
	Eryngium ovinum	Blue Devil
I	*Eucalyptus camaldulensis*	River Red-gum
	Eucalyptus camaldulensis var. *camaldulensis*	River Red-gum
	Eucalyptus melliodora	Yellow Box
	Eucalyptus microcarpa	Grey Box
	Eutaxia microphylla var. *microphylla*	Common Eutaxia
	Geranium spp.	Crane's Bill
P	*Gnaphalium* spp.	Cudweed
	Gonocarpus tetragynus	Common Raspwort
	Goodenia ovata	Hop Goodenia
	Haloragis heterophylla	Varied Raspwort
	Hypnum cupressiforme var. *cupressiforme*	Common Plait-moss
	Isolepis cernua	Nodding Club-sedge
	Isolepis inundata	Swamp Club-sedge
	Isolepis spp.	Club Sedge
	Juncus bufonius	Toad Rush
	Juncus flavidus	Gold Rush
	Juncus pauciflorus	Loose-flower Rush
	Juncus spp.	Rush
	Juncus subsecundus	Finger Rush
	Lachnagrostis aemula s.l.	Leafy Blown-grass
	Lachnagrostis filiformis s.s.	Common Blown-grass
P	*Laphangium luteoalbum*	Jersey Cudweed

Status (cont.)	Scientific Name (cont.)	Common Name (cont.)
Indigenous species (cont.)		
	Lemna spp.	Duckweed
	Leptodontium paradoxum	Tall Beard-moss
	Linum spp.	Flax
	Lobelia anceps	Angled Lobelia
	Lomandra filiformis subsp. *coriacea*	Wattle Mat-rush
	Lomandra longifolia	Spiny-headed Mat-rush
	Lythrum hyssopifolia	Small Loosestrife
	Maireana decalvans s.s.	Black Cotton-bush
	Maireana spp.	Bluebush
	Melicytus dentatus s.l.	Tree Violet
	Microlaena stipoides var. *stipoides*	Weeping Grass
P	*Microseris walteri*	Yam Daisy
P	*Microtis* spp.	Onion Orchid
	Myriophyllum spp.	Water Milfoil
	Ottelia ovalifolia subsp. *ovalifolia*	Swamp Lily
	Oxalis perennans	Grassland Wood-sorrel
	Oxalis spp.	Wood Sorrel
P	*Ozothamnus obcordatus*	Grey Everlasting
	Panicum effusum	Hairy Panic
	Persicaria hydropiper	Water Pepper
	Phragmites australis	Common Reed
	Pimelea linifolia	Slender Rice-flower
	Pimelea spp.	Rice Flower
	Poa labillardierei	Common Tussock-grass
	Portulaca oleracea	Common Purslane
	Rumex brownii	Slender Dock
	Rumex spp.	Dock
	Rytidosperma auriculatum	Lobed Wallaby-grass
	Rytidosperma bipartitum s.s.	Leafy Wallaby-grass
	Rytidosperma caespitosum	Common Wallaby-grass
	Rytidosperma duttonianum	Brown-back Wallaby-grass
	Rytidosperma erianthum	Hill Wallaby-grass
	Rytidosperma fulvum	Copper-awned Wallaby-grass
	Rytidosperma racemosum var. *racemosum*	Slender Wallaby-grass
	Rytidosperma setaceum	Bristly Wallaby-grass
	Rytidosperma spp.	Wallaby Grass
	Rytidosperma tenuius	Purplish Wallaby-grass
	Salsola tragus	Prickly Saltwort

Status (cont.)	Scientific Name (cont.)	Common Name (cont.)
Indigenous species (cont.)		
	Schoenoplectus tabernaemontani	River Club-sedge
	Schoenus apogon	Common Bog-sedge
	Sclerolaena muricata var. *villosa*	Grey Roly-poly
	Sclerolaena spp.	Copperburr
P	*Senecio quadridentatus*	Cotton Fireweed
	Senna artemisioides s.l.	Desert Cassia
	Spergularia spp.	Sand Spurrey
	Themeda triandra	Kangaroo Grass
	Tortula antarctica	Bristly Screw-moss
	Tortula muralis	Common Wall-moss
	Tricoryne elatior	Yellow Rush-lily
	Triglochin striata	Streaked Arrowgrass
	Triquetrella papillata	Common Twine-moss
	Typha domingensis	Narrow-leaf Cumbungi
	Typha spp.	Bulrush
	Verbena spp.	Verbena
P	*Vittadinia cuneata*	Fuzzy New Holland Daisy
P	*Vittadinia muelleri*	Narrow-leaf New Holland Daisy
	Wahlenbergia communis s.s.	Tufted Bluebell
	Walwhalleya proluta	Rigid Panic
Introduced species		
	Acacia baileyana	Cootamundra Wattle
	Agave spp.	Agave
	Aira elegantissima	Delicate Hair-grass
	Aira spp.	Hair Grass
	Aloe spp.	Aloe
	Anthoxanthum odoratum	Sweet Vernal-grass
	Arctotheca calendula	Cape weed
R	*Asparagus asparagoides*	Bridal Creeper
	Asparagus officinalis	Asparagus
	Asphodelus fistulosus	Onion Weed
	Austrostipa verticillata	Bamboo Spear-grass
	Avena barbata	Bearded Oat
	Avena fatua	Wild Oat
	Avena sativa	Oat
	Avena spp.	Oat
	Bartsia trixago	Bellardia
	Berkheya rigida	African Thistle
	Brassica fruticulosa	Twiggy Turnip

Status (cont.)	Scientific Name (cont.)	Common Name (cont.)
Indigenous species (cont.)		
	Brassica spp.	Turnip
	Briza maxima	Large Quaking-grass
	Briza minor	Lesser Quaking-grass
	Bromus alopecuros	Mediterranean Brome
	Bromus catharticus	Prairie Grass
	Bromus diandrus	Great Brome
	Bromus hordeaceus	Soft Brome
	Bromus rubens	Red Brome
RC	*Carthamus lanatus*	Saffron Thistle
	Cassinia sifton	Drooping Cassinia
	Catapodium rigidum	Fern Grass
	Cenchrus clandestinus	Kikuyu
	Cenchrus spp.	Burr Grass
	Centaurium erythraea	Common Centaury
	Centaurium spp.	Centaury
	Centaurium tenuiflorum	Slender Centaury
	Cerastium glomeratum s.l.	Common Mouse-ear Chickweed
	Chenopodium album	Fat Hen
	Chloris gayana	Rhodes Grass
RC	*Chrysanthemoides monilifera*	Boneseed
RC	*Cirsium vulgare*	Spear Thistle
RC	*Convolvulus arvensis*	Common Bindweed
	Cortaderia spp.	Pampas Grass
	Corymbia citriodora subsp. *citriodora*	Lemon-scented Gum
	Cotula coronopifolia	Water Buttons
	Cucumis myriocarpus subsp. *myriocarpus*	Paddy Melon
	Cupressus spp.	Cypress
RC	*Cynara cardunculus* subsp. *flavescens*	Artichoke Thistle
	Cynodon dactylon var. *dactylon*	Couch
	Cyperus eragrostis	Drain Flat-sedge
	Dactylis glomerata	Cocksfoot
	Daucus carota	Carrot
	Delairea odorata	Cape Ivy
RC	*Dittrichia graveolens*	Stinkwort
	Ecballium elaterium	Squirting Cucumber
RC	*Echium plantagineum*	Paterson's Curse
	Ehrharta erecta	Panic Veldt-grass
	Ehrharta longiflora	Annual Veldt-grass

Status (cont.)	Scientific Name (cont.)	Common Name (cont.)
Indigenous species (cont.)		
	Eleusine spp.	Crows-foot Grass
	Eleusine tristachya	American Crows-foot Grass
RC	*Eragrostis curvula*	African Love-grass
	Erigeron bonariensis	Flaxleaf Fleabane
	Erigeron canadensis s.l.	Canadian Fleabane
	Erigeron spp.	Fleabane
	Eruca vesicaria subsp. *sativa*	Purple-vein Rocket
	Eucalyptus cladocalyx	Sugar Gum
	Festuca arundinacea	Tall Fescue
R	*Foeniculum vulgare*	Fennel
	Galenia pubescens var. *pubescens*	Galenia
	Gaudinia fragilis	Fragile Oat
	Gazania spp.	Gazania
RC	*Genista monspessulana*	Montpellier Broom
	Geranium dissectum	Cut-leaf Crane's-bill
	Helminthotheca echioides	Ox-tongue
	Hirschfeldia incana	Buchan Weed
	Holcus lanatus	Yorkshire Fog
	Hordeum leporinum	Barley-grass
	Hordeum marinum	
	Hordeum murinum s.l.	Barley-grass
	Hordeum spp.	Barley Grass
RC	*Hypericum perforatum* subsp. *veronense*	St John's Wort
	Hypochaeris radicata	Flatweed
RC	*Juncus acutus* subsp. *acutus*	Spiny Rush
	Juncus articulatus subsp. *articulatus*	Jointed Rush
	Juncus effusus subsp. *effusus*	Soft Rush
	Juncus ensifolius	Sword Rush
	Lactuca serriola	Prickly Lettuce
	Leontodon saxatilis subsp. *saxatilis*	Hairy Hawkbit
	Lepidium africanum	Common Peppercress
	Lepidium heterophyllum	Perennial Fieldcress
	Linum trigynum	French Flax
	Lolium perenne	Perennial Rye-grass
	Lolium rigidum	Wimmera Rye-grass
	Lophopyrum ponticum	Tall Wheat-grass
RC	*Lycium ferocissimum*	African Box-thorn

Status (cont.)	Scientific Name (cont.)	Common Name (cont.)
Indigenous species (cont.)		
	Lysimachia arvensis	Pimpernel
RC	*Marrubium vulgare*	Horehound
	Medicago polymorpha	Burr Medic
	Medicago spp.	Medic
	Melilotus indicus	Sweet Melilot
	Melilotus spp.	Melilot
	Modiola caroliniana	Red-flower Mallow
	Nassella hyalina	Cane Needle-grass
	Nassella leucotricha	Texas Needle-grass
R	*Nassella neesiana*	Chilean Needle-grass
RC	*Nassella trichotoma*	Serrated Tussock
	Olea europaea	Olive
R	*Opuntia* spp.	Prickly Pear
RC	*Opuntia stricta*	Common Prickly-pear
R	*Oxalis pes-caprae*	Soursob
	Oxalis spp. (naturalised)	Wood Sorrel
	Parapholis strigosa	Slender Barb-grass
	Parentucellia latifolia	Red Bartsia
	Paspalum dilatatum	Paspalum
	Paspalum distichum	Water Couch
	Petrorhagia dubia	Velvety Pink
	Phalaris aquatica	Toowoomba Canary-grass
	Phalaris spp.	Canary Grass
RC	*Physalis hederifolia*	Sticky Ground-cherry
	Plantago coronopus	Buck's-horn Plantain
	Plantago lanceolata	Ribwort
	Poa annua s.s.	Annual Meadow-grass
	Polycarpon tetraphyllum	Four-leaved Allseed
	Polygonum aviculare s.s.	Hogweed
	Polypogon monspeliensis	Annual Beard-grass
	Raphanus raphanistrum	Wild Radish
	Roepera sessilifolia	Cape Twin-leaf
	Romulea rosea	Onion Grass
RC	*Rosa rubiginosa*	Sweet Briar
RC	*Rubus anglocandicans*	Common Blackberry
	Rumex conglomeratus	Clustered Dock
	Rumex crispus	Curled Dock
R	*Salix* spp.	Willow
	Salvia verbenaca var. *verbenaca*	Wild Sage
	Schinus molle	Pepper Tree
RC	*Scolymus hispanicus*	Golden Thistle

