Melbourne Airport
M3R MDP

Chapters C5–D4

Volume 7

MELBOURNE AIRPORT

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Chapter C5
Airspace Hazards and Risks

Summary of key findings:

- This chapter assesses airspace hazards and their risks by considering potential issues that include
  - intrusions into operational airspace
  - wildlife strike
  - windshear and turbulence
  - impacts with remotely piloted aircraft
  - impacts on public safety.
- Strict controls exist to manage risks to aircraft operations and these will be implemented for Melbourne Airport's Third Runway (M3R)
- When these controls are taken into consideration, the risks presented by these hazards are low or negligible and therefore considered acceptable.


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C5.1 INTRODUCTION

This chapter describes the airspace hazards and risks relevant to the study area, together with the applicable legislation and policy requirements. The potential impacts of the operation of Melbourne Airport's Third Runway (M3R) are described (with associated assessment methodology) and, where required, the measures to avoid, manage, mitigate and/or monitor these impacts are detailed.

This work was undertaken by airport consulting firm REHBEIN Airport Consulting.

C5.2 METHODOLOGY AND ASSUMPTIONS

C5.2.1 Risk assessment methodology

The risk assessment methodology for M3R involves:

- Identifying and defining the risks for each airspace system being reviewed
- Identifying the hazards from operation of the runway system (both existing and upgraded) to develop a current and a future risk profile
- Identifying consequences arising from identified hazards
- Identifying the likelihood of these consequences happening
- Analysing and assessing the risks identified, incorporating available mitigations.

The range of the acceptability of risk has been well illustrated by the UK's Health and Safety Executive (HSE, 2001) as shown in **Figure C5.1**. To allow for the inherent uncertainty in estimating risk, levels of acceptability are divided into three groups.

i) a threshold above which risk is intolerable

ii) a threshold below which risk is considered negligible and broadly acceptable

iii) a level between these in which individual risks should be made As Low As Reasonably Practicable' called the ALARP region.

The term reasonably practical was originally used in the *Health and Safety at Work Act 1974* of the UK.

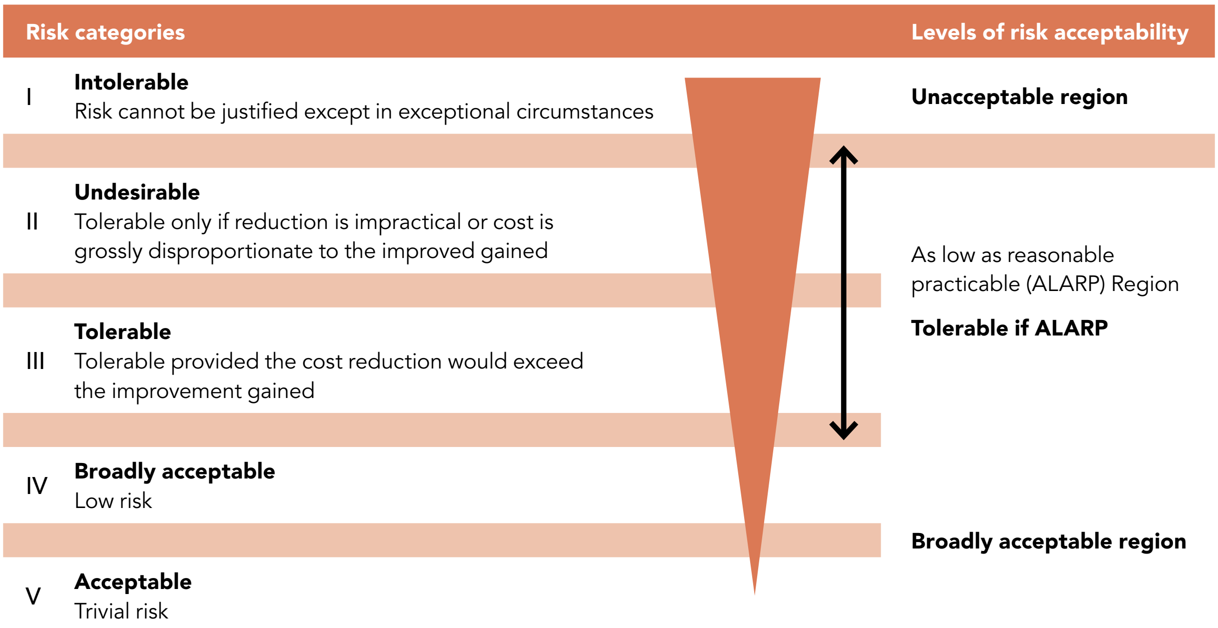
Similarly, safety legislation in Australia is based on the concept that an acceptable level of risk is achieved when risk is minimised as far as reasonably practicable after incorporating regulatory requirements.

The three levels of risk acceptability can be summarised as follows:

- Unacceptable: Risk is so high it is intolerable unless extraordinary circumstances apply. Risk reduction must be undertaken
- Tolerable if ALARP: Risk reduction measures should be implemented where reasonably practicable (i.e. unless further risk reduction is clearly not possible or cost is disproportionate to improvement gained)
- Broadly acceptable: Risks should be managed to ensure that they remain at this level and, if practicable, continually reduced. (In principle, the ALARP concept extends to this region as well).

'Reasonably practicable' is hard to define: the meaning of 'reasonably' and 'practicable' can be assessed only when value judgements are made. The general informal interpretation of what constitutes reasonably practicable is the accepted best practice in health and safety for an activity. When more formal analysis is necessary, cost-benefit analysis may be used. This means that risk reduction is considered practicable if – and only if – it is possible to find appropriate risk reduction measures where the cost is proportionate to the reduction in risk.

Figure C5.1
Depiction of ALARP regions in risk management



Source: APAM, 2020

C5.2.2
Identified risks

The possible risks associated with M3R that have been identified for consideration as part of this Major Development Plan (MDP) include:

- Intrusions into the operational airspace
- Lighting, reflectivity and glare
- Wildlife (bird and bat) strike
- Collisions with remotely piloted aircraft
- Windshear and turbulence
- Terrorism
- Jet blast impacts on public areas
- Aircraft accidents and public safety
- Objects falling from aircraft
- Construction hazards.

C5.2.3
Assumptions and limitations

This hazard and risk assessment is informed by the following key limitations and assumptions:

- The probability of aircraft accidents is based on historic data. Given Australia's low accident rate, global data has to be used. Although this assumes the historic global rate of accidents will continue into the future, ongoing aviation safety improvements will probably reduce accident rates. When this is combined with Australia's excellent aviation safety record, the predicted risks are likely to be a conservative overestimate.
- Aircraft accident and airport safety risks are affected by the effectiveness of regulatory controls. These are outside the control of Melbourne Airport. It is assumed the regulatory framework will deliver future levels of safety at least equivalent to those currently prevailing. The safety improvement culture and development of new technologies can also be reasonably expected to lead to improved levels of safety.

The Commonwealth and Victorian regulatory controls affecting airports and air traffic operation are listed in Section C5.3.1 (administration of these regulatory areas is outside the control of Melbourne Airport).

The requirements of some existing risk management frameworks at Melbourne Airport are prescribed under Commonwealth and Victorian legislation. They include:

- Aviation security
- Airport emergency planning
- Storage and handling of dangerous goods and hazardous substances.

Security arrangements conducted by other airports and airlines within the wider air transport network under applicable legislation are considered to adequately control risks (such as terrorist activity on air traffic arriving in Melbourne).

C5.3
STATUTORY AND POLICY REQUIREMENTS

C5.3.1
Regulatory framework for control of aviation operations

Commonwealth regulatory controls affecting airports and air traffic operation include (but are not limited to):

- *Civil Aviation Act 1988* (Cth)
- *Civil Aviation Regulations 1988* (Cth) (CA Regulations)
- *Civil Aviation Safety Regulations 1998* (Cth) (CAS Regulations)
- *Air Navigation Act 1920* (Cth)
- *Airports Act 1996* (Cth) (Airports Act)
- *Airports (Protection of Airspace) Regulations 1996* (Cth) (APARs)
- *Air Navigation Regulations 1947* (Cth)
- *Airport (Building Control) Regulations 1996* (Cth)
- *Airport (Environment Protection) Regulations 1997* (Cth)
- *Airports Regulations 1997* (Cth)
- *Airports (Control of On-Airports Activities) Regulations 1997* (Cth)
- *Airports (Ownership and Interests in Shares) Regulations 1996* (Cth)
- *Aviation Transport Security Act 2004* (Cth)
- *Aviation Transport Security Regulations 2005* (Cth).

These extensive legislative controls help to maintain a high level of safety in Australian aviation operations.

C5.3.2
National Airports Safeguarding Framework

The National Airports Safeguarding Framework (NASF) is a national land-use planning charter that aims 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 decisions by the relevant jurisdictions through adoption of safety guidelines.

The NASF was developed by the National Airports Safeguarding Advisory Group (NASAG). This comprised Commonwealth, state/territory government planning and transport officials, the Commonwealth Department of Defence, the Civil Aviation Safety Authority (CASA), Airservices Australia and the Australian Local Government Association (ALGA).

NASF currently consists of a set of seven principles and nine guidelines, as follows:

Principle 1: The safety, efficiency and operational integrity of airports should be protected by all governments, recognising their economic, defence and social significance

Principle 2: Airports, governments and local communities should share responsibility to ensure that airport planning is integrated with local and regional planning

Principle 3: Governments at all levels should align land use planning and building requirements in the vicinity of airports

Principle 4: Land use planning processes should balance and protect both airport/aviation operations and community safety and amenity expectations

Principle 5: Governments will protect operational airspace around airports in the interests of both aviation and community safety

Principle 6: Strategic and statutory planning frameworks should address aircraft noise by applying a comprehensive suite of noise measures

Principle 7: Airports should work with governments to provide comprehensive and understandable information to local communities on their operations concerning noise impacts and airspace requirements.

Guideline A: *Measures for Managing Impacts of Aircraft Noise*

Guideline B: *Managing the Risk of Building Generated Windshear and Turbulence at Airports*

Guideline C: *Managing the Risk of Wildlife Strikes in the Vicinity of Airports*

Guideline D: *Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation*

Guideline E: *Managing the Risk of Distractions to Pilots from Lighting in the Vicinity of Airports*

Guideline F: *Managing the Risk of Intrusions into the Protected Airspace of Airports*

Guideline G: *Protecting Aviation Facilities — Communication, Navigation and Surveillance (CNS)*

Guideline H: *Protecting Strategically Important Helicopter Landing Sites*

Guideline I: *Managing the Risk in Public Safety Areas at the End of Runways*

The full NASF principles and guidelines can be found on the Department of Infrastructure, Transport, Regional Development, Communications and the Arts (DITRDCA) website.

The NASF was agreed to by Commonwealth, state and territory ministers at the Standing Council on Transport and Infrastructure meeting on 18 May 2012. The agreement represents a collective commitment from governments to ensure an appropriate balance is maintained between the social, economic and environmental needs of the community and the effective use of airport sites. NASF applies to all airports in Australia.

As a Commonwealth-leased airport under the Airports Act, the protections intended under NASF Guidelines D, E and F are established through civil aviation legislation (specifically the APARs and the CA Regulations).

C5.3.3
Airspace protection

Airspace around airports is protected under the *Airports (Protection of Airspace) Regulations 1996* (APARs). Part 12 of the APARs defines 'prescribed airspace' using international standards. It is the space above two sets of invisible surfaces above the ground around an airport, namely the:

- Obstacle Limitation Surfaces (OLS)
- Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS) surfaces.

The OLS provide protection for aircraft flying into or out of the airport when the pilot is flying by sight (i.e. without reliance on aircraft instruments). PANS-OPS surfaces safeguard aircraft from colliding with obstacles when the aircraft's flight may be guided solely by instruments in reduced visibility.

The Airports Act 1996 designates any activity that results in an intrusion into an airport's prescribed airspace as a 'controlled activity'. It requires that controlled activities cannot be carried out without approval. The APARs allow DITRDCA or the airport operator to assess and approve applications to carry out controlled activities and impose conditions on approval where appropriate.

A controlled activity resulting in an intrusion into the airspace above the OLS may be permitted if assessed as acceptable by CASA, which may require the approved obstacle to be marked and/or lit.

The OLS for M3R are currently protected for the ultimate four-runway configuration of Melbourne Airport in accordance with the Melbourne Airport Master Plan and the declaration of airspace (2007). Copies of declared prescribed airspace for Melbourne Airport can be found on Melbourne Airport's website (www.melbourneairport.com.au/Corporate/Planning-projects/Airspace-protection).

Long-term intrusions into the airspace above a PANS-OPS surface are direct safety hazards to aircraft flying an instrument approach or departure procedure. Unavoidable and long-term PANS-OPS intrusions therefore require the airspace's redesign to accommodate them.

The PANS-OPS airspace required to accommodate M3R is generally protected through the airspace currently prescribed for the ultimate four-runway layout of Melbourne Airport (and the current prescribed airspace for Essendon Fields Airport).

Melbourne Airport is preparing updated prescribed airspace to ensure protection for the ultimate four-runway system, accounting for changes to criteria since the original designation. Although this is not expected to affect existing building height limits, consultation will take place with all local government areas that may be affected.

C5.3.4
Air turbulence from stack emissions

Gas efflux from industrial chimneys (with an average vertical velocity exceeding 4.3 metres per second) may be hazardous to flight in the prescribed airspace. It is a controlled activity under the APARs and requires a CASA review.

C5.3.5
Building-generated windshear and turbulence

The NASF *Guideline B Managing the Risk of Building Generated Windshear and Turbulence at Airports* provides guidance on the risks of windshear and turbulence generated by buildings in close proximity to runways that may affect aircraft in their critical phases of flight (especially on final approach). It indicates that legislation protecting OLS effectively mitigates the risk of building-generated turbulence for aircraft between 200 feet and 1,000 feet above ground level.

Below 200 feet above ground level, additional assessment is recommended for buildings within defined envelopes relative to the runway ends (the level of detailed assessment required depends on the height of the building and its location relative to the runway centre line).

Melbourne Airport has undertaken an assessment of building-generated windshear and turbulence effects from existing and proposed buildings in relation to M3R. (The assessment was based on the updated version of NASF Guideline B endorsed by government in May 2018.)

Results of the assessment are discussed in **Section C5.6.6**

C5.3.6
Lighting restriction zones

CASA has authority under the CA Regulations to require lights that may cause confusion, distraction or glare to pilots be extinguished or modified. It may authorise a notice to be served for infringement of the regulation; failure to comply with directions constitutes an offence.

The light restriction zones associated with M3R are in those associated with the ultimate four-runway layout (published in the Melbourne Airport Master Plan).

C5.3.7
Remotely piloted aircraft

Australia is one of the first countries to regulate operation of Remotely Piloted Aircraft (RPA). Part 101 of the *CAS Regulations (Unmanned Aircraft and Rockets)* prohibits RPA operation in a way that '… creates a hazard to another aircraft, another person, or property' (sub regulation 101.055 (1)).

The Regulations include restrictions on the operation of RPAs within the approach and departure paths of controlled aerodromes; or at heights greater than 400 feet above ground level or within three nautical miles (5.5 kilometres) of a controlled aerodrome.

C5.3.8
Wildlife strike risk

Wildlife strikes can cause major damage to aircraft and are an important safety hazard. The majority of aircraft collisions with wildlife occur near the airfield during take-off, landing and associated phases of flight. They can cause damage that may affect the pilot's ability to manoeuvre the aircraft and are a leading cause of aircraft crashes.

The risk of a strike on, or in the vicinity of, an airport is related to the prevalence and nature of wildlife activity within the boundary of an airport and in surrounding areas. Current aviation safety regulations govern on-airport wildlife strike prevention efforts but do not address the risk of wildlife strikes occurring outside an airport's boundary.

Airports actively manage wildlife populations and the risk of strikes on airport land. Chapter 17 of the *Part 139 (Aerodromes) Manual of Standards 2019* requires aerodrome operators to regularly monitor and record information about the presence and behaviour of wildlife on airport, and wildlife activity visible in the vicinity of the airport. Wildlife strikes must also be reported to the Australian Transport Safety Bureau by aircraft operators, and aerodrome operators monitor reported events. Melbourne Airport operates a wildlife hazard management plan that sets out the procedures for detection, monitoring, risk assessment and analysis, reporting and mitigation of wildlife hazards.

Land use planning decisions and the way in which existing land use is managed in the vicinity of airports can significantly influence the risk of wildlife hazards. Minimising the risk of wildlife strike requires careful planning of land uses that may attract birds/wildlife.

NASF *Guideline C Managing the Risk of Wildlife Strikes in the Vicinity of Airports* identifies land uses with the potential to increase wildlife strikes. It also gives guidance on buffer zones, within which certain activities around airports should be controlled. In these buffer zones, the Guideline recommends some activities be excluded while others have monitoring and control measures applied as shown in Table C5.1.

Table C5.1
Wildlife attraction risk and actions by landuse

Land Use		Wildlife Attraction Risk	Actions for existing developments			Actions for proposed developments / Changes to existing developments.		
			Area A (3km)	Area B (8km)	Area C (13km)	Area A (3km)	Area B (8km)	Area C (13km)
Agriculture	Turf farm	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
	Piggery	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
	Fruit tree farm	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
	Fish processing / packing plant	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
	Cattle /dairy farm	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
	Poultry farm	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
	Forestry	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
	Plant nursery	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
Conservation	Wildlife sanctuary / conservation area - wetland	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
	Wildlife sanctuary / conservation area - dryland	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Recreation	Showground	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor

Land Use (cont.)		Wildlife Attraction Risk (cont.)	Actions for existing developments (cont.)			Actions for proposed developments / Changes to existing developments. (cont.)		
			Area A (3km)	Area B (8km)	Area C (13km)	Area A (3km)	Area B (8km)	Area C (13km)
	Racetrack / horse riding school	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
	Golf course	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
	Sports facility (tennis, bowls, etc)	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
	Park / Playground	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
	Picnic / camping ground	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Commercial	Food processing plant	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
	Warehouse (food storage)	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
	Fast food / drive-in / outdoor restaurant	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
	Shopping centre	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
	Office building	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
	Hotel / motel	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
	Car park	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
	Cinemas	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
	Warehouse (non-food storage)	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
	Petrol station	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Utilities	Food / organic waste facility	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
	Putrescible waste facility - landfill	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
	Putrescible waste facility - transfer station	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
	Non-putrescible waste facility - landfill	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
	Non-putrescible waste facility - transfer station	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
	Sewage / wastewater treatment facility	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
	Potable water treatment facility	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action

Source: NASF Guideline, DITRDCA

The buffer zones applicable to Melbourne Airport are indicated on Figure C5.2. Note that the buffer radius is shown relative to the Aerodrome Reference Point (ARP) as well as relative to the existing runway ends. NASF Guideline C indicates that when calculating these buffers the ARP should generally be used as the point of origin – but that there may be circumstances where a different point or multiple points of origin are appropriate. Melbourne Airport has adopted runway ends as the appropriate points of origin for the establishment of risk zones. This is because zones based on the ARP (derived from the existing two-runway layout) may not adequately protect against land uses close to the future runway ends (where the risk from wildlife strike during critical phases of flight is greatest).