Status (cont.)	Scientific Name (cont.)	Common Name (cont.)
Indigenous species (cont.)		
	Scorzonera laciniata var. *laciniata*	Scorzonera
	Setaria parviflora	Slender Pigeon Grass
RC	*Solanum linnaeanum*	Apple of Sodom
	Solanum nigrum s.s.	Black Nightshade
	Sonchus asper s.s.	Rough Sow-thistle
	Sonchus oleraceus	Common Sow-thistle
	Sporobolus africanus	Rat-tail Grass
	Stenotaphrum secundatum	Buffalo Grass
	Symphyotrichum subulatum	Aster-weed
	Tragopogon spp.	Salsify
	Tribolium spp.	Desmazeria
	Trifolium angustifolium var. *angustifolium*	Narrow-leaf Clover
	Trifolium arvense var. *arvense*	Hare's-foot Clover

Status (cont.)	Scientific Name (cont.)	Common Name (cont.)
Indigenous species (cont.)		
	Trifolium campestre var. *campestre*	Hop Clover
	Trifolium glomeratum	Cluster Clover
	Trifolium pratense	Red Clover
	Trifolium spp.	Clover
	Trifolium striatum	Knotted Clover
RC	*Ulex europaeus*	Gorse
	Vicia hirsuta	Tiny Vetch
	Vicia sativa	Common Vetch
	Vicia spp.	Vetch
	Vinca major	Blue Periwinkle
	Vulpia bromoides	Squirrel-tail Fescue
	Vulpia muralis	Wall Fescue
	Vulpia myuros	Rat's-tail Fescue
	Vulpia spp.	Fescue
RC	*Xanthium spinosum*	Bathurst Burr

Listed flora species with potential to occur in the project area

The following table includes the listed flora species that have potential to occur within the project area. The list is sourced from the Victorian Biodiversity Atlas and the Protected Matters Search Tool (both most recently accessed on 15 December 2022).

Table B5.B.2
Listed flora species recorded/predicted to occur within 10 km of the project area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
National significance									
Amphibromus fluitans	River Swamp Wallaby-grass	VU			2020	PMST	Largely confined to permanent swamps, mainly along the Murray River between Wodonga and Echuca, with scattered records from southern Victoria.	Low	Some dam edges offer potential habitat but are of low suitability for the species due to the dominance of introduced grasses, as a result of historical land uses and, presumably, elevated nutrient loads.
Caladenia orientalis	Eastern Spider-orchid	EN	e	e	1770		Heath and heathy woodlands in coastal areas between the Mornington Peninsula and Wilsons Promontory.	Negligible	Very old record and no suitable heathy habitat present within the project area.
Dianella amoena	Matted Flax-lily	EN	e	cr	2021	PMST	Lowland grassland and grassy woodland, on well-drained to seasonally waterlogged fertile sandy loam soils to heavy cracking clays.	Low	Most grassland within the project area is highly modified and species-poor, having recolonised land that has been subject to earthworks and/or rock removal. Historical land uses and disturbances mean that this species is unlikely to be present. The extent and coverage of vegetation surveys over the past decade is likely to have detected an important population if one existing in the project area.
Diuris basaltica	Small Golden Moths	EN	e	cr	1965	PMST	Plains Grassland dominated by tussock-forming perennial grasses (including Kangaroo Grass), often with embedded surface basalt.	Negligible	No recent records from the local area. Most grassland within the project area is highly modified and species-poor, having recolonised land that has been subject to earthworks and/or rock removal.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
National significance									
Diuris fragrantissima	Sunshine Diuris	EN	e	cr	1974	PMST	Grassland dominated by Kangaroo Grass, on plains with heavy basalt soils and embedded boulders; only known naturally occurring population is in Sunshine.	**Negligible**	No recent records from the local area. Most grassland within the project area is highly modified and species-poor, having recolonised land that has been subject to earthworks and/or rock removal. Only known extant population is approximately 12 km south of the project area.
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.	**Negligible**	Although some suitable habitat may exist within the project area (e.g. in the woodland), the species has never been recorded from the local area or during detailed vegetation surveys within the project area over the past decade. The project area is outside the known distribution for the species, the nearest record being approximately 45 km west.
Eucalyptus crenulata	Buxton Gum	EN	e	e	2017		Alluvial soils in seasonally inundated depressions along river flats; records away from Buxton and Yering in the northeast are likely to be introductions.	**Negligible**	Outside current range. Naturalised plants likely to be from cultivation.
Glycine latrobeana	Clover Glycine	VU	v	v	1995	PMST	Grasslands and grassy woodlands, particularly those dominated by Kangaroo Grass. Widespread but sporadic distribution.	**Low**	Limited records within the local area. Most recent record is old (>20 years old). Suitable habitat present on-site, but modification of the project area means that site is unlikely to support a population.
Lachnagrostis adamsonii	Adamson's Blown-grass	EN	v	e		PMST	Low-lying, seasonally wet or swampy areas of plains communities, often in slightly saline conditions.	**Low**	Suitable habitat with moist saline soils is not present or very limited in the project area and most records of this species are from south-west Victoria with only a few occurrences near Craigieburn, north of Melbourne.
Lepidium aschersonii	Spiny Peppercress	VU	e	e		PMST	Heavy clay soils near salt lakes on the volcanic plains; disjunct records near Lake Omeo.	**Low**	No records within 10 km of the project area. Limited suitable habitat present and modification of the study area means that site is unlikely to support a population.
Lepidium hyssopifolium s.s.	Basalt Peppercress	EN	e	e	2018		Basalt plains grassland and woodland communities.	**Low**	Suitable habitat present on-site, but modification of the project area means that site is unlikely to support a population.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
National significance									
Leucochrysum albicans subsp. tricolor	White Sunray	EN	e	e		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**	Potential grassland habitat in the project area is modified and species poor. This species is generally known from intact, species-rich basalt plains grasslands in south-west Victoria. This obvious species is likely to have been detected during the past decade of vegetation surveys if it were present.
Pimelea spinescens subsp. spinescens	Spiny Rice-flower	CR	e	cr	2020	PMST	Primarily grasslands featuring a moderate diversity of other native species and inter-tussock spaces, although also recorded in grassland dominated by introduced perennial grasses.	**Low**	Suitable habitat present on-site. Project area is unlikely to support a population due to the highly modified habitat and current land management practices. The extent and coverage of vegetation surveys over the past decade is likely to have detected a population if one existing in the project area.
Prasophyllum frenchii	Maroon Leek-orchid	EN	e	e		PMST	Grassland and grassy woodland environments on sandy or black clay loam soils, which are generally damp but well drained.	**Low**	Very little suitable habitat present on-site and records of this species are from south-east of Melbourne or in south-west Victoria. The project area is unlikely to support a population due to the highly modified habitat and current land management practices. The extent and coverage of vegetation surveys over the past decade is likely to have detected a population if one existing in the project area.
Prasophyllum suaveolens	Fragrant Leek-orchid	EN	e	cr	1962		Open, species rich grasslands dominated by Themeda triandra on poorly draining red-brown soils in western Victoria.	**Negligible**	Limited records within the area. Closest record is old (>20 years old). Habitat is also highly modified and is likely unsuitable.
Pterostylis chlorogramma	Green-striped Greenhood	VU	v	e		PMST	Heathy woodland; more specific habitat requirements are poorly known.	**Low**	Limited suitable habitat comprised of heathy and shrubby forests within the project area. There are no records within the local area.
Pterostylis cucullata	Leafy Greenhood	VU				PMST	Protected areas of stabilised coastal sand dunes within scrub communities with an open ground layer; occasionally in Coastal Manna Gum woodland.	**Negligible**	Suitable habitat not present in the project area as this subspecies is known mostly from coastal scrub habitats.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
National significance									
Rutidosis leptorhynchoides	Button Wrinklewort	EN	e	e	2015	PMST	Higher quality Plains Grassland and Grassy Woodland in Western Victoria, particularly those with fertile soil and light timber cover.	**Negligible**	Recent record (<20 years old). Project area is unlikely to support a population due to the highly modified habitat and current land management practices. The species is generally only known from relatively undisturbed native grassland remnants.
Senecio macrocarpus	Large-headed Fireweed	VU	e	cr	2021	PMST	Grassland, shrubland and woodland habitats on heavy soils subject to waterlogging and/or drought conditions in summer.	**Negligible**	Recent record (<20 years old). Project area is unlikely to support a population due to the highly modified habitat and current land management practices. This large obvious herb is likely to have been detected during the past decade of vegetation surveys if an important population was present.
Senecio psilocarpus	Swamp Fireweed	VU	v			PMST	Seasonally inundated herb-rich swamps, growing on peaty soils or volcanic clays.	**Negligible**	No suitable habitat located within the project area and species is not known to be present in the local area.
Thesium australe	Austral Toad-flax	VU	v	e	1904		Most commonly in damp grassland and woodland, including subalpine grassy heathlands.	**Negligible**	No suitable habitat located within the project area and species is not known to be present in the local area.
Xerochrysum palustre	Swamp Everlasting	VU	v	cr	2005	PMST	Sedge-swamps and shallow freshwater marshes and swamps in lowlands, on black cracking clay soils.	**Negligible**	Recent record (<20 years old), but the project area does not support suitable wetland habitat.
State significance									
Acacia howittii	Sticky Wattle		r	v	2017		Moist forest. Natural occurrences are confined to South Gippsland and Central Highlands.	**Low**	Outside current range (not indigenous to the area). Naturalised plants likely to be from cultivation.
Acacia rostriformis	Bacchus Marsh Wattle		v	v	2020		Occurs in low hilly areas in Eucalyptus woodland.	**Negligible**	No suitable habitat located within the project area and species is not known to be present in the local area. This large obvious large shrub is likely to have been detected during the past decade of vegetation surveys if a population was present.
Allocasuarina luehmannii	Buloke		e	cr	2009		Non-calcareous soils in drier areas on slopes and plains; often in woodlands associated with Grey Box.	**Low**	Recent record (<20 years old). Suitable habitat present. This large obvious large tree is likely to have been detected during the past decade of vegetation surveys if a population was present in the project area.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
National significance									
Amphibromus pithogastrus	Plump Swamp Wallaby-grass		e	cr	1989		Seasonally damp depressions in grassland or grassy wetland.	**Negligible**	Limited records within the area. Closest record is old (>20 years old). Habitat is modified and unsuitable.
Atriplex billardierei	Glistening Saltbush		x	x	1980		Scattered along sandy seashores from the western to eastern extremities of Victoria.	**Negligible**	This is a coastal species that is considered extinct in Victoria.
Botrychium australe	Austral Moonwort		v	cr	1983		Lowland forest and scrubland to subalpine grasslands, lightly wooded plains, at the base of granitic hills, alongside subalpine streams, and in some disturbed environments.	**Negligible**	There are limited records within the area and the most recent record is old (>20 years old). Habitat is not suitable for the species.
Calotis lappulacea	Yellow Burr-daisy		r	v	2014		Dry rocky country, open woodland, and fertile, loam or clay soils.	**Low**	There are limited records within the local area. Potential woodland habitat in the project area is modified and species poor. This obvious species is likely to have been detected during the past decade of vegetation surveys if it were present.
Carex tasmanica	Curly Sedge		v	e	2001		Seasonally wet areas, such as around drainage lines and freshwater swamps, on fertile, clay soils derived from basalt.	**Negligible**	Limited records within the area. Closest record is old (>20 years old). Habitat is modified and unsuitable.
Chloris ventricosa	Plump Windmill Grass		v	e	2011		Woodlands. Mainly found on clay soils, sometimes in winter-wet depressions.	**Medium**	Limited records within the area. Closest record is located within habitat similar to habitat present within Melbourne Airport.
Cladium procerum	Leafy Twig-sedge		r	e	2018		Waterlogged soils, often along slow-flowing streams and lake margins.	**Low**	Species unlikely to be present within modified wetland habitat. Species is often planted in reconstructed wetland projects in the broader area. Closest record is from Jacana Wetlands which was revegetated in 2018.
Comesperma polygaloides	Small Milkwort		v	cr	2014		Grasslands on the western basalt plains; less commonly in grassy woodlands between Bendigo and the Wimmera.	**Negligible**	No suitable habitat located within the project area and species is not known to be present in the local area. This obvious sub-shrub is likely to have been detected during the past decade of vegetation surveys if a population was present.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
National significance									
Coronidium gunnianum	Pale Swamp Everlasting		v	cr	2017		Widespread and sometimes locally common, particularly in high-rainfall areas of Victoria; often in moist sites in open forests and woodlands.	**Low**	No suitable wetland habitat onsite.
Corymbia maculata	Spotted Gum		v	v	2021		In Victoria, naturally confined to a small population near Mt Tara in the east of the state.	**Negligible**	Outside of natural range of this species. Specimens in the region are likely to be planted.
Cullen parvum	Small Scurf-pea		e	e	2006		Lowland grasslands, including pastures and occasionally in otherwise disturbed grassy areas.	**Low**	Limited records within the local area. Suitable habitat present on-site, but modification of the project area means that site is unlikely to support a population.
Cullen tenax	Tough Scurf-pea		e	e	2017		Lowland grasslands, including pastures and occasionally in otherwise disturbed grassy areas.	**Low**	Limited records within the local area. Suitable habitat present on-site, but modification of the project area means that site is unlikely to support a population
Dianella longifolia var. grandis	Flax-lily		v	cr	2020		The habitat requirements of this species are poorly known.	**Low**	Recent records in the area (<20 years old). Suitable habitat present on-site, but modification of the project area means that site is unlikely to support a population. Species likely to have been encountered during the extensive native vegetation surveys if present within the project area.
Diuris palustris	Swamp Diuris		v	e	1979		Grasslands and open woodlands, often in swampy depressions; confined to the west of the State.	**Negligible**	No suitable habitat located within the project area and species is not known to be present in the local area. Most recent record is old (>20 years old).
Diuris punctata var. punctata	Purple Diuris		v	e	1982		Fertile, loamy soils and periodically wet areas in lowland grasslands, grassy woodlands, heathy woodlands and open heathlands.	**Negligible**	No suitable habitat located within the project area and species is not known to be present in the local area. Most recent record is old (>20 years old).
Diuris X palachila	Broad-lip Diuris		r	e	1904		Heathlands, grasslands, open woodlands and dry open forests.	**Negligible**	No suitable habitat located within the project area and species is not known to be present in the local area. Most recent record is old (>20 years old).