CASA requires Melbourne Airport to work in consultation with local planning authorities to monitor sites within 13km of the ARP that attract wildlife in accordance with NASF Guideline C.

C5.3.9
Aircraft accidents and public safety

Although Australia has an excellent aviation safety record there are inherent and unavoidable risks in the industry. How land use is managed around runways (including beyond airport boundaries) can help minimise disastrous outcomes for people on the ground in the event of an aircraft accident during take-off or landing.

Public Safety Areas (PSAs) are defined areas of land within which development is restricted to control the number of people on the ground within the most hazardous proximities of a runway (i.e. at either end of, and aligned with, the runway centreline). The aim of PSAs is to further reduce the already low risk of an air transport accident affecting people who live or work near an airport.

The primary purpose of a PSA is not to reduce the severity of damage to an aircraft or its occupants as a result of an accident (this is addressed by the provision of defined Runway End Safety Areas (RESA) in accordance with aerodrome regulations). The PSA further addresses the risk to the community around an airport for various accident scenarios.

The boundaries of a PSA are typically determined by reference to the statistical chance of an accident in that region. The scale of aircraft movements and the distance of a location from the critical take-off and landing points are used to estimate the likelihood of an accident at that location.

Although there is no current International Civil Aviation Organization (ICAO) standard for PSAs, the UK and Netherlands governments and others have implemented PSAs in their jurisdictions. In Australia, the Queensland Government applies planning controls to selected airport runways based upon a threshold rate of aircraft movements.

NASF *Guideline I Managing the Risk in Public Safety Areas at the Ends of Runways* identifies the UK and Queensland approaches as ways in which Australian airports may appropriately manage these specific risks to the public near airports.

C5.3.9.1
Approaches to PSA establishment

Several approaches have been developed worldwide to assess public risk close to airports:

- The United States establishes PSAs at the end of runways, the aim being to clear all objects from the area. Land use within these areas is only permitted if it neither attracts wildlife nor interferes with navigational aids
- The United Kingdom's Civil Aviation Authority determines levels of risk at each airport and develops the associated PSA. National Air Traffic Services (NATS) has calculated PSAs for more than 35 UK airports on behalf of the UK Department for Transport
- The Netherlands model (adopted by other European countries) determines third party risk to the area surrounding an airport using a statistical model
- In Queensland, a defined PSA dimension is applied to all runways that meet criteria regarding aircraft movements. PSA dimensions are defined with reference to the UK's methodology for determining third party risk.

The UK and Queensland approaches are discussed in more detail below.

The UK approach:

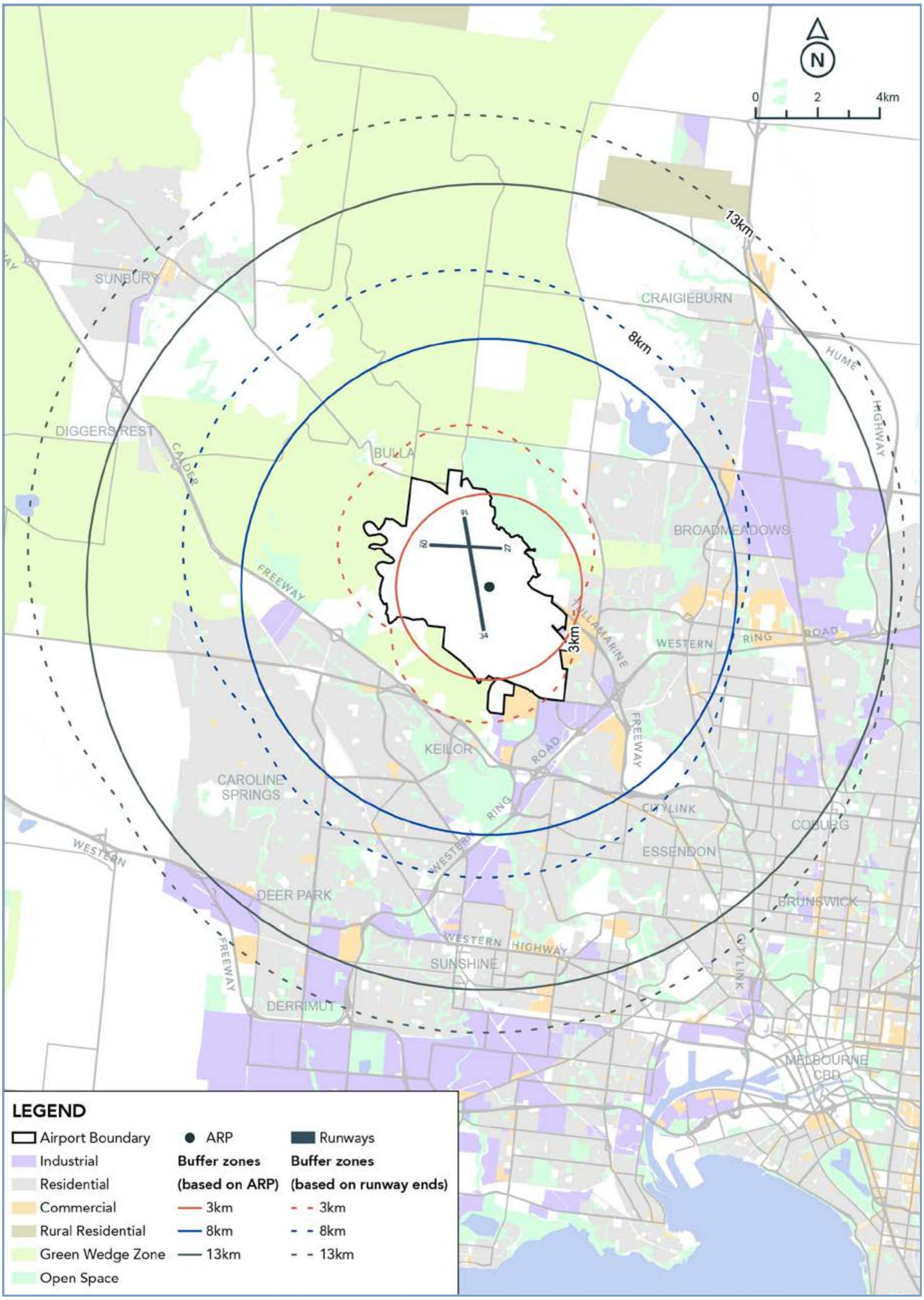
The UK has trialled two models of PSAs. The current model has been in place since 2002 and sets the PSA boundaries to cover the one-in-100,000 individual risk contour (i.e. individuals who live or work outside this PSA contour have a less than one-in-100,000 chance per year of fatality as a result of an aircraft accident).

The one-in-100,000 risk contours are calculated for each individual airport based on 15-year forecasts of the numbers and types of aircraft movements. The risk profile of an airport is determined by:

- The statistical expectation that an aircraft accident occurs in the vicinity of the airport
- The probability, given an accident has occurred, that it affects a particular location
- The size of the area likely to be affected as a result of an accident
- The probability of fatality for people on the ground within that area.

The UK method determines potential crash locations in relation to a runway's extended centre line and does not take account of any variation in flight paths. This is because the data set from which the crash location model is derived includes only information about the crash location relative to runway location (not the intended flight path).

Figure C5.2
NASF Guideline C wildlife hazard buffer zones



Source: APAM, 2020

The Queensland approach:

Queensland mandated PSAs at a number of strategic airports (Commonwealth and non-Commonwealth) within the state in 2002.

The PSAs are established in the *Queensland State Planning Policy (SPP) – Strategic Airports and Aviation Facilities*. The SPP protects, through the planning system, the operation of strategic airports and aviation facilities, enables the growth and development of Queensland's aviation industry, and ensures that development avoids increasing risk to public safety in public safety areas.

The Queensland PSA model is formed by a 1,000 metre long trapezium with a width of 350 metres at the runway end and a width of 250 metres at the other. Page 17 of the SPP provides criteria for the application of a PSA.

C5.3.9.2
Melbourne Airport PSAs

Melbourne Airport has historically adopted PSAs at the end of each ultimate runway with dimensions accordant with the Queensland PSA. These dimensions (as applied to existing Melbourne Airport runway infrastructure) are shown in **Figure C5.7**.

Based on the UK and Queensland approaches to land use in PSAs, and the NASF Guideline I, **Table C5.2** indicates the types of development considered compatible or incompatible within Melbourne Airport PSAs.

Table C5.2
Developments considered compatible and incompatible in Melbourne Airport PSAs

Public Safety Area	Compatible Uses	Incompatible uses / activities
Outer Area 1 in 100,000	**Long stay and employee car parking** (where the minimum stay is expected to be in excess of six hours) **Shorter stay car parking** (with a safety case – depends on intensity of use) **Built development for the purpose of housing plant or machinery** and would require **no people** on site on a regular basis, such as electricity switching stations or installations associated with the supply or treatment of water **Golf courses, but not club houses** (provided appropriate mitigation measures are in place to reduce wildlife attraction risk - see NASF Guideline C) **Open storage and types of warehouses with a very small number of people on site.** The planning authority could consider imposing conditions to prevent future intensification of the use of the site and limit the number of people to be present on the site **Developments which require few or no people on site on a regular basis** such as buildings housing plant or machinery **Low intensity public open space**	**Accommodation activities:** This includes dwelling houses, multiple dwellings, resort complexes, tourist park, hostels, retirement villages or other residential care buildings **Community activities:** educational establishment, community centres, hospitals, theatres, childcare and playgrounds, detention facilities, place of worship **Recreation activities:** This includes parks, outdoor recreation and sport, major sport and entertainment facilities **Entertainment and centre activities:** Shopping centres, service stations, showrooms, markets, hotels, theatres, tourist attraction, garden centres **Industrial and commercial uses involving large numbers of workers or customers:** Intensive uses such as high impact, medium and low impact industry, warehousing, services industry **Manufacture or bulk storage of flammable, explosive or noxious materials** **Public passenger transport infrastructure*:** This includes bus, train and light rail stations
Inner Area 1 in 10,000	**Long stay and employee car parking** (where the minimum stay is expected to be in excess of six hours) **Built development for the purpose of housing plant or machinery** and would require **no people** on site on a regular basis, such as electricity switching stations or installations associated with the supply or treatment of water **Golf courses, but not club houses** (provided appropriate mitigation measures are in place to reduce wildlife attraction risk - see NASF Guideline C)	**Accommodation activities:** This includes dwelling houses, multiple dwellings, resort complexes, tourist park, hostels, retirement villages or other residential care buildings **Community activities:** educational establishment, community centres, hospitals, theatres, childcare and playgrounds, detention facilities, place of worship **Recreation activities:** This includes parks, outdoor recreation and sport, major sport and entertainment facilities **Entertainment and centre activities:** Shopping centres, service stations, showrooms, markets, hotels, theatres, tourist attraction, garden centres **Industrial and commercial uses involving large numbers of workers or customers:** Intensive uses such as high impact, medium and low impact industry, warehousing, services industry **Manufacture or bulk storage of flammable, explosive or noxious materials** **Public passenger transport infrastructure*:** This includes bus, train and light rail stations

*Source: NASF Guideline, DITRDCA. *The planning of new transport links such as road and rail corridors within PSAs should be carefully considered and assessed in terms of the average density of people over time that might be exposed to risk.*

C5.3.9.3 Individual risk

The UK approach to PSAs is based on the calculation of individual risk, which allows a risk contour map to be developed. Individual risk is defined as the risk of fatality or serious injury due to an aircraft crash in a given year. For example, a person at a location with an individual risk level of 1 in 100,000 per year would on average have to stay stationary on the ground for 100,000 years to suffer severe consequences of an aircraft accident. The concept is intended to (conservatively) represent the risk to people in homes they might occupy on a more-or-less continuous basis.

The PSAs are based on the principles set out in a study conducted by NATS for the UK Department of Transport. The study is described fully in NATS *R&D Report 9636 Third Party Risk Near Airports and Public Safety Zone Policy* (NATS, London, June 1997).

The NATS study comprised two parts: the first identifying the risk modelling approach, the second proposing limits for third party risk tolerability at airports.

This NATS risk modelling approach has been adopted in this chapter to estimate individual risk contours relevant to Melbourne Airport. The estimation of M3R individual risk levels for PSA contours was done in accordance with the NASF Guideline I. The results are presented and discussed in Section C5.6.9.

C5.3.10 Objects falling from aircraft

In addition to public safety risk from aircraft accidents, areas in the vicinity of airports may potentially be impacted by falling aircraft components lost during take-off or landing. These items are generally small and lightweight removable access panels, covers, fairings or vanes. M3R introduces flight paths to areas not previously overflown, and therefore brings a very small risk of people and buildings being struck by falling aircraft components.

Airline safety management includes a strong focus on preventing objects accidentally detaching from aircraft in flight, through regulatory oversight and industry safety practices, to ensure this risk always remains ALARP.

When objects are discovered to have fallen off aircraft, these occurrences are reported to the Australian Transport Safety Bureau (ATSB) which maintains a database and may investigate.

Assessment of the potential impacts of objects falling from aircraft is presented in Section C5.6.10.

C5.3.11 Navigation systems and air traffic management

A variety of satellite and ground based navigational aids are routinely used to provide appropriate levels of safety for flight in reduced visibility conditions. Their accuracy, operation and availability are strictly controlled by CAS Regulations.

All aircraft operating at Melbourne Airport in reduced visibility conditions must be suitably equipped to use the available navigational aids.

At Melbourne Airport, Airservices uses various surveillance services to:

- Identify aircraft and monitor their position when operating on the airport manoeuvring area
- Acquire data on arriving aircraft
- Monitor the position of airport equipment and vehicles
- Process aircraft arriving and departing Melbourne Airport, and some aircraft transiting Melbourne Airport's airspace
- Detect intruders into Melbourne controlled airspace
- Process aircraft not equipped with transponders (a radar transmitter-receiver activated for transmission by reception of a predetermined signal).

These radar services help Air Traffic Control (ATC) fulfil its responsibilities in the controlled airspace surrounding Melbourne Airport according to the CAS Regulations.

Communications, Navigation and Surveillance (CNS) facilities are crucial to the safe and efficient operation of aircraft. If not properly assessed and managed, inappropriate development located in the Building Restricted Areas of CNS facilities can compromise their effectiveness. NASF Guideline G is intended to assist land-use planners at all levels in their consideration of these facilities when assessing development proposals and rezoning requests and when developing strategic land use plans. This helps ensure development proposals in the vicinity of CNS facilities are appropriately assessed by the relevant technical stakeholders.

C5.4 DESCRIPTION OF SIGNIFICANCE CRITERIA

C5.4.1 Tolerable risk limits for PSAs

The establishment of a tolerance threshold for individual risk in relation to public safety is complicated. Values in the range $1x10^{-6}$ (one in 1 million) to $1x10^{-4}$ (one in 10,000) are routinely adopted by various jurisdictions, dependent on a range of circumstances.

The UK Health and Safety Executive (HSE) had been using a recommended upper limit for the tolerable risk to third parties from hazardous industry of $1x10^{-4}$ since the mid-1980s. At around $1x10^{-6}$, levels of individual risk begin to merge into the background risks from everyday life. The range from $1x10^{-4}$ to $1x10^{-6}$ per year is termed the 'ALARP region' within which risks should be managed within practicability (see Section C5.2).

The studies undertaken to establish airport PSA policy in the UK specifically considered proposals for setting tolerable limits for individual risk in relation to aircraft crashes. A constrained cost-benefit analysis was undertaken to determine specific land use restrictions. The analysis quantified the benefits of reducing risk and compared these with the costs of removing or prohibiting activities at each point outside the one-in-10,000 individual risk contour. The study concluded there is no case for removing *existing* development outside the one-in-10,000 risk contour but that *new* development should be restricted as far out as the one-in-100,000 contour.

This assessment has adopted the one-in-100,000 contour as the baseline individual risk contour of interest, as it the individual risk threshold adopted in UK policy for new development. This is consistent with NASF Guideline I.

An assessment of the impacts of constructing M3R on the levels of individual risk in surrounding land areas has been undertaken with reference to the following:

- Existing incompatible development in areas subject to individual risk of one-in-10,000 or greater should ideally be removed or mitigated (but may be acceptable subject to a satisfactory safety case)
- Existing development within areas subject to individual risk of one-in-100,000 (but not within the one-in-10,000 individual risk contour) need not be removed but the risks should be ALARP
- Future development within areas subject to individual risk of one-in-100,000 or greater that is of a nature discouraged by the PSA policy adopted in NASF Guideline I should be restricted.

C5.4.1.1 Future development

Planning consideration has been applied to the potential for future development which would be considered incompatible with PSA principles adopted in Queensland and the UK. Fundamentally, development in a strategic airport's PSA should not involve:

- A significant increase in the number of people living, working or congregating in the area
- The manufacture, use or storage of flammable, explosive, hazardous or noxious materials.

Table C5.3 lists the Victorian Planning Scheme zones (as at December 2019) within four kilometres of Melbourne Airport. The permissible uses within each zone (according to the current planning scheme) have been considered in order to identify the potential for future development to occur that may be incompatible with the above public safety principles. The potential impact of M3R on future development, if a PSA policy similar to that currently suggested in NASF Guideline I were to be implemented in Victoria, is classified on a five-point scale from negligible to major. This can be considered to be the significance of the impact of M3R on future development within the extent of each land use zone that lies within the estimated one- in-100,000 individual risk contour.