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
National significance									
Eleocharis plana	Flat Spike-sedge		v	cr	1986		Shallow freshwater pools and the margins of lakes and rivers.	**Negligible**	No suitable habitat located within the project area and species is not known to be present in the local area. Most recent record is old (>20 years old).
Eragrostis trachycarpa	Rough-grain Love-grass		r	e	1996		Moist grassland or grassy woodland sites.	**Low**	Old nearby record (>20 years old). Suitable habitat present on-site, but modification of the project area means that site is unlikely to support a population.
Eremophila maculata subsp. maculata	Spotted Emu-bush		r	cr	2021		Mainly in Black Box forests or woodlands on heavy clay soils.	**Negligible**	In Victoria, this species is confined to the north-west. There is a single record within the local area, but there is no suitable Black Box forest habitat within the project area.
Eucalyptus globulus subsp. globulus	Southern Blue-gum		r	e	2020		Damp forest communities. Restricted to South Gippsland and the Otway Ranges.	**Negligible**	Outside of natural range of this species. Specimens in the region are likely to be planted.
Eucalyptus leucoxylon subsp. connata	Melbourne Yellow-gum		v	e	2017		Well-drained slopes in a restricted area around Melbourne and Geelong.	**Negligible**	Nearby records are recent (<20 years old), but this is a large conspicuous species that would have been identified during previous survey efforts.
Eucalyptus leucoxylon subsp. megalocarpa	Large-fruit Yellow-gum		e	cr	2018		Coastal, near Nelson.	**Negligible**	This large obvious large tree is likely to have been detected during the past decade of vegetation surveys if a remnant (not planted) population was present in the project area.
Eucalyptus sideroxylon subsp. sideroxylon	Mugga		r	e	2020		Typically found on poor, shallow soils, including sands, gravels, ironstones and clays.	**Low**	This large obvious large tree is likely to have been detected during the past decade of vegetation surveys if a remnant (not planted) population was present in the project area.
Geranium solanderi var. solanderi s.s.	Austral Crane's-bill		v	e	2019		Grasslands or grassy woodlands where hydrology is not a limiting factor.	**Medium**	Recent records nearby (<20 years old). Suitable habitat onsite and can be present in disturbed grasslands and grassy woodlands.
Geranium sp. 1	Large-flower Crane's-bill		e	cr	2021		The habitat requirements of this species are poorly known.	**Low**	There are limited species records within the local area. Habitat may be present, but the species potential to persist on the site is unknown due to limited habitat information.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
National significance									
Geranium sp. 3	Pale-flower Crane's-bill		r	e	2016		Grasslands and dry woodlands.	**Medium**	Recent records nearby (<20 years old). Suitable habitat onsite and can be present in disturbed grasslands and grassy woodlands.
Goodia medicaginea	Western Golden-tip		r	e	2016		Drier sites within wet or dry sclerophyll forests.	**Low**	Suitable habitat present within the woodland, but this is a conspicuous shrub that would have been recorded during previous survey efforts.
Heterozostera tasmanica	Eelgrass		r	e	2007		Locally common in shallow waters to a depth of c. 8m in sandy soil.	**Low**	A single record within the local area. This species is usually confined to coastal or near-coastal areas. No suitable habitat within the project area.
Lachnagrostis semibarbata var. semibarbata	Purple Blown-grass		r	e	2001		Wet marshes and slightly saline swamps and depressions in plains communities.	**Medium**	Limited records within the area. Closest record is located within habitat similar to habitat present within Melbourne Airport.
Leiocarpa leptolepis	Pale Plover-daisy		e	e	1912		Grasslands and grassy woodlands, often in disturbed areas. In Victoria, confined to one known population approximately 4km east of Mildura.	**Negligible**	Species is not known to be present in the local area. One old record (>20 years old).
Leionema bilobum subsp. bilobum	Truncate Leionema		r	v	2006		Endemic to heathland and heathy woodland, in the Grampians and mostly in the north and east (e.g. Mt Difficult, Mt William, Wonderland and Serra Ranges), but with isolated occurrences at Mt Zero and Wallaby Rocks. Usually in rocky, elevated sites.	**Negligible**	Outside of natural range of this species. Specimens in the region are likely to be planted.
Melaleuca armillaris subsp. armillaris	Giant Honey-myrtle		r	e	2020		Near coastal heath/scrub, rocky coast and foothill outcrops.	**Negligible**	No suitable habitat within the project area. Nearby records are likely to be planted. Species is indigenous to East Gippsland with a naturalised population from cultivated specimens in the west of the state (around Melbourne).
Nicotiana suaveolens	Austral Tobacco		r	e	2021		Areas of sandy or gravelly soil typically associated with streams, gullies and other drainage lines; also grasslands and escarpment shrublands.	**Low**	Suitable habitat present within the project area along Arundel Creek, Deep Creek and the Maribyrnong, but species was likely to be detected during the extensive native vegetation surveys if present.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
National significance									
Podolepis linearifolia	Basalt Podolepis		e	e	2016		Grasslands and grassy woodlands.	**Low**	Nearby records are recent (<20 years old), but modification of the project area means that site is unlikely to support a population.
Prostanthera nivea var. nivea	Snowy Mint-bush		r	v	2014		Largely confined to shrubland and open woodland associated with granite outcrops.	**Low**	A single record within the local area. Limited suitable woodland habitat within the project area. This species is a conspicuous shrub that would have been detected during previous vegetation surveys if present.
Pterostylis cucullata subsp. cucullata	Leafy Greenhood		e	e	1770		Protected areas of stabilised coastal sand dunes within scrub communities with an open ground layer; occasionally in Coastal Manna Gum woodland.	**Negligible**	Species is not known to be present in the local area. One old record (>20 years old).
Pterostylis truncata	Brittle Greenhood		e	cr	1939		Grassland and grassy woodland habitats, largely to the west of Melbourne.	**Negligible**	Species is not known to be present in the local area. One old record (>20 years old).
Rhagodia parabolica	Fragrant Saltbush		r	v	2021		Plains and escarpment grassland, shrubland and woodland.	**Low**	Suitable habitat present, but not detected during surveys. An obvious shrub that would have likely been detected if present.
Senecio cunninghamii var. cunninghamii	Branching Groundsel		r	e	1981		Heavy soils that are sometimes winter-wet, or dry rocky soils; often on embankments or escarpments.	**Negligible**	Old record (>20 years old) and very few within local area. Project area is unlikely to support a population due to the high levels of land modification and land management practices. This large obvious herb is likely to have been detected during the past decade of vegetation surveys if an important population was present.
Thelymitra gregaria	Basalt Sun-orchid		e	cr	1953		Open, species-rich grassland dominated by Themeda triandra on poorly draining soils of the volcanic plains.	**Negligible**	Species is not known to be present in the local area. One old record (>20 years old).
Tripogonella loliiformis	Rye Beetle-grass		r	e	2016		Dry sites in association with escarpments and rocky outcrops.	**Medium**	Species was recorded within suitable habitat in the woodland in 1994 but has not been recorded since.

Listed ecological communities with potential to occur in the project area

The following table includes the listed ecological communities with potential to occur within the project area. The list is sourced from the Victorian Biodiversity Atlas and the Protected Matters Search Tool (both most recently accessed on 15 December 2022).

Table B5.B.3
Listed ecological communities predicted to occur within 10 km of the project area.