C5.4.1.2 Existing development

The assessment of significance has applied the framework described in *Chapter A8: Assessment and Approvals Process*. For severity, criteria have been adopted with respect to existing development, consistent with the above tolerable risk limits, and these are described in Table C5.4.

C5.4.2 Other risks

The severity criteria for all other risks identified in this chapter are described in Table C5.5.

Table C5.3
Planning scheme zones and PSA policy

Zone	Potential for future development which would be incompatible with public safety principles	
Commonwealth Land not Controlled by Planning Scheme	Melbourne Airport and Airservices Australia operational and commercial uses.	Minor
Commercial 1 Zone	Accommodation, offices and places of worship are allowed without permit. Individuals may be present at these locations with similar frequency and duration as they would be in residential areas.	High
Commercial 2 Zone	Non-residential uses which encourage congregations of people, generally for transient and infrequent purposes such as entertainment and shopping. Hospitals and major sports facilities are prohibited.	High
Comprehensive Development Zone	Encourages a wide range of commercial uses which are likely to encourage the presence of people for extended durations on a regular basis.	Major
Farming Zone	Generally agricultural uses with negligible residential dwellings, hazardous materials or congregations of people.	Negligible
General Residential Zone	Development of new residential areas is discouraged within PSAs.	Major
Green Wedge Zone	Some permanent dwellings and other uses which might encourage congregations of people are possible with permit required. Limitations are generally provided on density and hence numbers of people exposed to risk.	Minor
Green Wedge A Zone	Similar to Green Wedge Zone but greater density of subdivision is allowed. Density is still well below General Residential or Low Density Residential zones.	Moderate
Industrial 1 Zone	Industrial uses with a generally low density of occupancy such as warehouses, along with small-scale retail and offices. May be some potential for dangerous goods storage. Hospitals, hotels, major retail and entertainment are generally prohibited.	Moderate
Industrial 3 Zone	As Industrial 1 Zone but some less desirable uses such as supermarkets are allowed without a permit.	High
Low Density Residential Zone	General residential development encouraged but with a limit of one dwelling per lot. Generally incompatible with PSA principles.	High
Mixed Use Zone	Encourages residential and commercial uses.	Major
Neighbourhood Residential Zone	Development of new residential areas is discouraged within PSAs.	Major
Public Conservation and Resource Zone	Public uses attracting frequent and/or prolonged visitation are generally discouraged in this zone.	Negligible
Public Park and Recreational Zone	Dwellings are not generally allowable. Occasional gatherings of small numbers of people at open sports grounds. Other uses are small-scale and specifically related to public land use.	Minor
Public Use Zone – Cemetery/ Crematorium	Regular but infrequent gatherings of small to moderate numbers of people associated with memorial services. General presence of employees for the operation and maintenance of the facilities.	Moderate
Public Use Zone – Education	Uses are likely to include educational facilities where employees and students may congregate regularly.	Major
Public Use Zone – Health and Community	Uses are likely to include facilities where vulnerable persons visit regularly or are residents for extended periods.	Major
Public Use Zone – Local Government	Uses may include public utility and community services and facilities which could involve employees or attract regular public use.	High
Public Use Zone – Other Public Use	Possible future uses are not well defined but must be carried out on behalf of the public land manager. Depending on the use the level of incompatibility may vary from low to high.	Moderate
Public Use Zone – Service and Utility	Limited potential to result in permanent occupation or congregations of large numbers of people.	Minor
Public Use Zone – Transport	Transport uses permitted such as railways, stations and tramways as may carry large volumes of people on a transient basis.	Moderate
Residential Growth Zone	Development of new residential areas is discouraged within PSAs.	Major
Road Zone – Category 1	Frequent transient vehicles generating a low to moderate occupancy level (when compared with major freeway traffic levels).	Minor
Road Zone – Category 2	Infrequent transient vehicles generating a very low to low occupancy level (when compared with major freeway traffic levels).	Negligible

Source: Rehbein, 2020

Zone (cont.)	Potential for future development which would be incompatible with public safety principles (cont.)	
Rural Conservation Zone	Public uses attracting frequent and/or prolonged visitation are generally discouraged in this zone.	Negligible
Special Use Zone	Special Use Zone land uses vary depending on the local planning scheme schedule. For the purposes of this assessment each zone has been assigned a significance level.	Minor to major
Township Zone	Residential uses are encouraged in this zone. Development of new residential areas is discouraged within PSAs.	Major
Urban Floodway Zone	Uses permissible under this zone are generally of a low density occupancy except for certain outdoor recreational uses. Compatibility is considered similar to Public Park and Recreational Zone.	Minor
Urban Growth Zone	Residential and other dense urban land uses which are unlikely to be compatible within PSAs.	Major

Table C5.4
Significance criteria - existing development and public safety

Impact severity	Description
Major	Existing incompatible development (residential, commercial or industrial) is brought within a level of individual risk of one in 10,000 or greater
High	Existing residential development is brought within a level of individual risk of one in 100,000 or greater
Moderate	Extensive areas of existing industrial or commercial development are brought within a level of individual risk of one in 100,000 or greater.
Minor	Small areas of existing commercial or industrial development are brought within a level of individual risk of one in 100,000 or greater OR Existing transport corridors are brought within a level of individual risk of one in 10,000 or greater
Negligible	No existing developments are brought within a level of individual risk of one in 100,000 or greater
Beneficial	Existing development with moderate, minor or major incompatibility with public safety areas is removed from the PSAs

Source: Rehbein, 2020

Table C5.5
Severity criteria – general

Impact severity	Description
Major	M3R would lead to a considerable and tangible increase in risk levels compared to the No Build scenario and the resulting level of risk would be considered intolerable.
High	M3R would lead to a tangible increase in risk levels compared to the No Build scenario, the resulting level of risk would still be considered tolerable if ALARP, but significant management measures over and above would be required to ensure ALARP.
Moderate	M3R will lead to an increase in risk levels compared to the No Build scenario. Existing aviation legislative and land-use planning controls may not be sufficient to ensure the risk remains ALARP.
Minor	M3R will lead to an increase in risk levels compared to the No Build scenario, but existing aviation legislative and land-use planning controls will ensure the risk remains ALARP.
Negligible	M3R would have no measurable impact over and above that anticipated without the M3R.
Beneficial	M3R would lead to a reduction in risk levels compared to the No Build scenario.

Source: Rehbein, 2020

C5.5 EXISTING CONDITIONS

C5.5.1 Wildlife hazards

Melbourne Airport recorded 655 wildlife strikes associated with air transport operations (i.e. excluding general aviation and military) between 2008 and 2017. **Figure C5.3** shows the frequency of recorded wildlife strikes each year per 10,000 RPT aircraft movements over that period. The average strike rate (2008-2017) at Melbourne is approximately three strikes per 10,000 aircraft movements; and varied between 2.1 and 4.7 each year over the period.

For comparison, the strike rate per 10,000 movements for RPT operations at major aerodromes across Australia (as recorded by the ATSB for 2008-2017) averaged 6.2 and varied from 5.43 to 6.82 over those years.

Table C5.6 and **Figure C5.4** show that the average rate of bird strikes at Melbourne Airport is low relative to other major airports in Australia. Over the period 2004-2017, on average Melbourne Airport had the lowest rate of bird strikes of any of the 10 major airports.

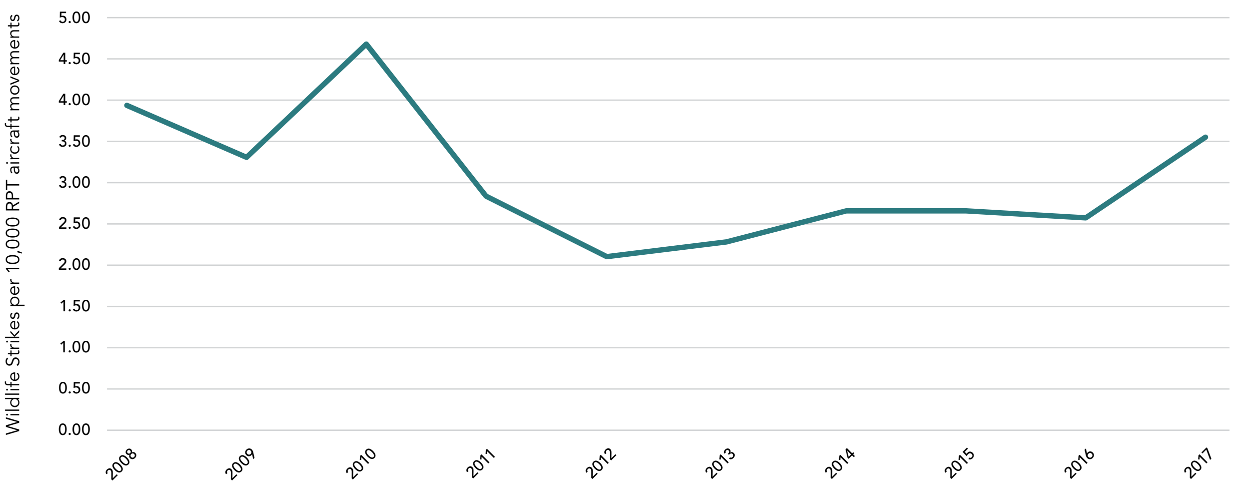
This comparison suggests that compared with other Australian airports the risk presented by wildlife hazards at Melbourne Airport is low.

Table C5.6
Rate of bird strikes each year at major Australian airports 2008-2017

Airport	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avg
Adelaide	5.75	9.86	6.46	9.66	7.30	5.28	6.53	7.78	5.19	8.20	7.2
Brisbane	6.97	6.58	6.55	7.15	5.64	5.93	4.47	4.63	5.47	6.27	5.9
Cairns	17.83	17.64	18.94	15.56	13.29	16.70	20.86	23.66	18.25	18.38	18.1
Canberra	6.51	4.47	7.29	9.46	4.28	6.71	6.84	7.04	7.27	6.10	6.6
Darwin	35.65	39.20	28.75	23.70	29.63	50.98	23.07	36.21	27.46	26.37	31.9
Gold Coast	8.79	9.36	12.74	12.21	10.97	9.82	14.19	16.32	14.83	16.32	12.7
Hobart	14.46	14.37	11.29	8.57	5.18	6.04	9.49	7.40	8.00	3.17	8.6
Melbourne	**3.95**	**3.31**	**4.69**	**2.85**	**2.11**	**2.29**	**2.66**	**2.67**	**2.58**	**3.56**	**3.0**
Perth	5.92	4.86	6.32	7.34	7.45	4.80	5.34	3.25	5.18	6.40	5.7
Sydney	3.01	4.09	3.84	4.49	2.66	2.84	3.18	3.08	3.69	2.97	3.4
Average	**6.28**	**6.77**	**6.82**	**6.82**	**5.43**	**5.93**	**5.63**	**6.05**	**5.90**	**6.23**	**6.2**

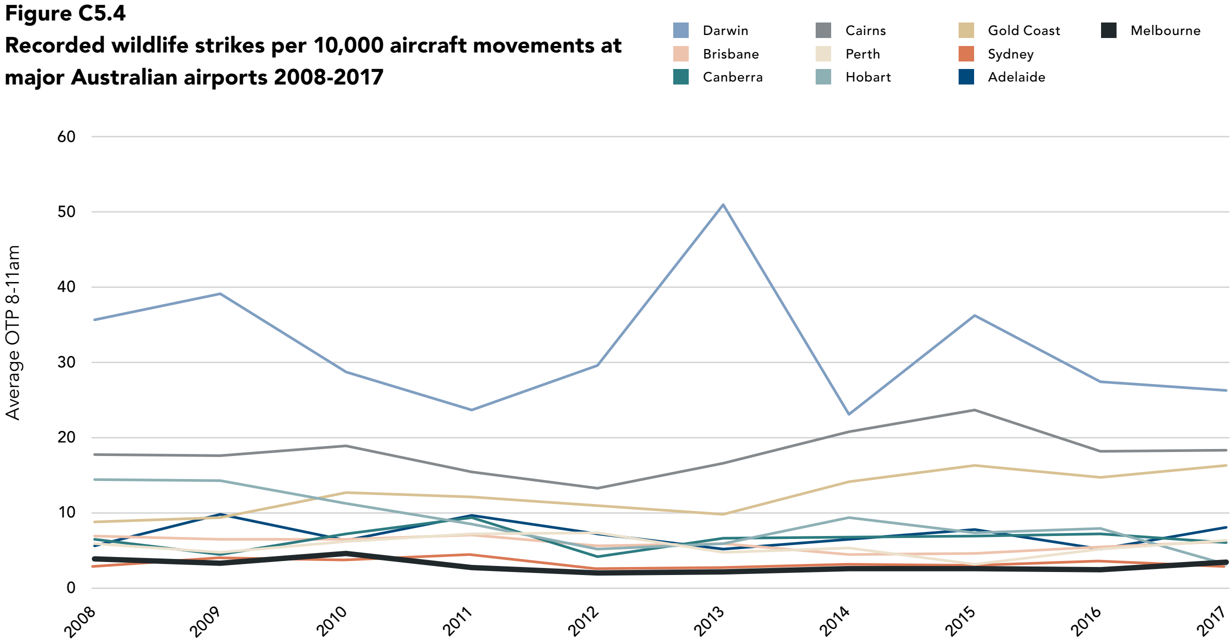
Source: ATSB, BITRE. Note: Table C5.5 only indicates strikes which occurred inside the aerodrome boundary, related to high or low capacity air transport operations, or unknown operations (i.e. excluding general aviation or military movements), as recorded by the ATSB. Aircraft movements recorded by BITRE only include RPT and may exclude certain other types of air transport operations.

Figure C5.3
Recorded wildlife strikes per 10,000 aircraft movements at Melbourne Airport, 2008-2017



Source: ATSB, BITRE

Figure C5.4
Recorded wildlife strikes per 10,000 aircraft movements at major Australian airports 2008-2017



Source: ATSB, BITRE

C5.5.2
Distribution of aircraft operations by runway

The operating modes for the airport runway system play an integral role in the safe and efficient movement of aircraft. The distribution of aircraft movements by runway end (determined by runway operating mode priorities established under noise abatement procedures) directly affects the probability of individual risk.

Figure C5.5 shows the numbers of movements and proportions in each Wake Turbulence Category (WTC) during 2019 using the existing runway configuration. WTC provides an approximation of the size distribution for aircraft as indicated in Table C5.7.

These distributions can be used to estimate public safety individual risk contours for existing operations.

C5.5.3
Aircraft accidents and industry safety standards

Australia has not experienced a high-capacity (i.e. aircraft with more than 38 seats) Regular Public Transport (RPT) fatal accident since 1968 and has never had a major accident involving an RPT jet aircraft. There has never been a serious accident involving RPT air services at Melbourne Airport. RPT dominates the airport's traffic, whereas general aviation (with a greater probability of crash incidents) is a relatively small proportion of movements (<1% in 2019).

Melbourne Airport's aviation environment is highly regulated. It is a certified aerodrome under section 139.050 of the CAS Regulations and therefore satisfies CASA that appropriate operating procedures, and adequately trained and experienced personnel, are in place so that suitable provision for the safety of aircraft and personnel is provided.

Melbourne Airport vigilantly maintains compliance with all applicable regulations, and proactively seeks industry best practice in safety standards.

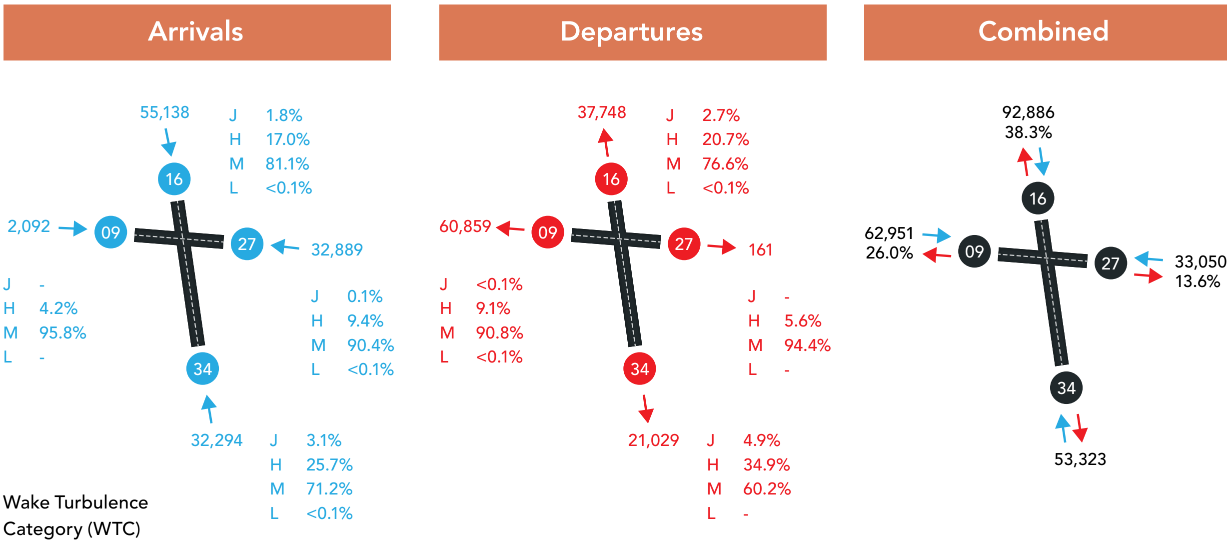
The RPT aircraft using the airport are subject to extensive regulatory controls to ensure they are adequately serviced and maintained in accordance with the requirements of the CAS Regulations. Pilots and crew are subject to similarly high levels of licensing and regulatory control.

Table C5.7
Wake Turbulence Categories and common aircraft types

WTC	Letter	Criteria	Example aircraft operating at Melbourne Airport
Super	J	Specified in ICAO Doc 8643	Airbus A380s
Heavy	H	Maximum take-off mass; Greater than 136,000 kg (unless specified by J)	Airbus A350s, Boeing B777s,
Medium	M	Maximum take-off mass; Less than 136,000 kg Greater than 7,000 kg	Airbus A320s, Boeing B737s, Bombardier Dash 8 Q400, Saab 340
Light	L	Maximum take-off mass; Less than 7,000 kg	Cessna 172, Beech 350 Super King Air

Source: APAM, 2020

Figure C5.5
Movement summary by runway end and WTC – 2019



Wake Turbulence Category (WTC)
J - Super
H - Heavy
M - Medium
L - Light

Source: SoundIN & Rehbein, 2020

PSA risk estimation

Methods for estimating individual risk require three basic inputs:

- The annual probability of an aircraft accident occurring near a given airport (i.e. accident frequency). Accident frequency is estimated from annual aircraft movements multiplied by the applicable accident rate for each aircraft type.
- The distribution of these accidents with respect to the airport location (i.e. accident location)
- The size of the accident area and the lethality within this area (i.e. accident consequence).

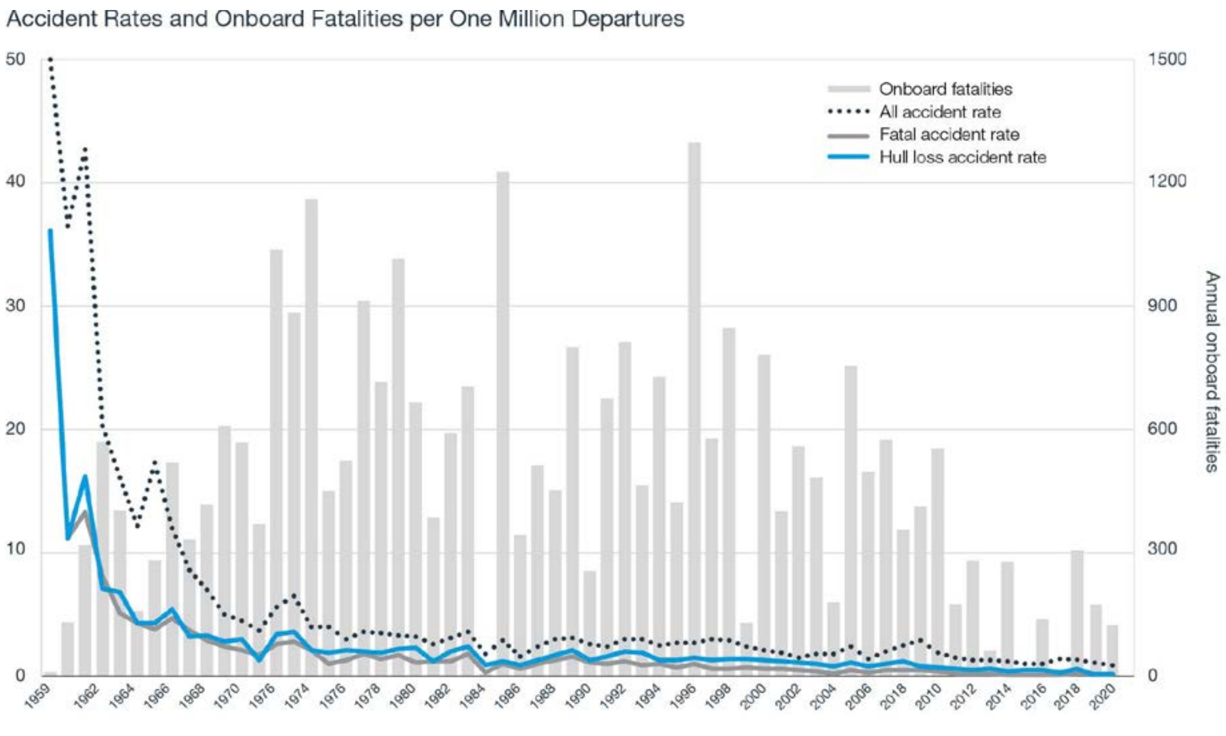
Each input carries a degree of uncertainty due to the limited availability of data sets from which to develop accurate models.

Accident frequencies used in the assessment are based upon historical data between 1970 and 1998. Air travel is statistically safe, and the evolution of aircraft and aviation safety practices is continually improving safety performance. Both ICAO (2011, 2016 and 2020) and Boeing (2021) indicate an improving accident rate as illustrated in Figure C5.6.

Figure C5.7 shows the following with respect to the existing runway ends:

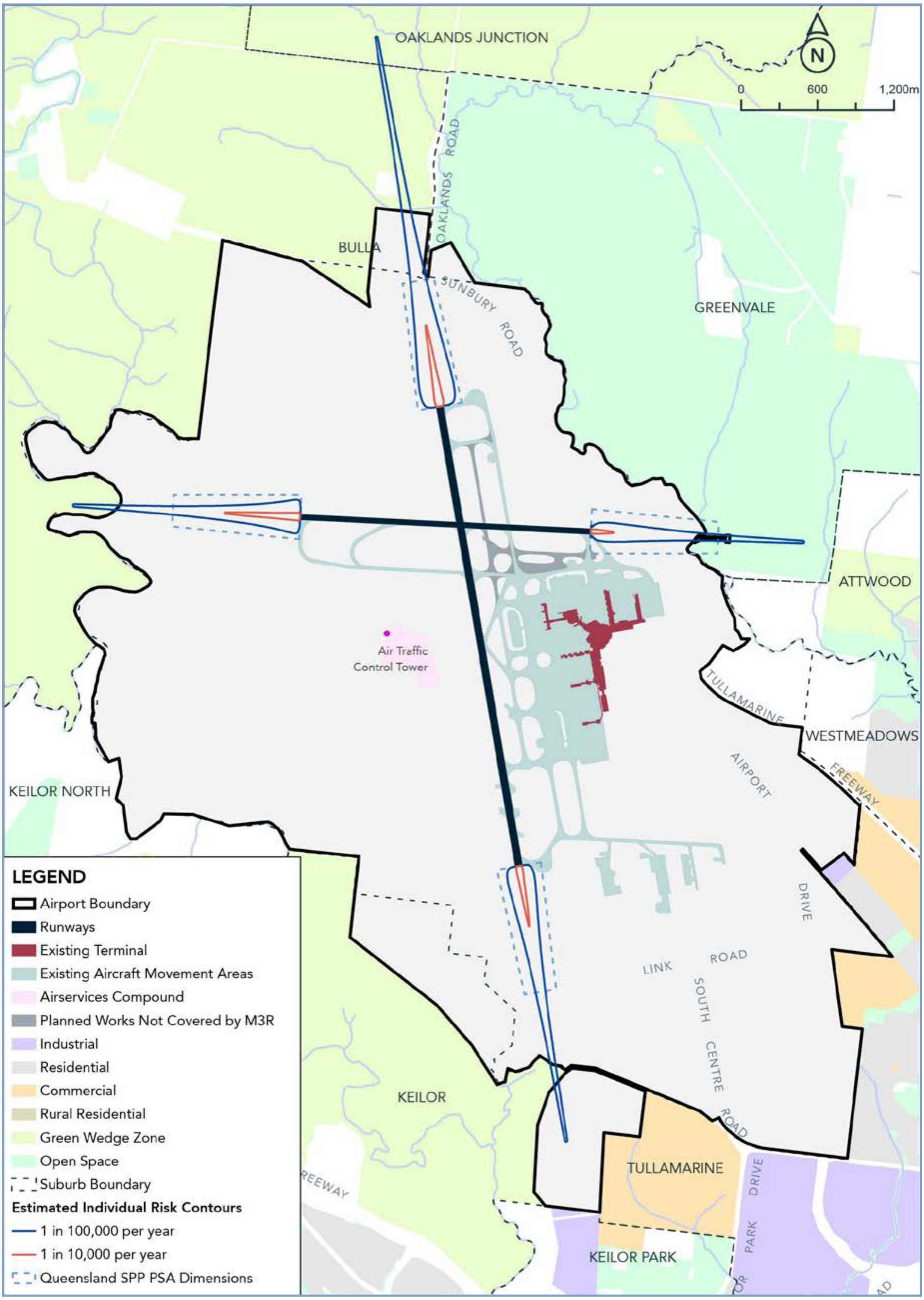
- The calculated one-in-100,000 per year individual risk contour
- The calculated one-in-10,000 per year individual risk contour
- The dimensions of the public safety areas currently defined in the Queensland SPP.

Figure C5.6
Accident rates and on-board fatalities, worldwide commercial jet fleet 1959-2020



Source: Boeing

Figure C5.7
Estimated Public Safety Area individual risk contours for 2019



Source: Rehbein, 2020

C5.6 ASSESSMENT OF POTENTIAL IMPACTS

C5.6.1 Identified hazards

The following hazards are the principal risks to safe operation of aircraft associated with M3R. Each is considered in more detail in the subsequent sections.

- Intrusions into operational airspace
- Lighting, reflectivity and glare
- Wildlife (bird and bat) strike
- Collisions with remotely piloted aircraft
- Windshear and turbulence
- Terrorism
- Jet blast impacts on public areas
- Aircraft accidents and public safety
- Objects falling from aircraft
- Construction hazards.

C5.6.2 Intrusions into operational airspace

Airspace obstructions can be a hazard to aircraft operations. The control of developments which may introduce such hazards in the vicinity of Melbourne Airport is regulated under the APARs. Melbourne Airport has identified the airspace it considers necessary for the ultimate development of the airport (including M3R) in its Master Plan.

The 2022 Master Plan (as with previous versions) incorporates the necessary airspace for the proposed runway and airspace architecture described in this MDP (see **Chapter C2: Airspace Architecture and Capacity**).

Melbourne Airport's preliminary assessment of the required airspace for M3R has indicated there may be some existing structures (e.g. light poles) and other obstacles (e.g. trees) intruding into the future operational airspace. Each will be assessed in detail to determine, in conjunction with CASA, the appropriate action to ensure safety of aircraft operations.

The location and elevation of the new north-south runway provides the maximum practicable clearance from existing obstacles on Sunbury Road.

As the process of airspace design progresses it will take account of any existing structures, terrain and other potential obstacles to ensure that:

- The detailed design of all airspace and procedures is in accordance with international and Australian rules for safe aircraft operations
- Any additional protections necessary against future development intruding into operational airspace are enacted through the APARs and other relevant legislation.

In summary, the risks of obstacles within operational airspace that could affect the safety of aircraft operations are, and will continue to be, adequately addressed through existing regulatory and planning frameworks.

C5.6.3 Lighting, reflectivity and glare

Lighting and glare from reflective surfaces (including solar panels) can be a hazard to aircraft operations when positioned such that the intensity of light directed towards the aircraft or air traffic controllers reduces visibility of the surroundings.

Lighting in the vicinity of airports also needs to consider its potential to cause pilot confusion through pattern and colour: lights should not emulate the aerodrome's operational guidance systems, particularly in marginal visibility conditions.

Guidance provided in the *Manual of Standards Part 139*, *NASF Guideline E* and the associated lighting restriction zones for the ultimate four runway layout established in the Melbourne Airport Master Plan, together with monitoring of developments and the powers CASA holds under the CA Regulations, will ensure these risks to be ALARP regarding M3R.

Further lighting and glare assessments relating to on-airport facilities will be carried out in the detailed design stages.

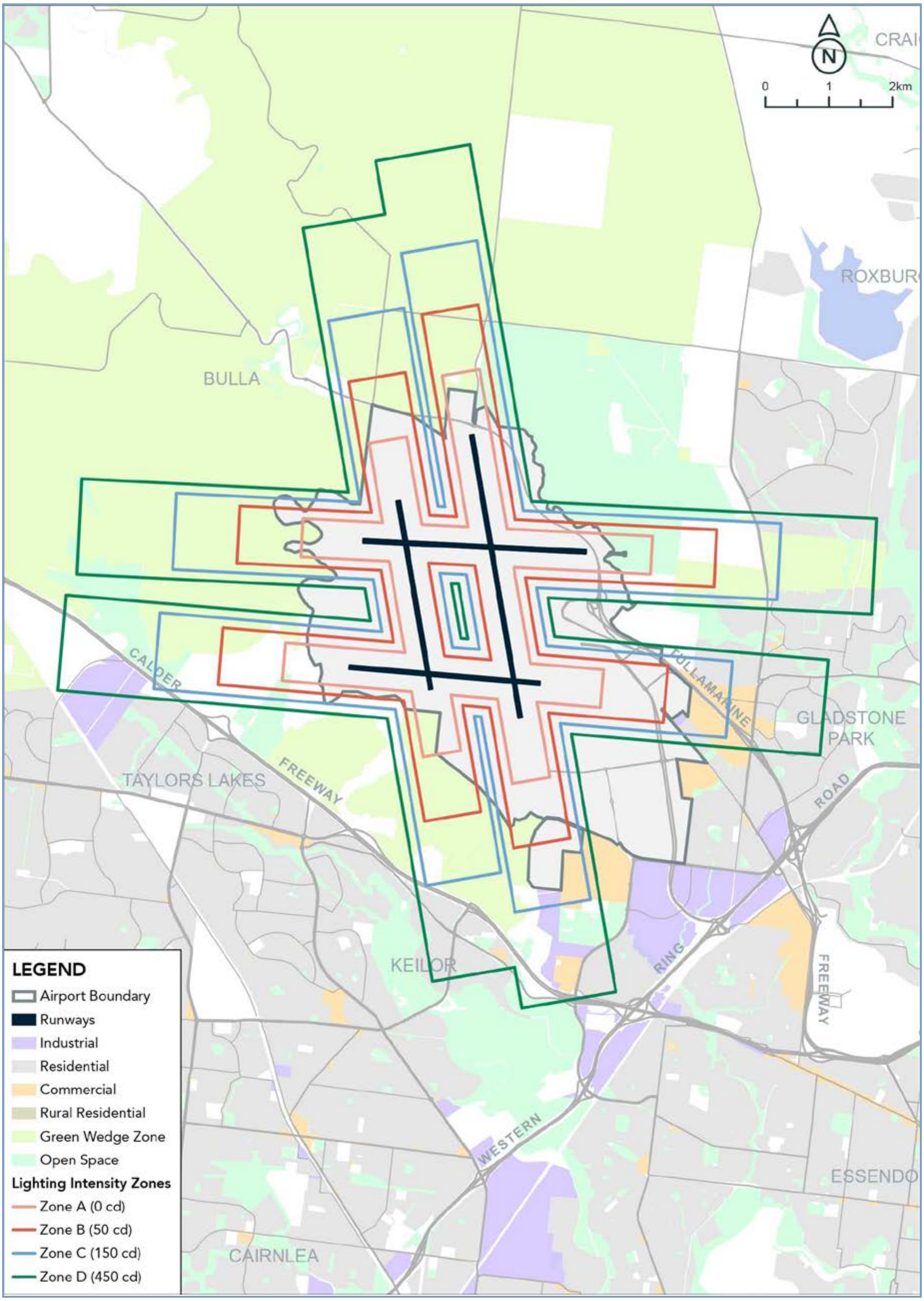
C5.6.4 Wildlife (bird and bat) strike

Wildlife hazards to aircraft operations are influenced by both on-airport and off-airport habitat management and active and passive wildlife control measures, combined with land-use planning to minimise activities that bring aircraft and birds into conflict. This land-use planning framework has been set out in accordance with *NASF Guideline C*. This identifies buffer zones located three, eight and 13 kilometres from the airport; together with high, medium and low risk land-use activities within each zone. The buffer zones applying to the runway ends both with and without M3R are shown in **Figure C5.9**.

Melbourne Airport engages a specialist ecological team to manage on-airport wildlife strike risks. It works in accordance with a strict Wildlife Hazard Management Plan (WHMP) that the airport is required to develop and implement under the CAS Regulations. This management process is expected to continue.

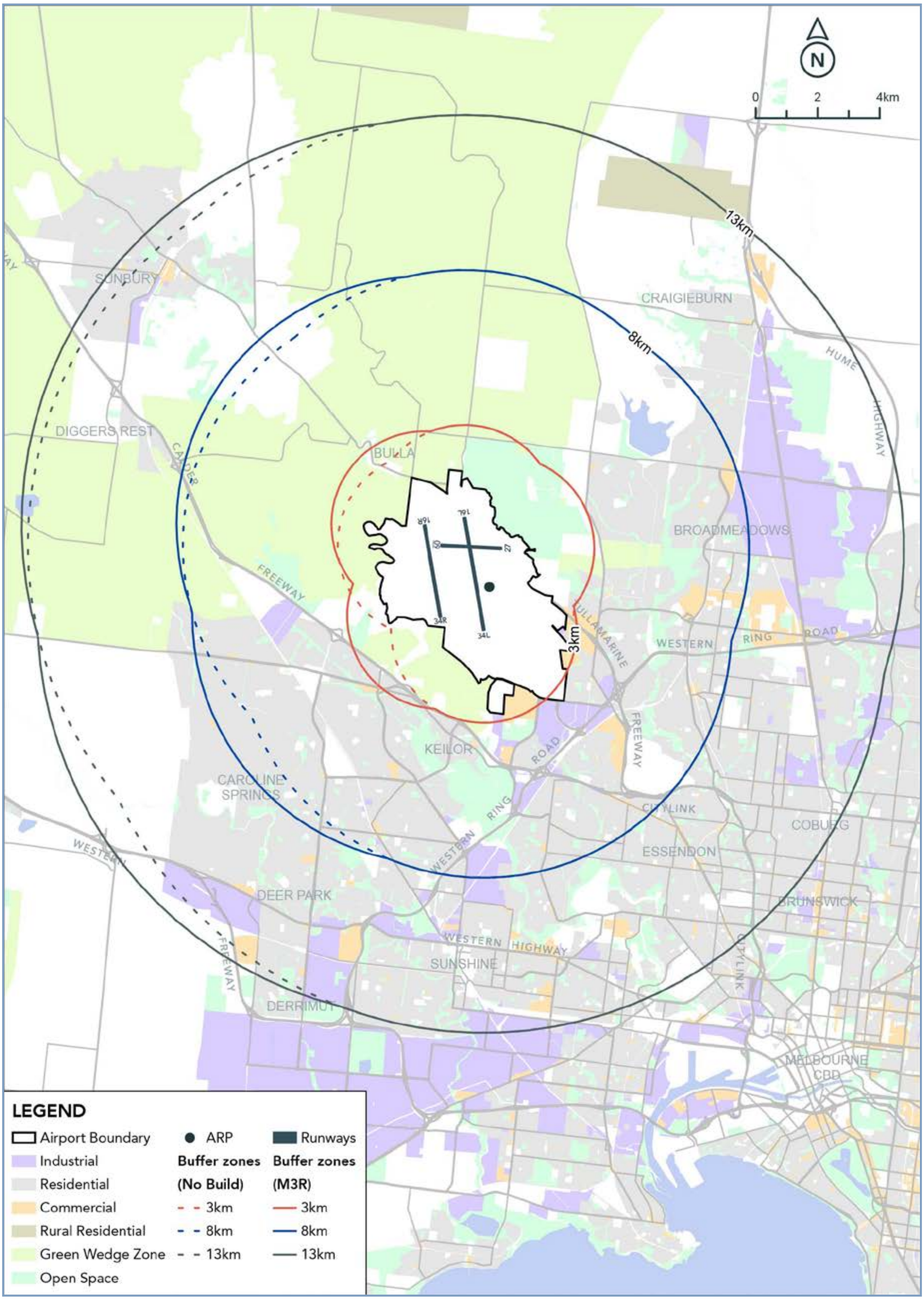
Melbourne Airport has completed a preliminary assessment of M3R for potential locations and habitat values that might attract concentrations of birds and bats and thereby pose a risk of aircraft collisions within the airport and surrounding airspace – specific to M3R (Biosis, 2021).