Ecological community	Status	Comments
Grassy Eucalypt Woodland of the Victorian Volcanic Plain Critically Endangered Community	EPBC	Plains Grassy Woodland (EVC 55) has affinities with this community when River Red-gum is the dominant canopy species. However, all patches of this EVC recorded within the project area are less than 0.5 ha and highly fragmented, meaning they do not meet the size or condition thresholds to qualify as this community (TSSC, 2009).
Grey Box *(Eucalyptus microcarpa)* Grassy Woodlands and Derived Native Grasslands of South-eastern Australia Endangered Community	EPBC	This community is associated with Hills Herb-rich Woodland (EVC 71) and Plains Woodland (EVC 803) within the project area. Grey Box is the most common Eucalypt within treed areas of the project area and is present as a regenerating species in derived native grassland.
Natural Temperate Grassland of the Victorian Volcanic Plain Critically Endangered community	EPBC	This community is present as a naturally treeless native grassland throughout the project area. It is associated with higher quality patches of Plains Grassland (EVC 132).
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains Critically Endangered Community	EPBC	Wetland EVCs in the project area do not represent this community as associated wetland vegetation does not fit the key landscape setting and floristic diagnostics. This is due to the wetland EVCs present occurring in creek systems (and not as depressional wetlands), the lack of low growing wetland grass or herb species and the dominance of large emergent graminoids that are contra-indicator species for this community.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered	EPBC	The eucalypt species that define this community are not present in the project area except for the occasional Yellow Box, which is associated with Hills Herb-rich Woodland (EVC 71) and Plains Woodland (EVC 803). These EVCs represent the Grey Box Grassy Woodland community listed above.
Grey Box - Buloke Grassy Woodland Community	FFG	This community is typically found in northern or central Victoria, not southern Victoria, and is characterised by a sub-stratum of Buloke *Allocasuarina luehmannii*. The Grey Box Woodland present in the project area does not represent this community as there are no Buloke trees present. It therefore does not fit the description of this community.
Victorian Temperate Woodland Bird Community	FFG	This community is present in the Grey Box Grassy Woodland of the project area. Listed woodland birds within this community that have been recorded or may occur are Swift Parrot, Brown Treecreeper, Speckled Warbler, Yellow-tufted Honeyeater, Fuscous Honeyeater, Black-chinned Honeyeater, Painted Honeyeater, Jacky Winter, Red-capped Robin, Hooded Robin and Diamond Firetail.
Western (Basalt) Plains Grassland	FFG	This community corresponds with all patches of Plains Grassland (EVC 132) in the project area.
Western Basalt Plains (River Red Gum) Grassy Woodland	FFG	Plains Grassy Woodland (EVC 55) has affinities with this community when River Red-gum is dominant canopy species. However, all patches of this EVC within the project area are highly modified and lack the clearly-recognisable open canopy of River Red-gum. The patches are too small, fragmented and highly modified to match the description of this community.

APPENDIX B5.C
FAUNA

Summary

- Fauna recorded from the project area.
- Significant fauna with potential to occur in the project area.
- Migratory fauna with potential to occur within 10 kilometres of the project area.

Fauna species recovered from the study

Note to tables

EPBC Act: EX – Extinct CR – Critically Endangered EN – Endangered VU – Vulnerable CD – Conservation Dependent PMST – Protected Matters Search Tool	Vic ex - extinct cr – critically endangered en – endangered vu – vulnerable nt – near threatened dd – data deficient rx – regionally extinct PS – pest species (CaLP Act) (DSE 2009; DSE 2013) N - Declared noxious aquatic species * - Introduced species
FFG Act: L – Listed as threatened under FFG Act N – Nominated for listing as threatened I – determined ineligible for listing	Most recent database records are from the Victorian Biodiversity Atlas unless otherwise specified as follows: PMST – Protected Matters Search Tool Birdlife – Birdlife Australia database search or manual interrogation of Birdlife Australia Bird data

The following table includes a list of fauna recorded from the project area (current assessment and FY19 Growling Grass Frog surveys).

Table B5.C.1
Fauna Recorded from the project area

Scientific Name	Common Name	Status			Survey Method				
		EPBC	VIC	FFG	Incidental	SLL Tile survey	M3R GGF Spotlighting/ Call Play back	GSM survey	FY19 GGF surveys
Indigenous Species									
Birds									
Acanthiza chrysorrhoa	Yellow-rumped Thornbill				X				
Acanthiza pusilla	Brown Thornbill				X				
Alauda arvensis	Eurasian Skylark				X				
Anas superciliosa	Pacific Black Duck				X				
Anthus novaeseelandiae	Australasian Pipit				X				
Aquila audax	Wedge-tailed Eagle				X				
Ardea pacifica	White-necked Heron				X				
Artamus cyanopterus	Dusky Woodswallow				X				
Cacatua galerita	Sulphur-crested Cockatoo				X				
Cacatua tenuirostris	Long-billed Corella				X				
Cacomantis pallidus	Pallid Cuckoo				X				
Chrysococcyx lucidus	Shining Bronze-Cuckoo				X				
Cincloramphus mathewsi	Rufous Songlark				X				

Scientific Name (cont.)	Common Name (cont.)	Status (cont.)			Survey Method (cont.)				
		EPBC	VIC	FFG	Incidental	SLL Tile survey	M3R GGF Spotlighting/ Call Play back	GSM survey	FY19 GGF surveys
Indigenous Species									
Birds (cont.)									
Coracina novaehollandiae	Black-faced Cuckoo-shrike				X				
Cormobates leucophaea	White-throated Treecreeper				X				
Corvus mellori	Little Raven				X				
Dacelo novaeguineae	Laughing Kookaburra				X				
Egretta novaehollandiae	White-faced Heron				X		X		
Eolophus roseicapilla	Galah				X				
Falco berigora	Brown Falcon				X				
Glossopsitta concinna	Musk Lorikeet				X				
Gymnorhina tibicen	Australian Magpie				X				
Lalage tricolor	White-winged Triller				X				
Malurus cyaneus	Superb Fairy-wren				X				
Manorina melanocephala	Noisy Miner				X				
Melithreptus brevirostris	Brown-headed Honeyeater				X				
Ninox boobook	Southern Boobook						X		
Ocyphaps lophotes	Crested Pigeon				X				
Pardalotus punctatus	Spotted Pardalote				X				
Pardalotus striatus	Striated Pardalote				X				
Petrochelidon nigricans	Tree Martin				X				
Platycercus elegans	Crimson Rosella				X				
Platycercus eximius	Eastern Rosella				X				
Psephotus haematonotus	Red-rumped Parrot				X				
Ptilotula penicillata	White-plumed Honeyeater				X				
Rhipidura albiscapa	Grey Fantail				X				
Rhipidura leucophrys	Willie Wagtail				X				
Smicrornis brevirostris	Weebill				X				
Synoicus ypsilophorus	Brown Quail				X			X	
Taeniopygia guttata	Zebra Finch				X				
Threskiornis spinicollis	Straw-necked Ibis				X				
Todiramphus sanctus	Sacred Kingfisher				X				
Trichoglossus haematodus	Rainbow Lorikeet				X				
Vanellus miles	Masked Lapwing				X				

Scientific Name (cont.)	Common Name (cont.)	Status (cont.)			Survey Method (cont.)				
		EPBC	VIC	FFG	Incidental	SLL Tile survey	M3R GGF Spotlighting/ Call Play back	GSM survey	FY19 GGF surveys
Indigenous Species									
Mammals									
Macropus giganteus	Eastern Grey Kangaroo				X				
Pseudocheirus peregrinus	Eastern Ring-tailed Possum						X		X
Tadarida australis	White-striped Freetail Bat						X		
Wallabia bicolor	Black-tailed Wallaby				X				
Reptiles									
Amphibolurus muricatus	Tree Dragon				X				
Chelodina longicollis	Eastern Snake-necked Turtle		dd				X		X
Christinus marmoratus	Marbled Gecko				X				
Ctenotus robustus	Large Striped Skink					X			
Emydura macquarii	Murray River Turtle		vu	cr					X
Eulamprus tympanum tympanum	Southern Water Skink								X
Lampropholis guichenoti	Pale-flecked Garden Sunskink					X			
Lerista bougainvillii	Bougainville's Skink					X			
Parasuta flagellum	Little Whip Snake					X			
Pseudemoia pagenstecheri	Tussock Skink		vu	e		X			
Pseudonaja textilis	Eastern Brown Snake								X
Saproscincus mustelinus	Weasel Skink					X			
Tiliqua scincoides	Common Blue-tongued Lizard					X			
Frogs									
Crinia signifera	Common Froglet						X		X
Limnodynastes dumerilii	Eastern Banjo Frog						X		X
Limnodynastes peronii	Striped Marsh Frog						X		X
Limnodynastes tasmaniensis	Spotted Marsh Frog					X	X		X
Litoria ewingii	Southern Brown Tree Frog				X		X		X
Litoria lesueuri	Southern Stony-creek Frog								X
Litoria raniformis	Growling Grass Frog	VU	en	v	X		X		X
Litoria verreauxii verreauxii	Verreaux's Tree Frog								X

Scientific Name (cont.)	Common Name (cont.)	Status (cont.)			Survey Method (cont.)				
		EPBC	VIC	FFG	Incidental	SLL Tile survey	M3R GGF Spotlighting/ Call Play back	GSM survey	FY19 GGF surveys
Indigenous Species									
Fish									
Anguilla australis	Southern Shortfin Eel						X		
Invertebrates / crustaceans									
Cherax destructor destructor	Common Yabby								
Synemon plana	Golden Sun Moth	CR	cr	v	X			X	
Introduced species									
**Cyprinus carpio*	European Carp		N						X
**Mus musculus*	House Mouse		PS						
**Rattus rattus*	Black Rat						X		
**Vulpes vulpes*	Red Fox		PS		X				

Listed fauna species predicted to occur within the project area

The following table includes listed fauna species that have potential to occur within the project area. The list of species is sourced from the Victorian Biodiversity Atlas (last accessed on 15 December 2022), the Protected Matters Search Tool (last accessed on 15 December 2022) and Birdlife Australia Records (accessed on 11 March 2020).