Figure C5.8
Ultimate four runway lighting Restriction zones



Source: Melbourne Airport, 2020

Figure C5.9
NASF Guideline C wildlife hazard buffer zones with and without M3R



Source: Rehbein, 2020

When considering on and off-airport wildlife strike risks, the assessment concludes:

- Melbourne Airport has in place a mature and robust approach to managing wildlife risks
- It is likely that collisions will increase proportionate to the increase in flights
- The strike risk from the grey-headed flying-fox may decrease as a result of the M3R project removing a significant portion of their Grey Box Woodland foraging habitat
- The habitat surrounding M3R is the same as for existing runways (the parallel North-South runways are similar distances from the Grey Box Woodland, and both surrounded by open grassland). The exception is the waterbird group which account for 2.01 per cent of combined collisions.
- The location of M3R is marginally closer to wetlands such as Arundel Creek and its associated dams, Deep Creek and the quarry dam site. Based on this assessment, there is potential for a marginal increase in collisions with waterbirds as a result due to the closer proximity of M3R to wetland habitat.

It is reasonable to conclude that the rate of wildlife strike per 10,000 aircraft movements will be similar for both the Build and No Build scenarios.

At the existing average wildlife strike rate of 2.1 to 4.7 strikes per 10,000 movements (2008 to 2017) the number of wildlife strikes a year can be estimated based on forecast aircraft movements. This is presented in Table C5.8.

The rate of wildlife strikes at Melbourne Airport is low compared with other major Australian airports. M3R is not expected to result in an increase to wildlife strike rates.

Most bird strike occurrences pose a low risk to the safety of aircraft and passengers, with no potential for an accident outcome. There are generally many effective defences in place that keep the safety of flight risk associated with these occurrences low. For example, modern aircraft engines are designed to withstand ingestion of birds and other flying wildlife. However, some bird strike occurrences result in either: personal injury (particularly when the occurrence involves larger birds and/or multiple birds, and in cases where a bird penetrates the windshield), or damage to the aircraft, especially where this involves engine ingestion.

The ATSB assesses the probable level of safety risk associated with each reported safety occurrence, considering the circumstances when it happened.

Figure C5.10 shows that the average mass for bird strikes at Melbourne Airport over the period 2008-2017 is one of the lowest among major Australian airports.

The ATSB data also shows that Melbourne has the lowest proportion of multiple strikes of all major Australian airports. This suggests flocking is not a significant contributor to risk at Melbourne.

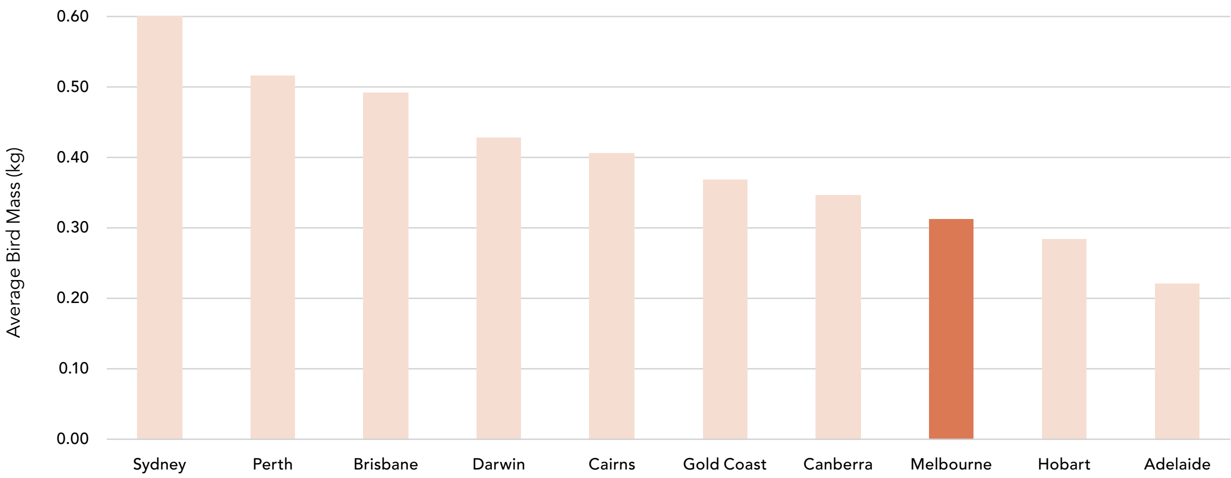
Due to the already low wildlife strike rate and risk levels presented by wildlife strike at Melbourne Airport, and the expectation that strike rates will not increase as a result of M3R (with reference to the significance framework of Table C5.5) the risk presented by M3R is considered negligible.

Table C5.8
Estimated annual wildlife strikes

Year	Forecast annual aircraft movements		Estimated annual wildlife strikes	
	Build	No Build	Build	No Build
2026	288,650	288,650	60 – 135	60 – 135
2031	333,800	315,300	70 – 155	65 – 150
2046	465,270	328,770	100 – 200	70 – 155

Source: Rehbein, 2020

Figure C5.10
Average bird mass of wildlife strikes at major airports (inside aerodrome confines)



Source: ATSB, 2018

C5.6.5
Remotely piloted aircraft

RPAs include drones, model aircraft and unmanned aerial vehicles. They are an increasing hazard for airports. It is presently a focus for CASA, Airservices and other authorities to ensure the legislation governing the operation of RPAs in the vicinity of airports is appropriate and effective.

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.

Aside from the club, the risks presented by RPAs at Melbourne Airport are not considered to be any greater than for other airports. The increase in risk as a result of M3R is as low as reasonably practicable, and will be managed through the applicable legislative controls.

C5.6.6
Windshear and turbulence

Building-induced windshear/turbulence can become a safety concern when a significant obstacle is located in the path of a crosswind to an operational runway. Wind flow is diverted around and over the building, causing the crosswind speed to vary along the runway. The degree to which the crosswind speed varies is dependent on the size and shape of the building, and its location with respect to the runway.

NASF Guideline B details the key considerations for managing the risk of building-generated windshear and turbulence at airports to help land use planners and airport operators reduce the associated risk.

Buildings that could pose a safety risk are those located within a rectangular 'assessment trigger area' around the runway ends that is:

- 1200 metres or closer perpendicular from the runway centreline (or extended runway centreline)
- 900 metres or closer in front of the runway threshold (towards the landside of the airport)
- 500 metres or closer from the runway threshold along the runway.

Buildings in the assessment trigger area are evaluated against a 1:35 sloping surface from the runway centreline (refer to **Figure C5.11**). This sloping surface extends from the runway centreline; building heights evaluated against the 1:35 surface should be measured above the runway level. The 1:35 surface can be applied to rule out buildings that will clearly not pose a risk. Where buildings would infringe the 1:35 surface, they will require further assessment.

Figure C5.12 shows that the assessment trigger areas for the new north-south runway 16R/34L do not include any existing Melbourne Airport buildings. However, the reduction in length of Runway 09/27 would bring the Airservices Australia control centre into the assessment trigger area for Runway 09.

C5.6.7
Terrorism

Melbourne Airport is designated a Category 1 airport under the *Aviation Transport Security Act 2004* (Cth). All persons entering airside (non-public) areas are therefore subject to screening and examination in accordance with government-mandated aviation security requirements.

The development of M3R is not expected to increase the specific risk of terrorism activities against aircraft.

The new north-south runway (16R/34L) will result in flight paths passing over areas which are not currently subject to aircraft overflight. These areas are similar in nature to the areas currently under the flight paths for the existing north-south runway (16L/34R). Melbourne Airport will work collaboratively with relevant government authorities to monitor any threats that may emerge in these areas, and minimise the potential for any malicious attack against aviation, to ensure this risk remains ALARP.

C5.6.8
Jet blast impacts on public areas

The exhaust velocity from aircraft jet engines when starting their take-off roll can be significant and may pose a risk to people and vehicles. Within the airfield (not accessible to the public) these risks are controlled by strict operational procedures, rigorous training, and restricted access to affected areas.

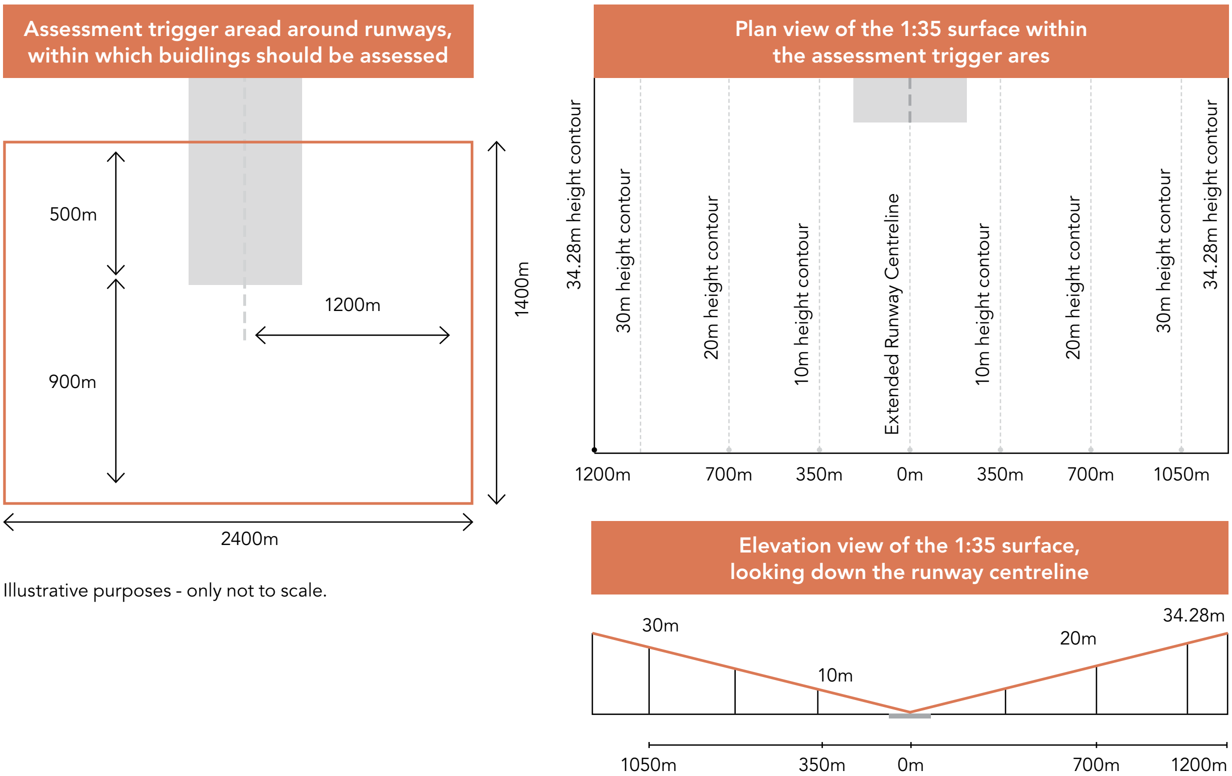
The CASA standards for aerodromes recommend maximum wind velocities that people, objects and buildings in the vicinity of an aeroplane may be subjected to and which will not be exceeded. These include (but are not limited to):

- Public areas within or outside the aerodrome boundary where passengers have to walk and people are expected to congregate — 60 kilometres per hour
- Public areas where people are not expected to congregate — 80 kilometres per hour
- Public roads — 50 kilometres per hour where vehicular speed may be 80 kilometres per hour or more; and 60 kilometres per hour where vehicular speed is expected to be below 80 kilometres per hour.

Large jet aircraft take-off thrust settings can generate wind velocities in excess of 50 kilometres per hour for 500 metres or more along the ground behind the aircraft.

The northern end of the proposed north-south runway (16R/34L) is more than one kilometre from Sunbury Road. Jet blast velocities which could be a hazard to public property or persons on Sunbury Road are not anticipated.

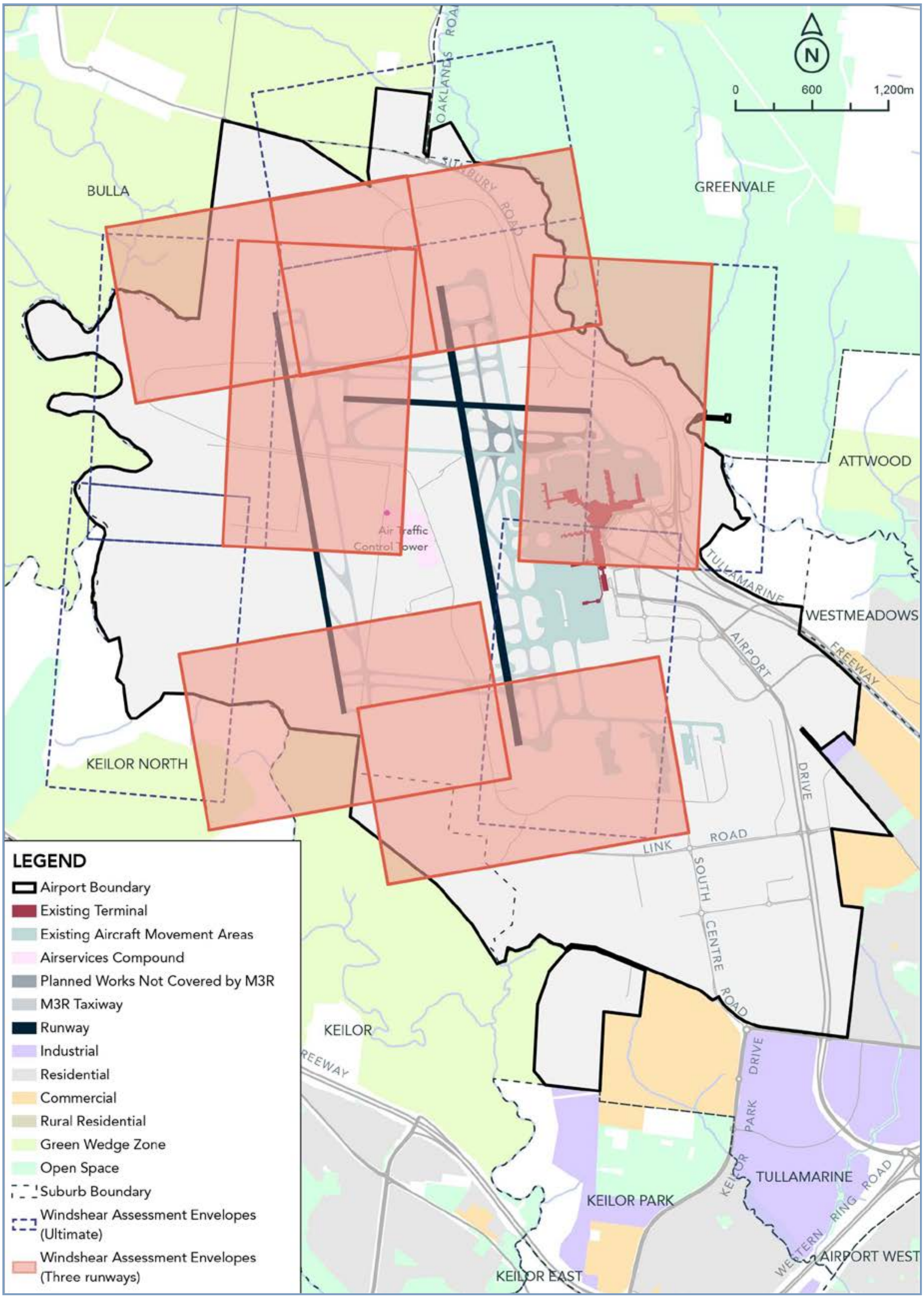
Figure C5.11
NASF Guideline B assessment trigger areas



Illustrative purposes - only not to scale.

Source: NASF Guideline B, 2013 and Melbourne Airport, 2020

Figure C5.12
Melbourne Airport windshear assessment envelopes (Ultimate with M3R shown)



Source: Rehbein, 2020

At the southern end of the proposed north-south runway (16R/34L) however, the runway 34L threshold will be about 350 metres from the airport boundary; and the extremity of the runway starter extension will be approximately 150 metres from the airport boundary. Risk to public areas south of the airport from jet blast will increase with M3R compared to the existing situation. The impact to public areas will be further assessed in the detailed design stages.

Melbourne Airport is required under Part 139 of CAS Regulations to ensure the safety of the public. It is therefore expected that a jet blast deflector fence will need to be provided at the southern end of the proposed north-south runway to offer protection from jet blast velocities to public areas south of the runway.

C5.6.9 Public safety impacts

Development of M3R will require the establishment of Public Safety Areas (PSAs) for the new north-south runway 16R/34L.

The distribution of aircraft movements between runways will change with the introduction of M3R, depending on the operating strategy applicable to parallel runway modes and to aid minimisation of aircraft noise impacts during sensitive periods (particularly at night). The distributions of aircraft movements expected with and without M3R for 2026 and 2046 are shown in **Figure C5.13** and **Figure C5.14**. These indicate that, as a result of the use of parallel runway modes, the numbers of aircraft movements passing to the east and west of the airport will reduce considerably.

Because individual risk levels are a function of the number and type of aircraft operations, change to the distribution of movements, together with increased overall traffic, will alter the levels of individual risk when calculated using the methodology described in **Section C5.2.1**.

It should be noted that the distributions of movements in the No Build scenarios are based on an expected average year. This has been assessed with reference to forecast operations and expected weather conditions drawn from 13 years of historic meteorological data. This is the same method used to determine the distributions of movements for M3R, and in aircraft noise and other impact assessments. Actual operations in any given year will vary from the average. Furthermore, predictions for future years used a forecast schedule and considered available modes of operation that can service the forecast demand. In future, higher capacity modes are forecast to be required more often. The distributions for the future No Build scenarios are therefore different to the actual operations recorded in 2019 and shown in **Figure C5.5**.

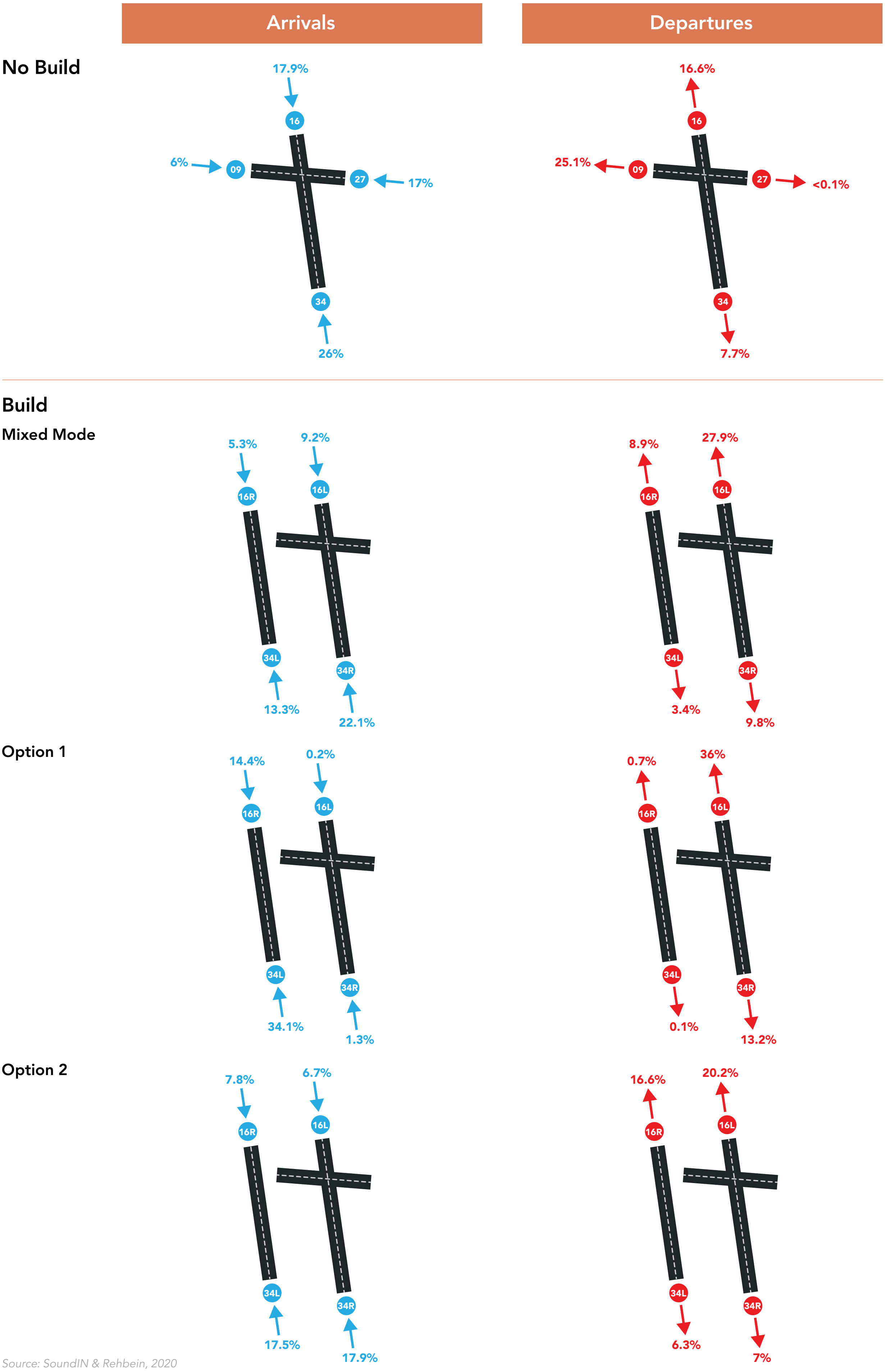
In addition to the new PSAs for the proposed north-south runway 16R/34L, estimated risk levels for the existing runway will vary in the Build scenario due to the increased number, and changed distribution of, aircraft movements compared with the No Build scenario.

The key considerations in assessing the impact of changes to public risk exposure are:

- Whether there are any existing land uses which would expose individuals to risk levels greater than one-in-10,000 per year, and which would require removal of existing incompatible development or other mitigation or management measures
- The extent of land in the one-in-100,000 estimated individual risk contour, within which restrictions on future development (due to PSA) would be inconsistent with the current planning scheme intent (as defined by the current zoning maps).

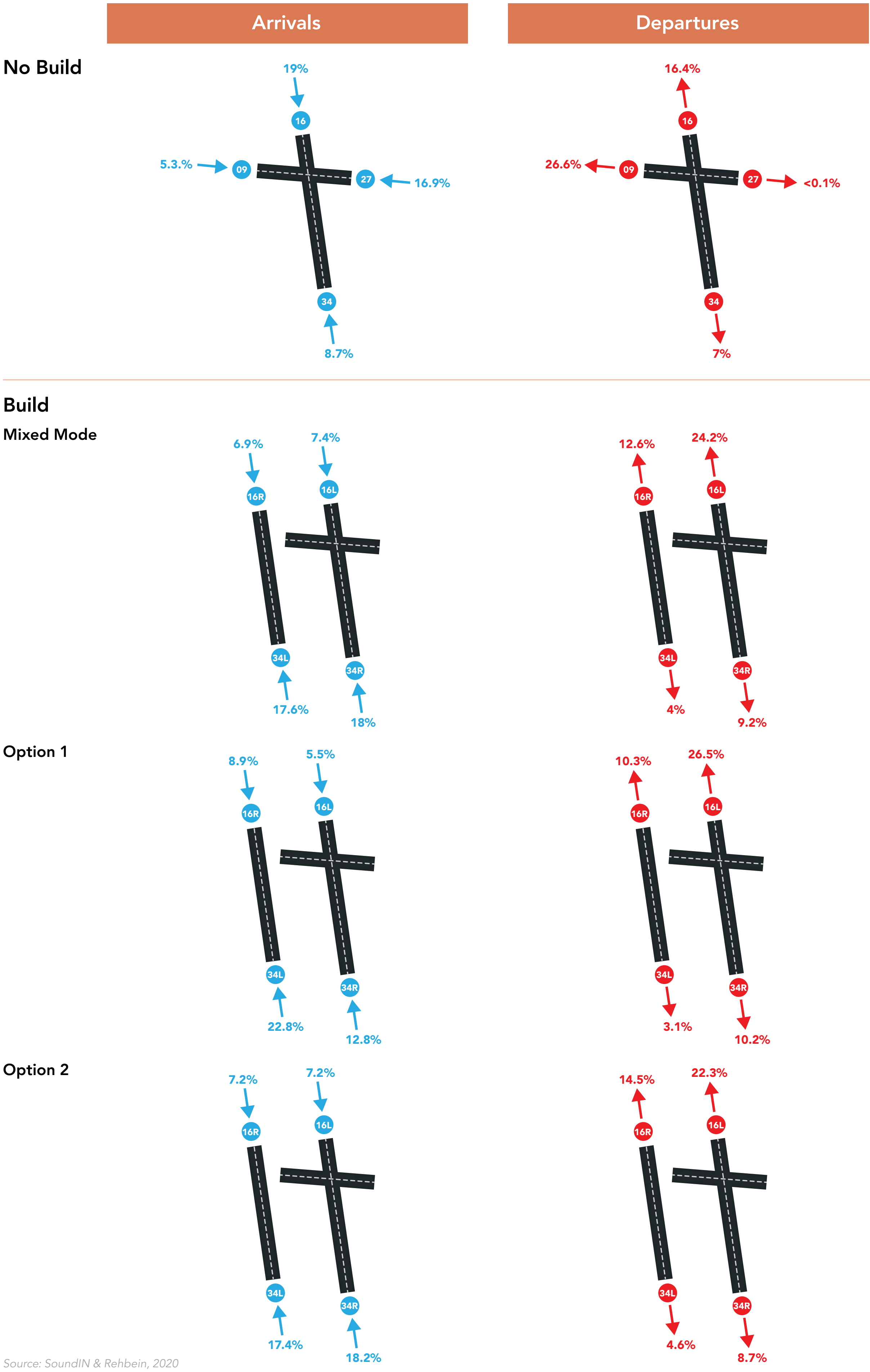
The impacts of changes in individual risk levels to third parties as a result of M3R are discussed separately in terms of existing (**Section C5.6.9.2**) and future (**Section C5.6.9.1**) development. This is because the general principle of PSAs is to manage the risks to the public by restricting new development rather than removing existing development.

Figure C5.13
Movement summary by runway end – 2026



Source: SoundIN & Rehbein, 2020

Figure C5.14
Movement summary by runway end – 2046



Source: SoundIN & Rehbein, 2020

C5.6.9.1 Impacts on future development

Figure C5.15 to Figure C5.18 show the following with respect to the runway ends, both with and without M3R, in 2026 and 2046 (calculations as per the methodology of Section C5.3.9):

- The estimated one-in-100,000 per year individual risk contour
- The estimated one-in-10,000 per year individual risk contour (calculated in the same manner)
- The level of incompatibility between the future land uses allowable under current Victorian Planning Scheme zoning and the public safety principles adopted in Queensland and the UK.

Because impacts vary with runway operating strategy, and this MDP presents options for segregated mode operations (when full mixed mode is not required for capacity reasons), the contours presented represent a composite worst-case of the potential impacts of all three options (i.e. full mixed mode, Option 1 and Option 2).

Figure C5.15 indicates that the extents of the one-in-100,000 individual risk contours in 2026 with M3R are largely contained within areas zoned compatible with the public safety principles (i.e. with minor or negligible incompatibility). The exception is an area south of the proposed runway, where the one-in-100,000 individual risk region extends across the Calder Freeway into existing residential areas.

Figure C5.17 indicates that, by 2046, the area of incompatible zoning in the one-in-100,000 individual risk contour increases south of the airport while remaining broadly the same to the north.

The one-in-10,000 individual risk contours are all contained within Melbourne Airport land in both the No Build and M3R Build scenarios (with the exception of the area south of the proposed 34L threshold, where the inner PSA extends outside the airport boundary in 2026 and 2046). These areas are the locations of existing development and discussed further under Section C5.6.9.2.

Table C5.9 summarises the extents of land in each zone that would be subject to levels of individual risk of one-in-100,000 or greater by 2046, with and without M3R.

The introduction of M3R would result in an increase of approximately 37 hectares of land within a level of individual risk of one-in-100,000 or greater (the majority being in land currently designated as Green Wedge Zone under the Planning Scheme). Approximately three hectares of land zoned for residential purposes, and approximately three hectares of industrial/commercial zoned land, would be affected.

Public safety risk east and west of existing east-west runway 09/27 is reduced with M3R. Modelling presented by M3R to date has not included use of Runway 09/27. This strategy was adopted to avoid understating the potential impacts of the primary parallel north-south operating modes.

Table C5.9
Estimated land affected by public safety contours by planning scheme zone in 2046

Zone	Without M3R (ha)	With M3R (ha)	Difference (ha)
Commercial 2 Zone	-	0.20	+0.20
Industrial 1 Zone	-	3.34	+3.34
Green Wedge Zone	16.06	59.10	+43.04
Green Wedge Zone (adjoining Sunbury Road corridor)	0.50	0.72	+0.22
Public Conservation and Resource Zone	9.32	-	-9.32
Public Park and Recreational Zone	-	0.36	+0.36
Neighbourhood Residential Zone	-	2.74	+2.74
General Residential Zone	-	0.07	+0.07
Public Use Zone 1 – Service and Utility	-	0.09	+0.09
Public Use Zone 5 – Cemetery/Crematorium	0.31	0.24	-0.07
Public Use Zone 6 – Local Government	-	0.13	+0.13
Public Use Zone 7 – Other Public Use	3.69	-	-3.69
Road Zone – Category 1	2.60	2.39	-0.21
Road Zone – Category 2	0.08	0.11	+0.03
Total	32.56	69.49	+36.93

Source: Rehbein, 2020

Runway 09/27 remains an important element of Melbourne Airport's operation following M3R. Feedback during the public exhibition clearly demonstrated community desire for its ongoing use for sharing noise, especially at night.

Melbourne Airport acknowledges that there is significant opportunity to introduce operating modes that promote use of Runway 09/27 with the objective of noise sharing. The process of detailed airspace design (pending approval of the M3R MDP) shall incorporate this objective and include updated noise modelling. Public safety risk will be updated post completion of detailed airspace design to reflect the use of Runway 09/27.

The impact of M3R on future land uses is, on balance, low in accordance with the significance framework of Table C5.4 and Table C5.5. There will be an increase in individual risk levels across some areas (to the south of the proposed north-south runway 16R/34L in particular) and a reduction in individual risk levels to the east and west. While there will be a net increase in areas subject to one-in-100,000 individual risk levels, they are generally already zoned for land uses broadly compatible with public safety principles (i.e. negligible or minor incompatibility as set out in Table C5.3). Those areas subject to higher impacts (moderate, high or major incompatibility) are generally the sites of existing development.

The resulting restrictions on future land uses as a result of M3R – even if a future planning control relating to PSAs in the vicinity of the airport were to be introduced – are expected to be limited.

C5.6.9.2
Impacts for existing land use

M3R will change the levels of individual risk experienced at the location of some existing infrastructure facilities and developments. However, these are considered minor in the context of the significance framework in Table C5.4 and Table C5.5.

Existing land use north of the existing north-south runway (16L/34R)

North of the existing north-south runway (16L/34R) the inner PSA (one-in-10,000 individual risk) remains within Melbourne Airport land in 2026 and 2046. The outer PSA (one-in-100,000 individual risk) extends across Sunbury Road, covering a width of approximately 110 metres in 2026 increasing to 175 metres by 2046. The risk levels in this area are slightly reduced with M3R Build compared with the No Build scenario (where the outer PSA would be approximately 185 metres wide crossing Sunbury Road in 2046).

Existing land use north of the new north-south runway (16R/34L)

North of the new north-south runway (16R/34L) the inner PSA (one-in-10,000 individual risk) remains within Melbourne Airport land in 2026 and 2046.

The outer PSA (one-in-100,000 individual risk) extends across Sunbury Road for a width of 75 metres in 2026, increasing to 105 metres in 2046.

North of Sunbury Road, the outer PSA extends across Green Wedge Zone land for approximately 1.8 kilometres at a width of 100 metres (gradually tapering). Two existing buildings would be within the outer PSA in 2026, and an additional existing building included by 2046.

Existing land use south of the existing north-south runway (16L/34R)

To the south of the existing north-south runway (16L/34R), in 2026 the inner PSA (one-in-10,000 individual risk) begins to extend south across Operations Road, increasing to a width of 30 metres by 2046. Without M3R, the inner PSA remains north of Operations Road in 2046.

The outer PSA covers a larger area to the south of the existing runway with M3R than with No Build. This is due to increased aircraft movement numbers and a greater proportion of arrivals than departures operating from the south. About 300 metres of Operations Road is within the outer PSA by 2046.

In 2026, the outer PSA is largely contained within Melbourne Airport land (except for a short section crossing Green Wedge Zone over the Hanson depot on Annandale Road and extending approximately 240 metres into industrial zoned land near Butler Way/ McGregors Drive in Keilor). By 2046, the outer PSA continues extending approximately 100 metres into the adjacent commercial zoned land to the south (Thomsons Road/Quinn Drive) narrowly encroaching the south-west corner of Keilor Park Recreation Reserve.