Table B5.C.2
Listed fauna species recorded/predicted to occur within 10 km of the project area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
National significance									
Pedionomus torquatus	Plains-wanderer	CR	cr	cr	1979	PMST	Native grassland with a sparse, open structure.	Low	There is no structurally suitable habitat to support a population of the species within the project area and the species is now very rarely recorded in Southern Victoria.
Rostratula australis	Australian Painted-snipe	EN	cr	cr	1977	PMST	Generally found in shallow, terrestrial freshwater wetlands with rank, emergent tussocks of grass, sedges and rushes. Australian Painted Snipe can occur in well-vegetated lakes, swamps, inundated pasture, saltmarsh and dams.	Low	Dams and waterways within the project area do not provide suitable habitat for this species.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
National significance (cont.)									
Botaurus poiciloptilus	Australasian Bittern	EN	en	cr	1950	PMST	Occurs in wetlands with tall, dense vegetation where it forages in shallow water. Prefers permanent freshwater habitats, particularly when dominated by sedges, rushes and reeds.	**Low**	Dams and waterways within the project area do not provide suitable habitat for this species.
Falco hypoleucos	Grey Falcon	VU	en	v		PMST	Lightly timbered plains and Acacia scrub.	**Low**	Species unlikely to occur south of the Great Dividing Range in Victoria, therefore the project area does not provide habitat for this species.
Calyptorhynchus banksii graptogyne	Red-tailed Black-Cockatoo (south-eastern)	EN	en	e	1846		The south-eastern Red-tailed Black-Cockatoo only occurs in the south-east of South Australia and south-west Victoria. Red-tailed Black-Cockatoos rely on stringybark, buloke and gum woodland habitats and scattered trees throughout the range for feeding and nesting. They are highly nomadic, moving throughout their range in response to food availability.	**Negligible**	The contemporary range of this species does not extend east of the Grampians.
Callocephalon fimbriatum	Gang-gang Cockatoo	EN			2002	PMST	Southern Victoria to Eastern NSW. Forests and woodlands from coast to alpine areas. Autumn-winter dispersal from highlands to lower elevations. Forages in eucalypts, acacias and some exotic garden trees and shrubs.	**Medium**	Suitable woodland habitat within the project area, and this species is also likely to utilise planted vegetation.
Polytelis swainsonii	Superb Parrot	VU	en	e	1846		Found along timbered waterways and nearby well-watered woodlands. It is found in the Riverina area of New South Wales and Victoria and Northern New South Wales in winter.	**Negligible**	The species does not naturally occur in the Melbourne region.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
National significance (cont.)									
Polytelis anthopeplus	Regent Parrot	VU	vu	v	1897		Two separate populations: eastern population are found in south-western New South Wales, north-western Victoria and the Murray Mallee region of South Australia, this population is found in River Red Gum, floodplain, woodland and mallee habitats. The western population is found in south west Western Australia where they are found in open forest and woodland.	**Negligible**	This record is of aviary escapees (VBA record interrogation). The species does not naturally occur in the Melbourne region.
Neophema chrysogaster	Orange-bellied Parrot	CR	cr	cr	1977		Coastal vegetation including saltmarshes, dunes, pastures, shrublands, sewage plants, saltworks, islands, and beaches.	**Negligible**	No suitable habitat.
Lathamus discolor	Swift Parrot	CR	en	cr	2019	Birdlife, PMST	A range of forests and woodlands, especially those supporting nectar-producing tree species. Also well-treed urban areas.	**Recorded**	The species was recorded from the Grey Box Woodland within the project area in 2019 (Steele & Peter 2019). The Grey Box Woodland represents a large example of intact habitat for the species in the southern extent of its mainland range. Other scattered eucalyptus and planted trees may also provide foraging habitat for the species on occasion but scattered trees are unlikely to provide significant habitat for the species.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
National significance (cont.)									
Hirundapus caudacutus	White-throated Needletail	VU	vu	v	2010	Birdlife, PMST	An almost exclusively aerial species within Australia, occurring over most types of habitat, particularly wooded areas.	**High**	It is likely that the species utilises all of the airspace at Melbourne Airport with the woodland providing preferable habitat for the species. Additional interrogation of Birdlife Australia's online database (Birddata) revealed there is an incidental record of the species from 2010 (Birdlife Australia) over Sky Road in Melbourne Airport and other records surrounding the Airport. The species is known to have a preference for foraging above wooded areas and is known to roost in the canopy and hollows of trees in in forests and woodlands.
Thinornis cucullatus	Hooded Plover	VU	vu	v		PMST	Sandy ocean beaches, estuaries and inland lakes.	**Negligible**	No suitable habitat.
Sternula nereis	Fairy Tern	VU	en	cr	1977		Fairy Terns inhabit coastal environments including intertidal mudflats, sand flats and beaches. Nests above high-water mark on sandy shell-grit beaches.	**Negligible**	No suitable habitat.
Charadrius mongolus	Lesser Sand Plover	EN	cr	e	1978		A migratory species that forages on exposed sand and mudflats. High tide roost sites are often located on beaches. This species has been recorded at Mud Islands within Port Phillip Bay, and Reef Island within Westernport Bay. The species has also previously been recorded along the coastline at the Western Treatment Plant.	**Negligible**	No suitable habitat.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
National significance (cont.)									
Charadrius leschenaultii	Greater Sand Plover	VU	cr	v		PMST	Intertidal mudflats and sandbanks of sheltered bays and estuaries.	**Negligible**	No suitable habitat within the project area, and no records within the local area.
Numenius madagascariensis	Eastern Curlew	CR	vu	cr	1977	PMST	Large intertidal sandflats, banks, mudflats, estuaries, inlets, sewage farms, saltworks, harbours, coastal lagoons and bays.	**Negligible**	No suitable habitat.
Limosa lapponica	Bar-tailed Godwit	VU		v	1977		Bar-tailed Godwits inhabit estuarine mudflats, beaches and mangroves. They are common in coastal areas around Australia. They are social birds and are often seen in large flocks and in the company of other waders.	**Negligible**	No suitable habitat.
Calidris ferruginea	Curlew Sandpiper	CR	en	cr	1977	PMST	Large intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms.	**Negligible**	No suitable habitat.
Calidris canutus	Red Knot	EN	en	e		PMST	Large intertidal sandflats, banks, mudflats, estuaries, inlets, sewage farms, saltworks, harbours, coastal lagoons and bays.	**Negligible**	No suitable habitat within the project area, and no records within the local area.
Grantiella picta	Painted Honeyeater	VU	vu	v		PMST	A migratory species that breeds in southern Australia, it occupies dry open woodlands and forests located on the inland foothills of the Great Dividing Range. Typically forages for fruit and nectar in mistletoes and in tree canopies.	**Low**	No records of the species in the local area and rarely recorded in the Melbourne area. Not detected in any of the surveys undertaken in the Grey Box Woodland.
Anthochaera phrygia	Regent Honeyeater	CR	cr	cr	1971	PMST	A range of dry woodlands and forests dominated by nectar-producing tree species.	**Low**	Now very rarely recorded in the Melbourne area. Not detected in any of the surveys undertaken in the Grey Box Woodland.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
National significance (cont.)									
Dasyurus maculatus maculatus (SE mainland population)	Spot-tailed Quoll	EN	en	e	1883	PMST	Rainforest and wet and dry sclerophyll forests and woodlands.	**Negligible**	This species is locally extinct.
Dasyurus viverrinus	Eastern Quoll	EN	rx		1902		The Eastern Quoll is a medium-sized carnivorous marsupial that once occupied a broad range of forest, woodland and grassland habitats in Victoria. The species is now restricted to Tasmania and is considered to be extinct from mainland Australia.	**Negligible**	The species is now extinct in the wild in Victoria.
Perameles gunnii	Eastern Barred Bandicoot (Mainland)	VU	ew	e	2021	PMST	Natural temperate grasslands and grassy woodlands.	**Negligible**	This species is locally extinct. The 2003 record relates to the captive population introduced to Woodlands Historic Park.
Petaurus australis	Yellow-bellied Glider	VU				PMST	Sclerophyll forest with large hollow-bearing trees, prefers mature eucalypt dominated forest and woodland. Distributed along South-eastern Australia.	**Low**	There is limited suitable habitat within the project area, and no local records.
Pteropus poliocephalus	Grey-headed Flying-fox	VU	vu	v	2021	PMST	Rainforest, wet and dry sclerophyll forest, woodland and urban areas.	**Recorded**	The species is known to forage in flowering eucalypts within the project area (Ecology and Infrastructure International, 2018). The closest 'camp' for the species is located approximately 20 km south-east of the project area. Habitat present within the project area is unlikely to provide important habitat critical for the survival of this species.
Delma impar	Striped Legless Lizard	VU	en	e	2019	PMST	Natural temperate grassland, grassy woodland and exotic grassland.	**Low**	Extensive targeted surveys were undertaken for the species as part of the current ecological assessments. The species was not detected during the current assessment or during any of the numerous previous assessments undertaken.
Tympanocryptis pinguicolla	Grassland Earless Dragon	EN	cr	cr	1990	PMST	Natural temperate grassland.	**Low**	This species has not been reliably recorded in the wild for 50 years. It is therefore potentially extinct.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
National significance (cont.)									
Litoria raniformis	Growling Grass Frog	VU	en	v	2020	PMST	Still or slow-flowing waterbodies and surrounding terrestrial vegetation.	**Recorded**	Growling Grass Frog have been recorded from Arundel Creek and Moonee Ponds Creek within the project area and Deep Creek and the Maribyrnong River adjacent to the project area. Breeding, aquatic and terrestrial habitat for the species occurs within the project area.
Prototroctes maraena	Australian Grayling	VU	vu	e	2015	PMST	Adults inhabit cool, clear, freshwater streams.	**Medium**	Targeted surveys between 2013 and 2014 (Biosis, 2015) did not record the species within the project area but the species is known to occur downstream from the project area in the Maribyrnong River and is therefore likely to utilise similar suitable habitat in the portion of the Maribyrnong River adjacent to the project area. Permanently altered run-off and water quality to be managed by design and relevant permit conditions to ensure integrity of adjacent waterways as habitat for the species.
Galaxiella pusilla	Dwarf Galaxias	VU	en	e		PMST	Slow-flowing or still freshwater wetlands such as swamps, drains and backwaters of streams.	**Low**	No Dwarf Galaxias were detected during previous aquatic surveys (Biosis, 2015). This species has not been recorded from the Maribyrnong or Yarra River catchments.
Maccullochella macquariensis	Trout Cod	EN	cr	e	1908		Found within faster flowing sections of the Murray River and its tributaries, in deep holes or amongst fallen timber and other debris. Also occurs in upper reaches of rivers where water is clear and there is little fallen timber.	**Negligible**	Project area is outside accepted range of the species. Historic records represent failed translocations.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
National significance (cont.)									
Maccullochella peelii	Murray Cod	VU	vu	e	1981	PMST	Found within the Murray River catchment usually in sluggish turbid rivers, in deep holes or amongst fallen timber and other debris. Also occurs in upper reaches of rivers where water is clear and there is little fallen timber. There is also a large viable population of the species in the Yarra River Catchment.	**Low**	The database records represent failed translocations. There are no contemporary records of this species from the Maribyrnong catchment.
Macquaria australasica	Macquarie Perch	EN	en	e	1970		Streams with clear water and deep, rocky holes with abundant cover.	**Negligible**	Project area is outside accepted range of the species. Historic records represent failed translocations.
Nannoperca obscura	Yarra Pygmy Perch	VU	vu	v		PMST	Lakes, pools and slow-flowing streams with abundant aquatic vegetation.	**Low**	Limited suitable habitat within the project area, and no local records.
Bidyanus bidyanus	Silver Perch	CR	vu	e	1981		Found in lowland rivers within the Murray-Darling Basin commonly found in deeper water adjacent to large woody habitats. Has been widely stocked in reservoirs and farm dams.	**Negligible**	Project area is outside accepted range of the species. Historic records represent failed translocations.
Synemon plana	Golden Sun Moth	CR	cr	v	2020	PMST	Natural temperate grassland, grassy woodland and pasture supporting spear grasses and wallaby grasses and exotic grassland dominated by Chilean Needle-grass.	**Recorded**	Species recorded from a small area of suitable habitat north of the Grey Box Woodland. The species was not recorded anywhere else within the project area during extensive current and previous surveys for the species. It is unlikely that that species occurs anywhere else in the project area.
Paralucia pyrodiscus lucida	Eltham Copper Butterfly	EN	en	cr	1922		Drier sclerophyll forests and woodlands supporting Sweet Bursaria Bursaria spinosa, especially along ridgelines.	**Low**	Planted habitat for this species occurs within the regeneration area of the woodland, but the species has not been recorded from the local area for close to 100 years, the nearest known population is in the Eltham – Greensborough area.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
State significance									
Anseranas semipalmata	Magpie Goose		nt	v	2016		Swamps, lakes, sewage ponds, flooded pasture, dams.	**Low**	Unlikely to utilise waterways at Melbourne Airport, not suitable habitat. Closest record from 2016 is from a residential area north of Jacana Wetlands, no details whether this record was a fly over or utilising habitat within the Jacana Wetlands.
Geopelia cuneata	Diamond Dove		nt	v	2009		Drier woodlands and scrub, spinifex and mulga.	**Low**	This species is a vagrant to southern Victoria.
Lewinia pectoralis	Lewin's Rail		vu	v	1991		Swamps, dense riparian vegetation and saltmarsh.	**Low**	Confined to vicinity of watercourses and dams but there is limited suitable habitat present in the project area for this species. May fly over the project area.
Porzana pusilla	Baillon's Crake		vu		2015		Well-vegetated permanent and temporary fresh and brackish wetlands.	**Low**	Confined to vicinity of watercourses and dams but there is limited suitable habitat present in the project area for this species. May fly over the project area.
Burhinus grallarius	Bush Stone-curlew		en	cr	1846		Open woodland, treed farmland.	**Negligible**	This species is now extinct in southern Victoria.
Ardeotis australis	Australian Bustard		cr	cr	1846		Grassland, open dry woodlands of Mallee and mulga, arid heathland saltbush and bluebush.	**Negligible**	This species is now extinct in southern Victoria.
Egretta garzetta	Little Egret		en	e	2019		Swamps, billabongs, floodplain pools, mudflats, mangroves and channels; breeds in trees standing in water.	**High**	Suitable habitat present in watercourses and dams.
Ardea intermedia plumifera	Plumed Egret		en	cr	1982		Densely-vegetated freshwater wetlands including lakes, swamps and billabongs. Breeds in trees standing in water.	**High**	Suitable habitat present in watercourses and dams.
Ardea alba modesta	Eastern Great Egret		vu	v	2019		Flooded crops, pasture, swamps, lagoons, saltmarsh, sewage ponds, estuaries, dams, roadside ditches. Breeds in trees standing in water.	**High**	Suitable habitat present in watercourses and dams.
Ixobrychus dubius	Australian Little Bittern		en	e	1980		Inhabits terrestrial wetlands, preferably with dense emergent vegetation.	**Low**	Lack of suitable habitat. May rarely fly over the project area.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
State significance									
Stictonetta naevosa	Freckled Duck		en	e	2014		Large freshwater wetlands, generally with dense vegetation.	**Medium**	May occasionally use the large water storage dams on Arundel Creek on occasion, may fly over the project area.
Aythya australis	Hardhead		vu	v	2019		A mainly aquatic 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. Occasionally in estuarine and littoral habitats such as saltpans, coastal lagoons and sheltered inshore waters. Avoids main streams or rivers, except in calm reaches where aquatic flora is developed.	**Medium**	May visit the large water storage dams along Arundel Creek on occasion, may fly over the project area.
Oxyura australis	Blue-billed Duck		en	v	2019		Deep, freshwater wetlands.	**Medium**	May visit the large water storage dams along Arundel Creek on occasion, may fly over the project area.
Biziura lobata	Musk Duck		vu	v	2019		A largely aquatic species preferring deep water on large, permanent swamps, lakes and estuaries with abundant aquatic vegetation. Often occurs in areas of dense vegetated cover within a wetland. Less commonly recorded in small or shallow waters, such as billabongs, sewage ponds, freshwater rivers and densely vegetated farm dams.	**Medium**	May visit the large water storage dams along Arundel Creek on occasion, may fly over the project area.
Accipiter novaehollandiae	Grey Goshawk		vu	e	2018		Favours tall, wet forests in gullies but can occur in woodlands, dry forests, wooded farmlands and suburban parks. Relies on mature forests for breeding.	**Medium**	May occasionally use the Grey Box Woodland and to a lesser extent planted trees within the project area.
Haliaeetus leucogaster	White-bellied Sea-Eagle		vu	e	2019		Coastal areas such as beaches and estuaries, inland wetlands and major inland streams.	**Medium**	May visit waterways and dams in the project area on occasion, in particularly the Maribyrnong River and potentially the large water storage dams on Arundel Creek.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
State significance									
Falco subniger	Black Falcon		vu	cr	2018	Birdlife	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**	Areas of grassland and woodland area suitable habitat for this species.
Ninox strenua	Powerful Owl		vu	v	2007		Eucalypt forests and woodlands, well-treed urban areas.	**Medium**	Although not previously recorded, this species may use the Grey Box Woodland. Targeted surveys for the species have not been undertaken.
Neophema pulchella	Turquoise Parrot		nt	v	2000		Grassy open forest and woodland	**Medium**	The species may use the Grey Box woodland on rare occasions.
Hieraaetus morphnoides	Little Eagle		vu	v	2019	Birdlife	Woodland and open areas. Rabbits are a key component of their diet. Nesting occurs in mature trees in open woodland or riparian vegetation.	**Recorded**	Areas of grassland and woodland area suitable habitat for this species.
Hydroprogne caspia	Caspian Tern		nt	v	2007		Coastal waters and inland lakes and rivers.	**Low**	Lack of suitable habitat. May rarely fly over the project area.
Actitis hypoleucos	Common Sandpiper		vu	v	1981	PMST	Migrates to Australia from Eurasia in August where it inhabits a wide variety of coastal and inland wetlands with muddy margins before departing north in March.	**Medium**	The water storage dams on Arundel Creek may provide temporary foraging habitat for this species when water levels are lower.
Tringa nebularia	Common Greenshank		vu	e	1977	PMST	A variety of ephemeral and permanent inland wetlands and sheltered coastal wetlands.	**Medium**	The water storage dams on Arundel Creek may provide temporary foraging habitat for this species when water levels are lower.
Tringa stagnatilis	Marsh Sandpiper		vu	e	2018		Permanent or ephemeral wetlands, mudflats and saltmarshes in coastal and inland environments.	**Medium**	The water storage dams on Arundel Creek may provide temporary foraging habitat for this species when water levels are lower.
Melanodryas cucullata	Hooded Robin		nt	v	2002		Occupies a range of open woodlands including those dominated by Eucalypts, Acacias and Callitris spp. with an understorey of smaller trees, shrubs and grasses.	**Recorded**	Grey Box Woodland and woodland area along Barbiston Road provide suitable habitat for the species, one individual was recorded within the Grey Box Woodland in 2002. Species is an uncommon visitor to the local area, normally located north of the Great Dividing Range.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
State significance									
Pomatostomus temporalis	Grey-crowned Babbler		en	v	1846		Open forests and woodlands.	**Negligible**	The species is locally extinct.
Pyrrholaemus sagittatus	Speckled Warbler		vu	e	2018		Occurs in open forest and Box Ironbark Woodlands, usually with scattered shrubs and a cover of acacias. Seldom seen far from dense patches of shrubs.	**Recorded**	Habitat on-site is limited to woodland areas. The species was recorded in the Grey Box Woodland in the project area in 1990. The species has been recorded reliably across multiple years in nearby Woodlands Historic Park with the latest in 2019.
Stagonopleura guttata	Diamond Firetail		nt	v	1990		Occurs mostly in the lowlands and foothills in the north of Victoria. It has specific habitat requirements, which include grassy woodlands with tree cover for refuge and an undisturbed ground layer with grasses.	**Low**	There is a lack of contemporary records of this species from the local area including in the nearby Woodlands Historic Park. However, suitable habitat occurs in the Grey Box Woodland and adjacent grassland
Phascogale tapoatafa	Brush-tailed Phascogale		vu	v	2017		Occurs in dry foothill forest, which is open with sparse ground cover. Favours areas dominated by box, ironbark and Stringybark eucalypts.	**Medium**	Due to the isolation of Melbourne Airport from other suitable habitat and known populations we consider it unlikely that there is a resident population of the species utilising suitable habitat in the Grey Box Woodland. A database record from 2017 at Oaklands Junction confirms that the species is in the nearby region but it is unknown whether that record is from a nearby unknown population or was a young dispersing male. Surveys for this species have not been undertaken in the project area.
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat		dd	v	2016		Occurring in most environments from treeless deserts to wet forests. The species roosts singly or in colonies typically in tree hollows, but where trees are absent they are known to utilise the burrows of terrestrial mammals.	**High**	Species recorded form Bulla Hill and School Hill approximately 1.5 km north west of the project area (Biosis, 2016). Treed areas, in particular the woodland provide habitat for this species in the project area.
Miniopterus schreibersii oceanensis	Common Bent-wing Bat (eastern ssp.)		vu	cr	2013		A variety of treed and treeless habitats. Roosts in caves and man-made structures.	**High**	Treed areas, in particular the woodland provide habitat for this species in the project area.

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
State significance									
Ornithorhynchus anatinus	Platypus		vu	v	2007		A variety of freshwater waterbodies, particularly those with stable banks suitable for burrows, and shallow waters for foraging.	**High**	Species known from Deep Creek in Bulla, north of Melbourne Airport, Last recorded in 2018 in the Australian Platypus Conservancy records. The species is also known from Jacksons Creek and the Maribyrnong River adjacent to the project area.
Pogona barbata	Bearded Dragon		vu	v	1988		Woodlands, forests and heathlands with abundant cover of course woody debris.	**Low**	Species is not common south of the Great Dividing Range in Victoria. The Grey Box Woodland within the project area represents habitat for the species but it has been greatly modified and is unlikely to support a population of Bearded Dragon. The extensive field assessments undertaken within and around the habitat at Melbourne Airport are likely to have identified this large lizard if present.
Pseudemoia pagenstecheri	Tussock Skink		vu	e	2020		On the ground in a range of grasslands or sparse grassy woodlands from alps to coast.	**Recorded**	Species recorded during targeted surveys for SLL. Seventeen Tussock Skink were captured and recorded during the SLL tile surveys. Suitable habitat is present within grassland habitat throughout the project area and was recorded from tile grids landside and airside.
Pseudophryne bibronii	Brown Toadlet		en	e	2010		A wide variety of woodland, forest and grassland habitats.	**Medium**	Suitable habitat present for the species around waterways and in woodland areas within the project area. Species has not been recorded within Melbourne Airport but typical ecological surveys undertaken at Melbourne Airport have been outside of the male calling season for the species

Scientific name (cont.)	Common name (cont.)	Conservation status (cont.)			Most recent database record (cont.)	Other records (cont.)	Habitat description (cont.)	Likely occurrence in project area (cont.)	Rationale for likelihood ranking (cont.)
		EPBC	VIC	FFG					
State significance									
Pseudophryne semimarmorata	Southern Toadlet		vu	e	1961		A wide variety of woodland, forest and grassland habitats, where it shelters under leaf litter and other debris in moist soaks and depressions. Breeds in swamps and inundated habitats, and along creek lines.	**Medium**	Suitable habitat present for the species around waterways and in woodland areas within the project area. Species has not been recorded within Melbourne Airport but typical ecological surveys undertaken at Melbourne Airport have been outside of the male calling season for the species.
Emydura macquarii	Murray River Turtle		vu	cr	2017		A medium sized freshwater turtle that inhabits inland river systems including the Murray-Darling catchment.	**Recorded**	Species recorded from the quarry dam north of Deep Creek within the project area.
Neochanna cleaveri	Australian Mudfish		cr	e	2008		Freshwater habitats with abundant aquatic vegetation such as streams, backwaters, billabongs and floodplain wetlands.	**Medium**	Suitable habitat present within the project area in Arundel Creek and Moonee Ponds Creek when inundated.
Jalmenus icilius	Amethyst Hairstreak Butterfly		vu	e	2015		Larvae eat a wide range of plants favouring Acacia species and Cassia species. It is generally common except in the south-eastern end of its range in central and western Victoria, where it is now very scarce.	**Low**	One recorded from similar habitat within 10 km of the project area. Records of this species in the Melbourne area are very uncommon and the species has not been observed during other various ecological surveys at Melbourne Airport to date.