Existing land use south of the new north-south runway (16R/34L)

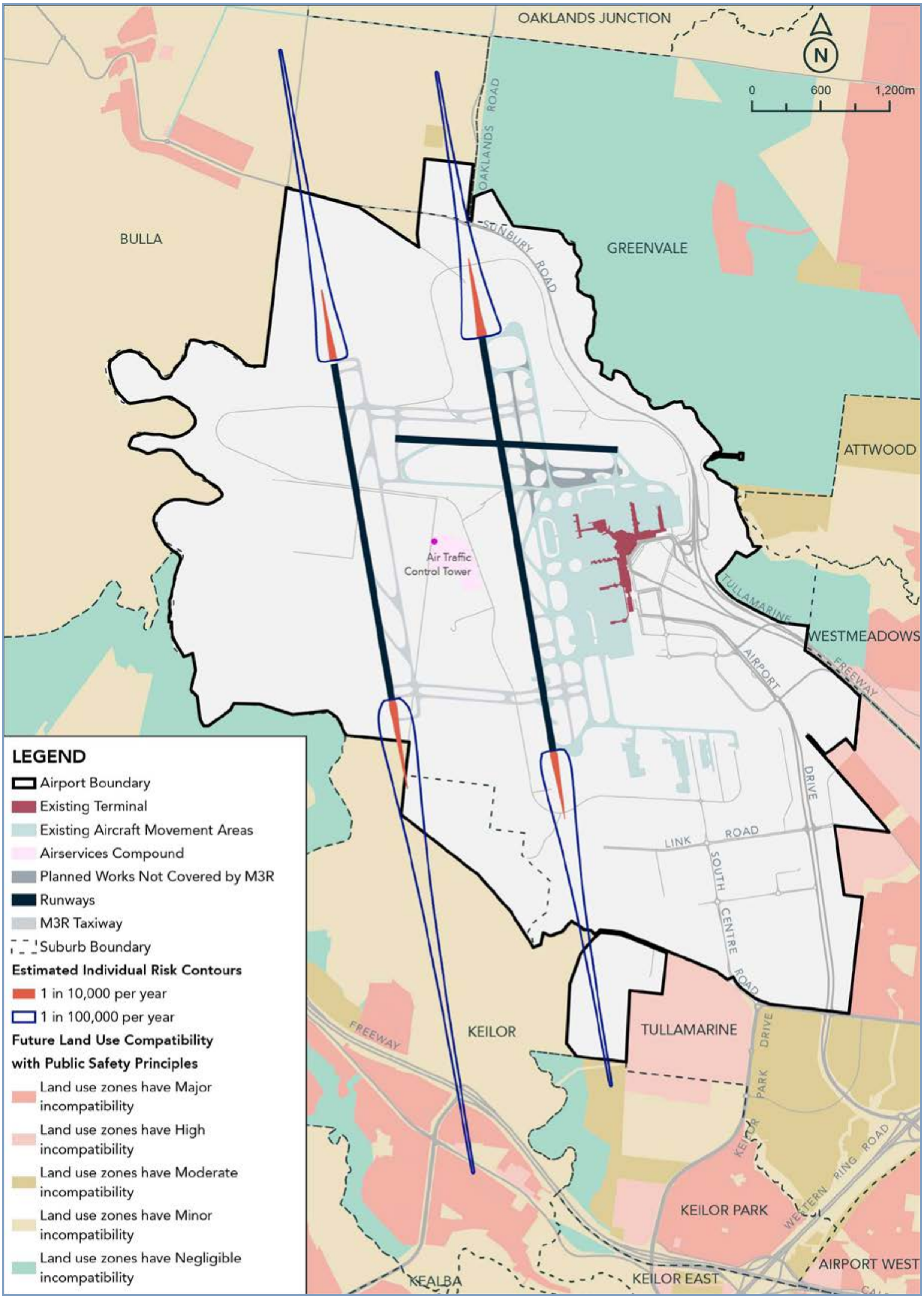
South of the new north-south runway (16R/34L), in 2026 the inner PSA (one-in-10,000 individual risk) will extend approximately 440 metres across Green Wedge Zone land south of Melbourne Airport's land boundary. And by 2046, extend to approximately 600 metres. The inner PSA will encompass part of an existing occupied property.

The majority of the outer PSA (one-in-100,000 individual risk) will cover Green Wedge Zone land including a few rural property buildings situated on M3R's extended runway centreline.

In both 2026 and 2046, the outer PSA will extend across the Calder Freeway (at a width of about 40 to 50 metres); and by 2046 extend onto existing residential development for a distance of approximately 1.2 kilometres south of the freeway. (The width of the outer PSA in this area is 20 to 40 metres.) It is estimated about 30 existing residential properties would be within the outer PSA in 2026, and about 60 properties by 2046.

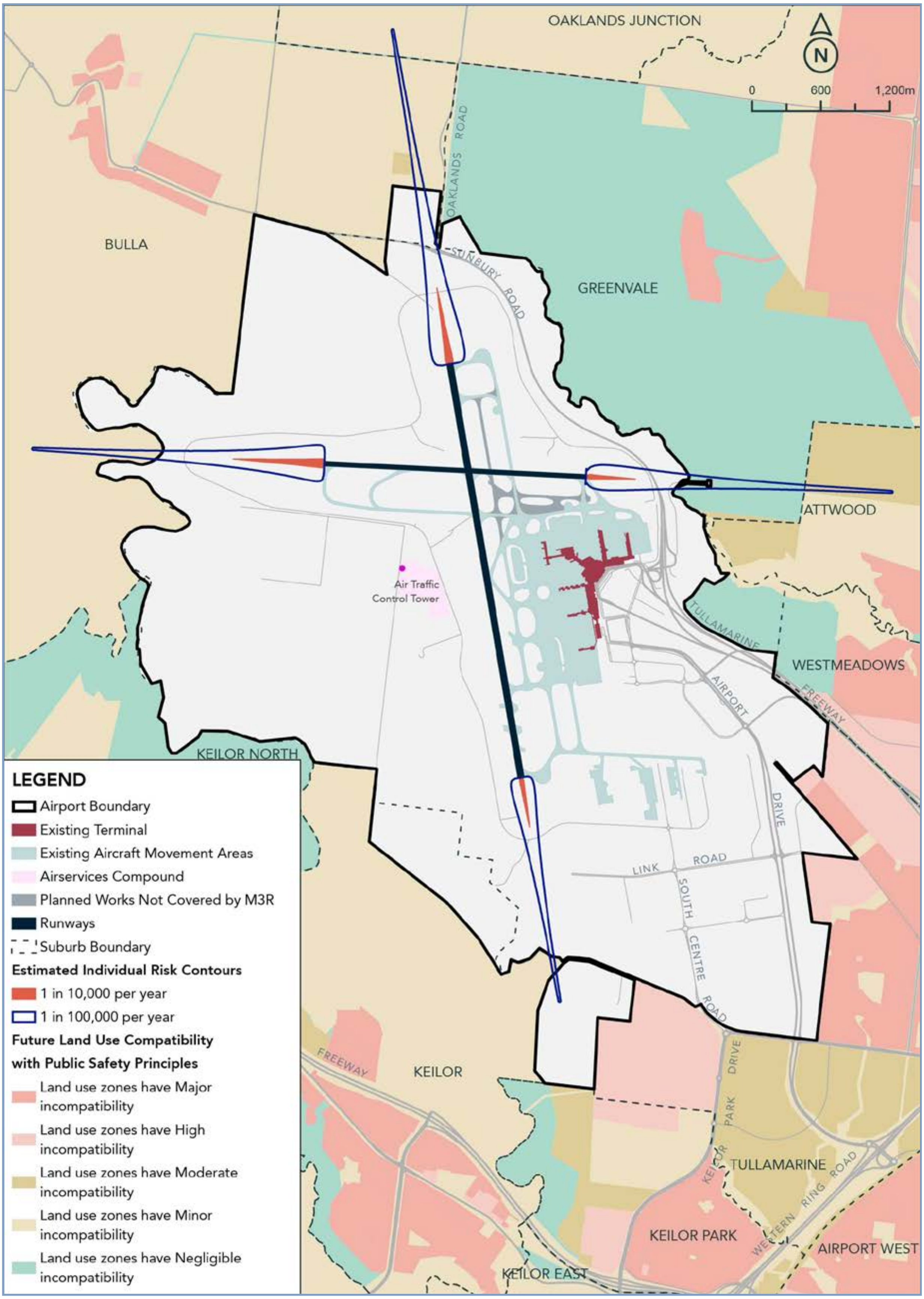
In comparison, the level of individual risk estimated to be experienced in residential areas under the worst case operating scenario is between one and two-in-100,000 per year. This compares with a risk level of 10-in-100,000 (i.e. one-in-10,000) at which the inner PSA would be established, and existing incompatible development considered for removal.

Figure C5.15
Estimated individual risk contour extents in 2026 – Build



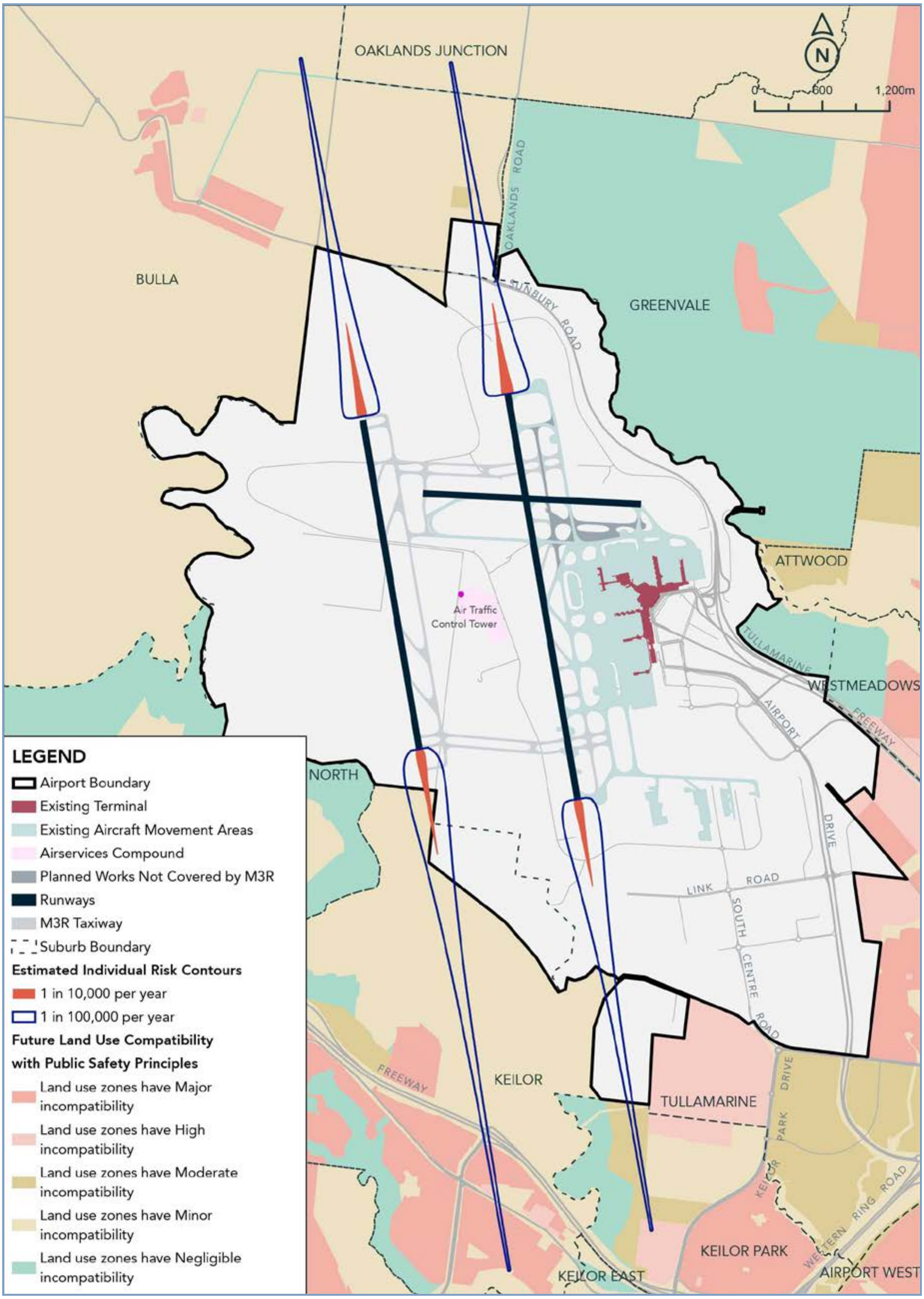
Source: Rehbein, 2020

Figure C5.16
Estimated individual risk contour extents in 2026 - No Build



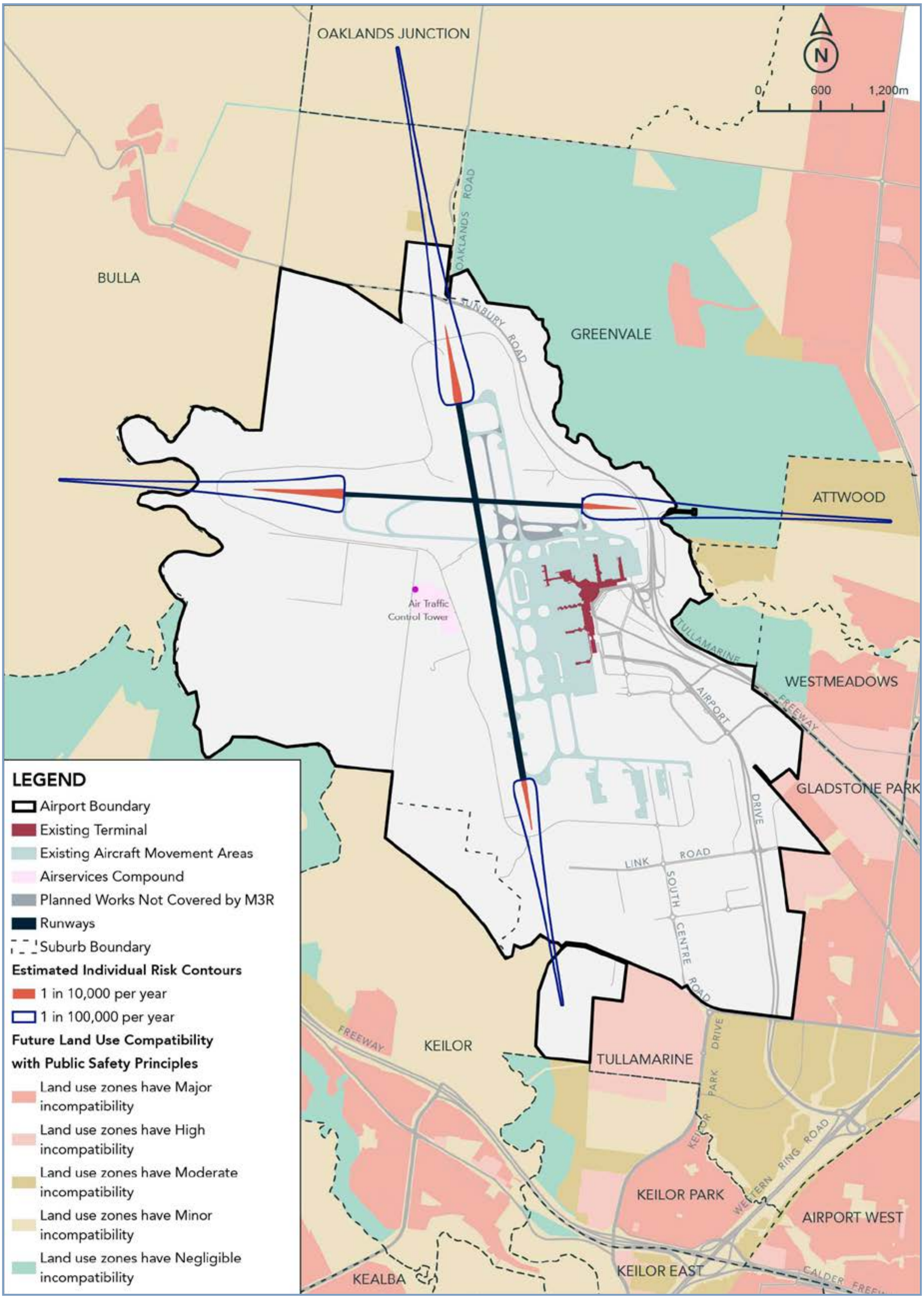
Source: Rehbein, 2020

Figure C5.17
Estimated individual risk contour extents in 2046 – Build



Source: Rehbein, 2020

Figure C5.18
Estimated individual risk contour extents in 2046 - No Build



Source: SoundIN & Rehbein, 2020

C5.6.10
Objects falling from aircraft

Over the past 17 years, the ATSB National Aviation Occurrence Database records 79 occurrences of Objects Falling From Aircraft (OFFA) within 50 kilometres around major Australian airports for air transport aircraft operations similar to those typically operating at Melbourne Airport (between August 2003 and November 2020). They were classified as incidents (77), serious incidents (1) and accidents (1). None caused any recorded major injuries or fatalities. Seven were in relation to operations to Melbourne Airport.

Over the same period, there have been an estimated 23 million air transport aircraft movements in Australia. This puts the frequency of occurrence of objects falling from these aircraft at approximately 3.4 per million aircraft movements Australia-wide. This can be considered a conservative estimate in relation to areas close to airport runways: many of the occurrences happened at indeterminate times during flight or on the runway itself.

In the area to the north of the new north-south runway 16R/34L (where movements are expected to average about 89,000 to 101,000 a year in 2046) the expected OFFA frequency is one object every 2.9 to 3.3 years.

To the south of the new north-south runway 16R/34L where slightly more movements are expected (approximately 100,000 to 121,000 per year on average by 2046), the expected frequency of OFFA is, conservatively, one falling object every 2.4 to 3.0 years.

Given the small and lightweight nature of many objects that occasionally fall from aircraft, and the large areas over which they tend to be distributed, the risk presented to any individual person or property is considered to be negligible.

C5.6.11
Construction hazards

Construction activities can potentially present hazards and risks to aircraft operations during the construction phase of M3R. These include:

- Intrusions into protected operational airspace by plant and equipment
- Interference with communication, navigation and surveillance aids by construction plant and equipment (see *Chapter A5: Project Construction*, Section A5.7)
- Confusion to pilots caused by changes to aerodrome movement area infrastructure and operating procedures
- Glare and confusion caused by lighting
- Dust which might reduce visibility or cause damage to aircraft engines
- Other foreign object debris from construction materials, including blasting
- Waste and areas of open exposed soil which might present food sources that attract birds to the area
- Security and access to the operational aerodrome by unauthorised personnel, including to the runway and taxiways.

Construction works on operational aerodromes are well-known procedures and therefore the risks associated with construction on and around live runways (and other aerodrome movement area facilities) are well understood.

Melbourne Airport (working in conjunction with its appointed contractor) is required to prepare a Method of Work Plan (MOWP) under Part 139 of the CAS Regulations. The MOWP will set out all the arrangements for ensuring the safe operation of aircraft during each stage of construction. The plan will be circulated to CASA, Airservices, aircraft operators and other relevant stakeholders before finalisation and acceptance by CASA. Once accepted, the plan will be implemented under constant supervision by suitably qualified and experienced aerodrome operational personnel competent in aerodrome safety management.

An essential part of the construction planning will be a Construction Management Plan (CMP) which Melbourne Airport will approve as part of its contract with the appointed M3R contractor. The CMP will include relevant measures for the mitigation and management of construction risks which works outside the aerodrome may generate (such as dust and bird management).

C5.7
AVOIDANCE, MANAGEMENT AND MITIGATION MEASURES

A number of potential hazards have been identified and assessed with respect to the impact of M3R. The majority of these are expected to have minor impact when managed in accordance with the existing aviation legislative controls (including those listed at Section C5.3.1) and measures discussed throughout Section C5.6.