Migratory species predicted to occur within the project area

The following table includes a list of migratory fauna species recorded, or predicted to be recorded, within 10 kilometres of the project area. The list of species is sourced from the Victorian Biodiversity Atlas, the Protected Matters Search Tool (last accessed on 15 December 2022) and Birdlife Australia Records (accessed on 11 March 2020).

APPENDIX B5.D
VEGETATION CONDITION ASSESSMENTS

Summary

- Assessments of vegetation and ecological community condition.

Vegetation condition data

Field checklists were used to assess the presence/absence of Natural Temperate Grassland and the derived grassland condition state of Grey Box Woodland (see **Appendix B5.A**).

Note: The number of habitat zones has been reduced between the design iterations as refinements to the project area have occurred. The result is a reduced ecological footprint with less impact on Natural Temperate Grassland and Grey Box Woodland.

Table B5.C.3
Migratory species recorded or predicted to occur within 10 km of the project area

Scientific name	Common name	Most recent record
Gallinago hardwickii	*Latham's Snipe*	2019
Plegadis falcinellus	*Glossy Ibis*	2011
Hirundapus caudacutus	*White-throated Needletail*	2019
Apus pacificus	*Fork-tailed Swift*	2007
Pandion haliaetus	*Osprey*	PMST
Ardenna tenuirostris	*Short-tailed Shearwater*	2008
Stercorarius parasiticus	*Arctic Jaeger*	2008
Sterna hirundo	*Common Tern*	2019
Hydroprogne caspia	*Caspian Tern*	2007
Thalasseus bergii	*Crested Tern*	2019
Charadrius mongolus	*Lesser Sand Plover*	1978
Charadrius bicinctus	*Double-banded Plover*	2004
Numenius madagascariensis	*Eastern Curlew*	1977
Limosa lapponica	*Bar-tailed Godwit*	1977
Actitis hypoleucos	*Common Sandpiper*	1981
Tringa nebularia	*Common Greenshank*	1977
Calidris ferruginea	*Curlew Sandpiper*	1977
Calidris acuminata	*Sharp-tailed Sandpiper*	2009
Calidris alba	*Sanderling*	1977
Calidris melanotos	*Pectoral Sandpiper*	PMST
Motacilla flava	*Yellow Wagtail*	PMST
Rhipidura rufifrons	*Rufous Fantail*	2014
Myiagra cyanoleuca	*Satin Flycatcher*	2010
Monarcha melanopsis	*Black-faced Monarch*	PMST

Natural Temperate Grassland of the Victorian Volcanic Plain

Table B5.D.1
Natural Temperate Grassland within the project area – results of assessments against condition thresholds and EVC benchmarks

Habitat Zone			5B	7B	8A	9B	18B	19A	19B	19C	19D
Bioregion			VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP
EVC #: Name			132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG
Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) criteria		2	Y	Y	Y	Y	Y	Y	Y	Y	Y
		3.1	Y	Y	Y	Y	Y	Y	Y	Y	Y
		3.2	N	N	N	N	N	N	N	N	N
		3.3	Y	Y	Y	Y	Y	Y	Y	N	N
		4.1	Y	NA	NA	NA	NA	NA	Y	NA	NA
		4.2	NA	Y	Y	Y	Y	Y	NA	Y	Y
EPBC Listed Community present			NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Canopy Cover	5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Lack of Weeds	15	4	4	7	4	4	4	4	0	0
	Understorey	25	10	15	10	10	20	10	10	10	10
	Recruitment	10	3	3	3	6	10	3	3	6	3
	Organic Matter	5	4	4	4	4	5	4	4	4	5
	Logs	5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Total Site Score		21	26	24	24	39	21	21	20	18
	EVC standardiser (x 75/55)		2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36
	Adjusted Site Score		28.64	35.45	32.73	32.73	53.18	28.64	28.64	27.27	24.55
Landscape Value	Patch Size	10	8	4	4	4	8	8	8	8	8
	Neighbourhood	10	5	3	5	2	4	4	4	4	4
	Distance to Core	5	3	3	3	1	3	1	1	1	1
	Total Landscape Score		16	10	12	7	15	13	13	13	13
HABITAT SCORE		100	44.64	45.45	44.73	39.73	68.18	41.64	41.64	40.27	37.55
Habitat points = #/100		1	0.45	0.45	0.45	0.4	0.68	0.42	0.42	0.4	0.38
Habitat Zone area (ha)			0.001	2.61	6.27	1.04	4.72	4.67	1.37	0.66	0.53
Habitat Hectares (Hha)			0	1.19	2.8	0.41	3.22	1.94	0.57	0.27	0.2

Habitat Zone (cont.)			19E	23A	25A	26A	26B	27A	28A	29A
Bioregion			VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP
EVC #: Name			132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG
Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) criteria		2	Y	Y	Y	Y	Y	Y	Y	Y
		3.1	Y	Y	Y	Y	Y	Y	Y	Y
		3.2	N	N	N	N	N	N	N	N
		3.3	Y	Y	Y	Y	Y	Y	Y	Y
		4.1	NA	NA	NA	NA	Y	Y	NA	Y
		4.2	Y	Y	Y	Y	NA	NA	Y	NA
EPBC Listed Community present			NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	NA	NA	NA	NA	NA	NA	NA	NA
	Canopy Cover	5	NA	NA	NA	NA	NA	NA	NA	NA
	Lack of Weeds	15	4	4	4	7	4	4	4	4
	Understorey	25	5	15	15	5	5	10	5	10
	Recruitment	10	3	6	6	3	3	6	3	3
	Organic Matter	5	4	4	5	4	4	4	4	4
	Logs	5	NA	NA	NA	NA	NA	NA	NA	NA
	Total Site Score		16	29	30	19	16	24	16	21
	EVC standardiser (x 75/55)		2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36
	Adjusted Site Score		21.82	39.55	40.91	25.91	21.82	32.73	21.82	28.64
Landscape Value	Patch Size	10	8	6	6	6	6	1	2	1
	Neighbourhood	10	4	4	4	4	4	3	5	3
	Distance to Core	5	1	1	1	3	3	3	3	3
	Total Landscape Score		13	11	11	13	13	7	10	7
HABITAT SCORE		100	34.82	50.55	51.91	38.91	34.82	39.73	31.82	35.64
Habitat points = #/100		1	0.35	0.51	0.52	0.39	0.35	0.4	0.32	0.36
Habitat Zone area (ha)			0.45	2.46	2.74	4.08	0.73	0.1	1.08	0.07
Habitat Hectares (Hha)			0.16	1.24	1.42	1.59	0.25	0.04	0.34	0.03

Table B5.D.2
Natural Temperate Grassland within the project area – results of assessments against condition thresholds and EVC benchmarks

Habitat Zone			32A	34A	41A	41D	42A	66A	77A	78A	80A
Bioregion			VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP
EVC #: Name			132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG
Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) criteria		2	Y	Y	Y	Y	Y	Y	Y	Y	Y
		3.1	Y	Y	Y	Y	Y	Y	Y	Y	Y
		3.2	N	N	N	N	N	Y	N	N	N
		3.3	Y	Y	Y	Y	N	Y	Y	N	Y
		4.1	NA	NA	NA	Y	Y	Y	NA	Y	Y
		4.2	Y	Y	Y	NA	NA	NA	Y	NA	NA
EPBC Listed Community present			NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Canopy Cover	5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Lack of Weeds	15	4	2	7	7	6	4	4	6	6
	Understorey	25	15	5	15	10	5	5	15	5	5
	Recruitment	10	6	3	10	3	6	3	6	3	3
	Organic Matter	5	4	4	5	5	4	2	5	4	4
	Logs	5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Total Site Score		29	14	37	25	21	14	30	18	18
	EVC standardiser (x 75/55)		2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36
	Adjusted Site Score		39.55	19.09	50.45	34.09	28.64	19.09	40.91	24.55	24.55
Landscape Value	Patch Size	10	6	2	8	8	1	1	4	1	1
	Neighbourhood	10	4	5	5	5	3	1	4	1	1
	Distance to Core	5	3	3	3	3	3	1	3	1	1
	Total Landscape Score		13	10	16	16	7	3	11	3	3
HABITAT SCORE		100	52.55	29.09	66.45	50.09	35.64	22.09	51.91	27.55	27.55
Habitat points = #/100		1	0.53	0.29	0.66	0.5	0.36	0.22	0.52	0.28	0.28
Habitat Zone area (ha)			7.9	1.14	13.78	0.5	0.2	0.06	0.01	0.13	0.33
Habitat Hectares (Hha)			4.15	0.33	9.16	0.25	0.07	0.01	0.01	0.03	0.09

Habitat Zone (cont.)			90A	90B	90D	90E	90F	95A	97A	98A
Bioregion			VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP
EVC #: Name			132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG
Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) criteria		2	Y	Y	Y	Y	Y	Y	Y	Y
		3.1	Y	Y	Y	Y	Y	Y	Y	Y
		3.2	N	N	N	N	N	N	N	N
		3.3	Y	Y	Y	Y	Y	Y	Y	Y
		4.1	Y	NA	NA	NA	Y	NA	NA	Y
		4.2	NA	Y	Y	Y	NA	Y	Y	NA
EPBC Listed Community present			NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	NA	NA	NA	NA	NA	NA	NA	NA
	Canopy Cover	5	NA	NA	NA	NA	NA	NA	NA	NA
	Lack of Weeds	15	6	6	2	6	9	7	4	0
	Understorey	25	5	5	5	5	5	15	15	5
	Recruitment	10	3	3	6	3	3	6	3	3
	Organic Matter	5	4	4	4	4	5	4	4	4
	Logs	5	NA	NA	NA	NA	NA	NA	NA	NA
	Total Site Score		18	18	17	18	22	32	26	12
	EVC standardiser (x 75/55)		2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36
	Adjusted Site Score		24.55	24.55	23.18	24.55	30	43.64	35.45	16.36
Landscape Value	Patch Size	10	8	8	8	8	8	8	8	1
	Neighbourhood	10	4	4	4	4	4	6	5	3
	Distance to Core	5	3	3	3	3	3	3	3	1
	Total Landscape Score		15	15	15	15	15	17	16	5
HABITAT SCORE		100	39.55	39.55	38.18	39.55	45	60.64	51.45	21.36
Habitat points = #/100		1	0.4	0.4	0.38	0.4	0.45	0.61	0.51	0.21
Habitat Zone area (ha)			0.66	4.03	1.27	1.45	0.53	1.03	0.17	0.21
Habitat Hectares (Hha)			0.26	1.59	0.49	0.57	0.24	0.62	0.09	0.04

Table B5.D.3
Natural Temperate Grassland within the project area – results of assessments against condition thresholds and EVC benchmarks

Habitat Zone			100A	102A	102B	124A	146A	148A	188A	194A	198A
Bioregion			VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP
EVC #: Name			132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG
Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) criteria		2	Y	Y	Y	Y	Y	Y	Y	Y	Y
		3.1	Y	Y	Y	Y	Y	Y	Y	Y	Y
		3.2	N	N	N	N	N	N	N	N	N
		3.3	Y	Y	Y	Y	Y	Y	Y	N	Y
		4.1	Y	Y	Y	Y	Y	Y	NA	NA	NA
		4.2	NA	NA	NA	NA	NA	NA	Y	Y	Y
EPBC Listed Community present			NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Canopy Cover	5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Lack of Weeds	15	6	6	6	6	6	0	4	0	7
	Understorey	25	5	5	10	5	5	5	5	15	5
	Recruitment	10	3	3	3	3	3	6	6	3	3
	Organic Matter	5	4	5	5	5	4	4	4	4	4
	Logs	5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Total Site Score		18	19	24	19	18	15	19	22	19
	EVC standardiser (x 75/55)		2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36
	Adjusted Site Score		24.55	25.91	32.73	25.91	24.55	20.45	25.91	30	25.91
Landscape Value	Patch Size	10	1	2	2	1	1	1	6	8	4
	Neighbourhood	10	2	2	2	1	3	2	4	5	4
	Distance to Core	5	3	3	3	1	1	1	1	3	3
	Total Landscape Score		6	7	7	3	5	4	11	16	11
HABITAT SCORE		100	30.55	32.91	39.73	28.91	29.55	24.45	36.91	46	36.91
Habitat points = #/100		1	0.31	0.33	0.4	0.29	0.3	0.24	0.37	0.46	0.37
Habitat Zone area (ha)			0.09	0.64	0.97	0.23	0.55	0.32	10.32	1.76	0.48
Habitat Hectares (Hha)			0.03	0.21	0.39	0.07	0.16	0.08	3.81	0.81	0.18

Habitat Zone (cont.)			200A	202A	206A	212A	214A	216A	234A	1010A
Bioregion			VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP
EVC #: Name			132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG
Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) criteria		2	Y	Y	Y	Y	Y	Y	Y	Y
		3.1	Y	Y	Y	Y	Y	Y	Y	Y
		3.2	N	N	N	N	N	N	N	N
		3.3	Y	Y	Y	Y	Y	Y	Y	Y
		4.1	Y	NA	NA	Y	NA	NA	Y	Y
		4.2	NA	Y	Y	NA	Y	Y	NA	N/A
EPBC Listed Community present			NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	NA	NA	NA	NA	NA	NA	NA	NA
	Canopy Cover	5	NA	NA	NA	NA	NA	NA	NA	NA
	Lack of Weeds	15	4	4	0	4	4	4	9	6
	Understorey	25	5	10	10	5	10	15	5	10
	Recruitment	10	3	6	3	3	3	6	6	3
	Organic Matter	5	4	4	4	4	4	4	4	4
	Logs	5	NA	NA	NA	NA	NA	NA	NA	NA
	Total Site Score		16	24	17	16	21	29	24	23
	EVC standardiser (x 75/55)		2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36
	Adjusted Site Score		21.82	32.73	23.18	21.82	28.64	39.55	32.73	31.36
Landscape Value	Patch Size	10	1	2	1	1	4	6	1	1
	Neighbourhood	10	4	3	3	2	4	4	2	1
	Distance to Core	5	3	1	1	1	1	1	1	3
	Total Landscape Score		8	6	5	4	9	11	4	5
HABITAT SCORE		100	29.82	38.73	28.18	25.82	37.64	50.55	36.73	36.36
Habitat points = #/100		1	0.3	0.39	0.28	0.26	0.38	0.51	0.37	0.36
Habitat Zone area (ha)			0.21	0.5	0.71	0.19	1.61	1.94	0.005	0.27
Habitat Hectares (Hha)			0.06	0.19	0.2	0.05	0.6	0.98	0.002	0.1

Table B5.D.4
Natural Temperate Grassland within the project area – results of assessments against condition thresholds and EVC benchmarks

Habitat Zone			1016A	1037A	1038A	4050A	4077A	4099A	4103A	4103B	TOTAL
Bioregion			VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	
EVC #: Name			132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	
Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) criteria		2	Y	Y	Y	Y	Y	Y	Y	Y	
		3.1	Y	Y	Y	Y	Y	N	Y	Y	
		3.2	N	N	N	N	N	N	N	N	
		3.3	Y	N	Y	N	Y	Y	Y	Y	
		4.1	Y	NA	NA	NA	Y	Y	Y	Y	
		4.2	NA	NA	Y	Y	NA	NA	NA	NA	
EPBC Listed Community present			NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score	
Site Condition	Large Old Trees	10	NA	NA	NA	NA	NA	NA	NA	NA	
	Canopy Cover	5	NA	NA	NA	NA	NA	NA	NA	NA	
	Lack of Weeds	15	4	7	7	6	6	6	6	6	
	Understorey	25	5	10	10	5	5	5	5	10	
	Recruitment	10	6	6	10	6	3	3	6	3	
	Organic Matter	5	5	3	5	5	2	4	5	3	
	Logs	5	NA	NA	NA	NA	NA	NA	NA	NA	
	Total Site Score		20	26	32	22	16	18	22	22	
	EVC standardiser (x 75/55)		2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	
	Adjusted Site Score		27.27	35.45	43.64	30	21.82	24.55	30	30	
Landscape Value	Patch Size	10	1	1	2	8	1	1	1	1	
	Neighbourhood	10	1	4	4	4	1	1	2	2	
	Distance to Core	5	3	3	3	1	3	3	3	3	
	Total Landscape Score		5	8	9	13	5	5	6	6	
HABITAT SCORE		100	32.27	43.45	52.64	43	26.82	29.55	36	36	
Habitat points = #/100		1	0.32	0.43	0.53	0.43	0.27	0.3	0.36	0.36	
Habitat Zone area (ha)			0.21	0.13	1	0.17	0.05	0.19	0.51	0.44	90.49
Habitat Hectares (Hha)			0.07	0.06	0.53	0.07	0.01	0.06	0.18	0.16	42.75

Grey Box Woodland and Derived Grasslands of South-Eastern Australia

Table B5.D.5
Grey Box Woodland within the project area – results of assessments against condition thresholds and EVC benchmarks

Habitat Zone			53A	93A	93B	3001	3002	3003
Bioregion			VVP	VVP	VVP	VVP	VVP	VVP
EVC #: Name			803: PW	803: PW	803: PW	803: PW	803: PW	803: PW
Grey Box Grassy Woodlands (GBW) and Derived Grasslands (DG) of South-Eastern Australia criteria		1B	Y	Y	Y	Y	Y	Y
		1C	Y	Y	Y	Y	Y	Y
		1A	Y	Y	Y	Y	Y	Y
		2A	NA	NA	NA	NA	NA	NA
		2B	NA	NA	NA	NA	NA	NA
		3A	NA	NA	NA	Y	Y	Y
		3B	NA	NA	NA	Y	Y	Y
		4A	NA	NA	NA	NA	NA	NA
		4B	NA	NA	NA	Y	Y	Y
		5A	Y	Y	Y	N	N	N
		5B	Y	Y	Y	NA	NA	NA
		5C	Y	Y	Y	NA	NA	NA
EPBC Listed Community present			GBW-DG	GBW-DG	GBW-DG	GBW	GBW	GBW
		Max Score	Score	Score	Score	Score	Score	Score
			0	0	3	4	4	6
Site Condition	Large Old Trees	10	0	0	0	3	3	3
	Canopy Cover	5	4	4	4	4	4	0
	Lack of Weeds	15	15	15	15	15	15	15
	Understorey	25	5	10	5	10	6	6
	Recruitment	10	4	5	5	5	5	3
	Organic Matter	5	0	0	0	4	4	5
	Logs	5	28	34	32	45	41	38
	Total Site Score		NA	NA	NA	NA	NA	NA
	EVC standardiser (x 75/55)		28	34	32	45	41	38
	Adjusted Site Score		8	8	8	8	8	8
Landscape Value	Patch Size	10	6	5	5	4	4	4
	Neighbourhood	10	3	3	3	4	4	4
	Distance to Core	5	17	16	16	16	16	16
	Total Landscape Score		45	50	48	61	57	54
HABITAT SCORE		100	0.45	0.5	0.48	0.61	0.57	0.54
Habitat points = #/100		1	3.47	1.27	5.97	4.12	2.97	6.3
Habitat Zone area (ha)			1.56	0.64	2.87	2.51	1.7	3.4
Habitat Hectares (Hha)			1.84	0.65	2.33	2.72	1.26	2.51

Habitat Zone			3004	3005	3006	3007	TOTAL
Bioregion			VVP	VVP	VVP	CVU	
EVC #: Name			803: PW	803: PW	803: PW	71: HHrW	
Grey Box Grassy Woodlands (GBW) and Derived Grasslands (DG) of South-Eastern Australia criteria		**1B**	Y	Y	Y	Y	
		1C	Y	Y	Y	Y	
		1A	Y	Y	Y	Y	
		2A	NA	NA	NA	NA	
		2B	NA	NA	NA	NA	
		3A	Y	Y	Y	Y	
		3B	Y	Y	Y	Y	
		4A	NA	NA	NA	NA	
		4B	Y	Y	Y	Y	
		5A	N	N	N	N	
		5B	NA	NA	NA	NA	
		5C	NA	NA	NA	NA	
EPBC Listed Community present			GBW	GBW	GBW	GBW	
		Max Score	Score	Score	Score	Score	
			6	10	0	8	
Site Condition	**Large Old Trees**	**10**	3	5	3	5	
	Canopy Cover	**5**	4	9	9	9	
	Lack of Weeds	**15**	15	20	15	20	
	Understorey	**25**	6	10	6	6	
	Recruitment	**10**	3	3	3	5	
	Organic Matter	**5**	4	4	2	5	
	Logs	**5**	41	61	38	58	
	Total Site Score		NA	NA	NA	NA	
	EVC standardiser (x 75/55)		41	61	38	58	
	Adjusted Site Score		8	8	8	8	
Landscape Value	**Patch Size**	**10**	3	5	4	5	
	Neighbourhood	**10**	4	4	4	4	
	Distance to Core	**5**	15	17	16	17	
	Total Landscape Score		56	78	54	75	
HABITAT SCORE		**100**	0.56	0.78	0.54	0.75	
Habitat points = #/100		**1**	3.23	39.51	0.99	10.89	
Habitat Zone area (ha)			1.81	30.82	0.54	8.17	78.74
Habitat Hectares (Hha)			1.7	3.4	1.81	56.02	54.01

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