C5.8
CONCLUSION

C5.8.1
Overview

This chapter presents an assessment of the principal risks presented by the operation of the new runway infrastructure related to M3R. These are:

- Intrusions into the operational airspace
- Lighting, reflectivity and glare
- Collisions with remotely piloted aircraft
- Windshear and turbulence
- Terrorism
- Jet blast impacts on public areas
- Wildlife (bird and bat) strike
- Aircraft accidents and public safety
- Objects falling from aircraft
- Construction hazards.

A summary of the severity, likelihood and risk rating for each risk is presented in **Table C5.10**.

The risks presented by all of the hazards, once mitigation measures are taken into consideration, are found to be low or negligible in terms of impact and are therefore considered acceptable.

C5.8.2
Risks to aircraft operations during construction

Risks during construction will be managed through standard operational safety and construction management practices in the vicinity of operational aerodromes; and be controlled by Melbourne Airport, CASA, Airservices and the M3R contractor in accordance with agreed statutory plans.

C5.8.3
Risks to aircraft operations after construction

The operational risks associated with intrusions into operational airspace, lighting, reflectivity and glare, collisions with remotely piloted aircraft, and terrorism against aircraft are considered to be adequately managed through the existing aviation legislative framework.

Risks due to jet blast impacts on public areas will be addressed through further study and the provision of an appropriate jet blast deflector at the southern end of the new north-south runway.

The risks to aircraft from wildlife hazards have been assessed by Melbourne Airport. No change to existing rates of wildlife strikes per 10,000 aircraft movements is expected as a result of the M3R.

C5.8.4
Risks to public safety due to aircraft crashes

The distribution of aircraft movements will change. It is dependent on the operating strategy applicable to parallel runway modes, along with the other changes to mode priorities that are proposed to help minimise of aircraft noise impacts during sensitive periods.

The extents of the one-in-100,000 individual risk contours in 2026 with M3R are largely contained within areas that are zoned such that intended future uses are broadly compatible with the public safety principles (minor or negligible incompatibility). The exception is an area to the south of the proposed north-south runway (16R/34L) where the one-in-100,000 individual risk region extends across the Calder Freeway into existing residential areas. By 2046, the area of incompatible zoning within the one-in-100,000 individual risk contour extends to the south of the airport.

The one-in-10,000 individual risk contours are contained within the Melbourne Airport land in both the No Build and Build scenarios. The exception is the area south of the proposed 34L threshold, where the inner PSA extends outside the airport boundary in 2026 and 2046.

In line with *NASF Guideline I Managing the Risk in Public Safety Areas at the Ends of Runways*, the impacts of estimated changes in individual risk levels on future development at Melbourne Airport have been assessed with reference to the policy currently adopted in the UK and in Queensland. The land uses allowed under the zoning within the current Planning Scheme are broadly compatible with the public safety principles adopted by the policies referred to. Some areas of existing incompatible development may fall within the outer PSAs associated with the existing and new north-south runways, predominantly to the south of the airport. However, at the individual risk levels estimated, NASF Guideline I public safety area policy does not trigger consideration of removal of these existing incompatible developments.

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Table C5.10
Risk assessment summary

Environment aspect & baseline condition	Assessment of original impact: Original Impact	Mitigation inherent in design/practice	Duration	Significance: Severity	Likelihood	Impact
Construction						
Construction impacts (negligible risk)	Without mitigation and management measures and controls, possible risks to safety or aircraft operations due to construction activities	Construction Management Plan	Short-term	Moderate	Unlikely	Low
Operation						
Intrusions into operational airspace (No significant intrusions)	The M3R will not introduce any significant intrusions into operational airspace	Aviation Legislative framework	Long-term	Minor	Unlikely	Low
Lighting, reflectively and glare (No significant issues)	Without mitigation and management measures and controls, M3R may cause some existing features to become a consideration	Previous planning and safeguarding strategies	Short-term	Minor	Unlikely	Low
Wildlife strike (3.1 strikes per 10,000 aircraft movements)	No change to existing wildlife strike rates	Current on-airport wildlife hazard management practices are continued. Land-use planning off-airport takes account of NASF Guideline C	Long-term	Negligible	Almost certain	Low
Collisions with RPAS (not known)	No change to existing	Aviation Legislative controls	Long-term	Minor	Possible	Low
Windshear and turbulence (Existing airport buildings are outside the assessment trigger areas of NASF Guideline B for proposed runway 16R/34L)	No impact	NASF Guideline B for building generated windshear and turbulence	Permanent	Minor	Unlikely	Low
Terrorism (not known)	M3R will not change likelihood of terrorism	Aviation Legislative controls	Short-term	Moderate	Rare	Low
Jet blast impacts on public areas (no impacts outside the airfield)	M3R will place southern end of new north-south runway (16R/34L) close the airport southern boundary	Jet blast deflector fence to be installed at southern end of runway 34L	Permanent	Negligible	Unlikely	Negligible
Aircraft accidents and public safety (Public safety risks predominate to north and south. Some risks exist to east and west of existing runway (09/27).	M3R will change patterns of aircraft movements and allow increased total traffic. Without mitigation and management measures and controls, this will increase risk to individuals from aircraft crashes in some existing land uses	Future planning for compatible land uses	Medium-term	Minor	Unlikely	Low
Objects falling from aircraft (negligible risk)	Areas to north and south of proposed north-south runway (16R/34L) will be exposed to the possibility of objects falling from aircraft	Aviation Legislative framework	Medium-term	Minor	Rare	Negligible

Mitigation and/or management measures	Assessment of residual impact				
	Residual Impact	Duration	Significance		
			Severity	Likelihood	Impact
Construction (cont.)					
N/A	N/A	N/A	N/A	N/A	Low
Operation (cont.)					
Aeronautical assessment of existing intrusions and removal/mitigation in accordance with aviation legislative framework	No impact	Permanent	Minor	Rare	Negligible
	N/A	N/A	N/A	N/A	Low
N/A	N/A	N/A	N/A	N/A	Low
N/A	N/A	N/A	N/A	N/A	Low
Additional investigations of building and non-building generated windshear and turbulence to be conducted, in exceedance of NASF Guideline requirements	Mitigations will better prepare pilots and Airservices to recognise the potential for exceedances and to manage them if they occur. Mitigations will provide Airservices and pilots more ability to avoid potential exceedances	Permanent	Minor	Unlikely	Low
N/A	N/A	N/A	N/A	N/A	Low
N/A	N/A	N/A	N/A	N/A	Negligible
N/A	N/A	N/A	N/A	N/A	Low
N/A	N/A	N/A	N/A	N/A	Negligible

Chapter D1
Community – Introduction

Overview

Part D of the Melbourne Airport's Third Runway (M3R) Major Development Plan (MDP) describes the potential impacts of the project in relation to economic, health and social matters. It includes the following chapters:

Chapter D2: Economic Impact Assessment describes the economic impacts and benefits of M3R for Melbourne Airport, stakeholders (including airlines), passengers and other customers, local communities, Victoria and Australia.

Chapter D3: Health Impact describes the potential implications on public health and community values resulting from M3R. The assessment includes a review of the cumulative effects on public health values and occupational health and safety impacts on the community, workforce and regional health services from all components of M3R. The assessments includes discussion of hazards and risks related to noise, vibration and water and air quality.

Chapter D4: Social Impact provides an assessment of the potential social impacts and benefits to the surrounding community associated with the ground-based and airspace changes for construction and operation of M3R. The chapter summarises community facilities and residential areas likely to experience significant effects resulting from M3R. Mitigation measures designed to minimise adverse impacts, and enhance social benefits, are described.


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Chapter D2 Economic Impact Assessment

Melbourne Airport's two existing runways had already reached functional capacity by 2019. By the mid-2020s, as travel recovers from the impact of COVID-19, the airport's capacity will be exceeded. The expected results of this are an increased risk of delays, higher airfares and fewer flights.

The proposed third runway, M3R, is therefore designed to ensure Melbourne Airport can meet this growing demand.

The significant and wide-ranging economic benefits of M3R, both locally and state-wide, include:

- The direct and indirect creation of 10,700 jobs in Victoria during the construction period
- The creation of 3,900 new jobs in Victoria within five years of M3R opening, which will grow to 37,000 jobs throughout Victoria by 2046
- The creation of 3,222 new jobs within the airport site by 2046
- An increase in Victoria's gross state product (GSP) of $4.6 billion by 2046
- More frequent flights at cheaper prices, leading to greater flexibility for travellers
- Increased tourism expenditure throughout Melbourne and Victoria
- A $468 million saving of travellers' time due to reduced airport congestion and fewer delays
- A $2.35 billion reduction in airport and airline operating costs from this reduced congestion
- The total net benefit of the third runway to Victoria is estimated at between $4.82 and $14.70 for each dollar invested
- Recent research on 30 years' of real-estate sales found that suburbs with exposure to aircraft noise had very similar sales trends and investment performance to suburbs with little to no aircraft noise

Should M3R not be built, Victoria risks forgoing the additional airport capacity that would facilitate economic growth and jobs growth – particularly in transport, accommodation and food services, and retail.


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D2.1
INTRODUCTION

This chapter describes the economic impact on the study area, and the applicable legislation and policy requirements of Melbourne Airport's Third Runway (M3R) major development project. The economic analysis considers the impact of the construction of a new parallel north-south runway (16R/34L), works to optimise the existing east-west runway (09/27) and associated taxiways and supporting infrastructure. This work was undertaken for Melbourne Airport by consulting firm SGS Economics & Planning Pty Ltd (SGS) and the Centre of Policy Studies (CoPS) at Victoria University.

D2.2
OVERVIEW

Melbourne is a global city with a rapidly growing population and economy. Between 2001 and 2019, Melbourne grew from 3.5 million to 5.1 million residents. Between 2000 and 2009, Melbourne contributed 19.1 per cent to Australia's GDP growth, and 23.8 per cent of the GDP growth 2010-19. In 2018-19 Melbourne's economy grew by 4 per cent, the highest growth rate of any Australian capital.

The advent of COVID-19 in 2020 has substantially disrupted Melbourne's growth. However, it is highly likely that economic and social activity requiring interstate and international connectivity will recover to a healthy growth trajectory within the decade. There may be some long-term changes in behaviour as a result of COVID-19 (e.g. remote working may become more common, interstate travel for meetings may be replaced by teleconferences, and shopping that moved online during the pandemic may never return to traditional formats). However, lockdowns have demonstrated that virtual interaction is a meagre substitute for human interaction, and that our drive to travel for exploration, adventure, growth and connection is innate.

This analysis assumes that passenger numbers will return to the trend predicted in the 2019 passenger number projections by the time M3R is operational. Detailed rationale for this assumption is provided in A2: Need for the Project.

While it is not possible to precisely model the aviation industry's recovery, it is expected that the 2019-equivalent activity will return by 2024 (IATA, 2020). When this occurs, the Melbourne economy will return to a growth state. Expansion of the metropolitan economy is generated by, and necessitates greater levels of, business activity, exports and tourism.

All these activities will require significant interstate and international connectivity. Infrastructure investments ranging from new rail lines to port expansions to the rollout of the NBN network are critical to ensure that Melbourne is integrated into the national and global economy.

Considerable investment in new infrastructure will be required to support a larger Victorian population and economy as it returns to growth post-COVID. Air travel is a key element of this infrastructure challenge. To meet the needs of a growing population and economy, increased capacity at Melbourne Airport will be required.

D2.3
METHODOLOGY AND ASSUMPTIONS

Two forms of economic analysis were used in this evaluation.

The first is an Economic Impact Assessment (EIA). This identifies the economy-wide impacts of the project, not only during its construction phase but also from increased ongoing operational activities, the business and leisure travel generated by increases in flights and flow-on effects throughout the economy.

The second method is a Cost Benefit Analysis (CBA). This calculates the present value of benefits generated by the project then subtracts the present value of the costs to determine whether there is a net benefit to the community over the long term.

Both these analyses draw on similar data. However, the presentation and interpretation of this data differs significantly between the two forms of economic analysis.

D2.3.1
Economic impact analysis

The economic impact analysis uses a modelling approach known as Computable General Equilibrium (CGE).

CGE examines how a project will affect the economy through all of the inter-industry flows in that economy (i.e. the linkages between industries). The model captures the initial effect or impact of the project (known as the economic stimulus) and traces all of the 'multiplier' or 'flow-on' effects in the economy. These flow-on impacts refer to both production-induced impacts and consumption-induced impacts. The final result is an overall assessment of the total economic contribution of the project to the economy – at the local, regional, state and national levels.

Production-induced effects relate to how local upstream industries (e.g. suppliers of raw materials in the construction process) benefit from the increased demand for their goods and services as a result of gaining supply contracts and how this leads to increases in their own local purchasing, enabling them to service these supply contracts. Consumption induced effects relate to the increased spending of wage and salary earners.

CGE modelling moves beyond a relatively restricted assessment of the output effects of proposed developments provided by traditional Input-Output (IO) analysis to a broader welfare framework favoured by policymakers when considering alternatives involving government expenditure of this nature. This type of modelling is underpinned by IO data, and so still captures the linkages and flow-on effects described in the low-fidelity option. But includes behavioural equations consistent with economic theory allowing for changes in prices, consumer and producer behaviour, responsive shifts in investor activity and the like.

Importantly, CGE models are able to identify the availability of labour and other resources in local regions. They can test whether there are sufficient unemployed resources in an area to meet the needs of each project, or whether prices or wages will need to increase to attract resources to the area. In addition, CGE models are able to consider issues such as the opportunity cost of spending measures in a single, robust and consistent economic framework.

The reason why CGE modelling is the preferred methodology of Commonwealth and Victorian governments is because of this ability to consider both competition for resources and the opportunity cost of spending measures.

The analysis in this report relies on applications of the Victoria University Regional Model (VURM). This is the rebranded version of the Monash Multi-Regional Forecasting model (MMRF). The change of name reflects the Centre of Policy Studies' (CoPS) move from Monash University to Victoria University in 2014. VURM is a dynamic economic model of Australia's six states and two territories. It models each region as an economy in its own right. For example, it contains region-specific prices, consumers and industries. Technical documentation of the model equations and database can be downloaded from the VURM website (Adams, Dixon and Horridge, 2015).

VURM is a dynamic, multi-sector, multi-region model of Australia, outlined in detail by Adams, Dixon and Horridge (2015). At the state/territory level, it is a fully specified bottom-up system of interacting regional economies. A top-down approach is used to estimate the effects of the policy at the sub-state level.

D2.3.1.1
The nature of markets

VURM determines regional supplies and demands of commodities through optimising behaviour of agents in competitive markets. Optimising behaviour also determines industry demands for labour and capital. Labour supply at the national level is determined by demographic factors; while national capital supply responds to rates of return. Labour and capital can cross regional borders in response to relative regional employment opportunities and relative rates of return.

The assumption of competitive markets implies equality between the basic price (i.e. the price received by the producer) and marginal cost in each regional sector. Demand is assumed to equal supply in all markets other than the labour market (where excess supply conditions can hold). The government intervenes in markets by imposing ad valorem (according to value) sales taxes on commodities. This places wedges between the prices paid by purchasers and the basic prices received by producers. The model recognises the margins (e.g. retail trade and road transport) which are required for the movement of commodities from producers to the purchasers. The costs of the margins are included in purchase prices of goods and services.

D2.3.1.2
Demands for inputs to be used in the production of commodities

VURM recognises two broad categories of inputs: intermediate inputs and primary factors. Firms in each regional sector are assumed to choose the mix of inputs that minimises the costs of production for their levels of output. They are constrained in their choices by a three-level nested production technology.

D2.3.1.3
Domestic final demand: household, investment and government

In each region, the household buys bundles of goods to maximise a utility function subject to an expenditure constraint. The bundles are combinations of imported and domestic goods, with domestic goods being combinations of goods from each domestic region. A Keynesian consumption function is used to determine aggregate household expenditure as a function of household disposable income.

Capital creators for each regional sector combine inputs to form units of capital. In choosing these inputs, they minimise costs subject to a technology similar to that used for current production, with the main difference being that they do not use primary factors directly.

State and territory governments and the Commonwealth Government demand commodities from each region. In VURM, there are several ways of handling these government demands, including:

- By a rule such as moving government expenditures with aggregate household expenditure, domestic absorption or Gross Domestic Product (GDP)
- As an instrument to accommodate an exogenously-determined (i.e. externally influenced) target, such as a required level of government budget deficit
- Exogenous determination.

D2.3.1.4
Foreign demand (international exports)

In the VURM, each export-oriented sector in each state or territory faces its own downward-sloping foreign demand curve. Thus, a shock that reduces the unit costs of an export sector will increase the quantity exported, but reduce the foreign currency price. By assuming that the foreign demand schedules are specific to product and region of production, the model allows for differential movements in foreign currency prices across domestic regions.

D2.3.1.5
Regional labour markets

The response of regional labour markets to policy shocks depends on the treatment of three key variables: regional labour supplies, regional unemployment rates and regional wage differentials. The main alternative treatments are:

- To set regional labour supplies and unemployment rates exogenously and determine regional wage differentials endogenously (i.e. within the region)
- To set regional wage differentials and regional unemployment rates exogenously and determine regional labour supplies endogenously (via interstate migration or changes in regional participation rates)
- To set regional labour supplies and wage differentials exogenously and determine regional unemployment rates endogenously.

The second treatment is the one adopted for this study, with regional participation rates exogenously determined. Under this treatment, workers move freely (and instantaneously) across state and territory borders in response to changes in relative regional unemployment rates. With regional wage rates indexed to the national wage rate, regional employment is demand determined.

D2.3.1.6
Physical capital accumulation

Investment undertaken in year '*t*' is assumed to become operational at the start of year '*t*+1'. Under this assumption, capital in industry '*i*' in region '*q*' accumulates according to a relatively simple equation: capital now equals capital previously after depreciation plus investment.

Investment in year '*t*' is explained via a mechanism that relates investment today with expected rate of return.

While this is not entirely accurate for M3R (as M3R investment is not assumed to become operational until some years after the investment) it is unlikely to lead to any unreasonable distortion in the analysis.

D2.3.1.7
Lagged adjustment process in the national labour market

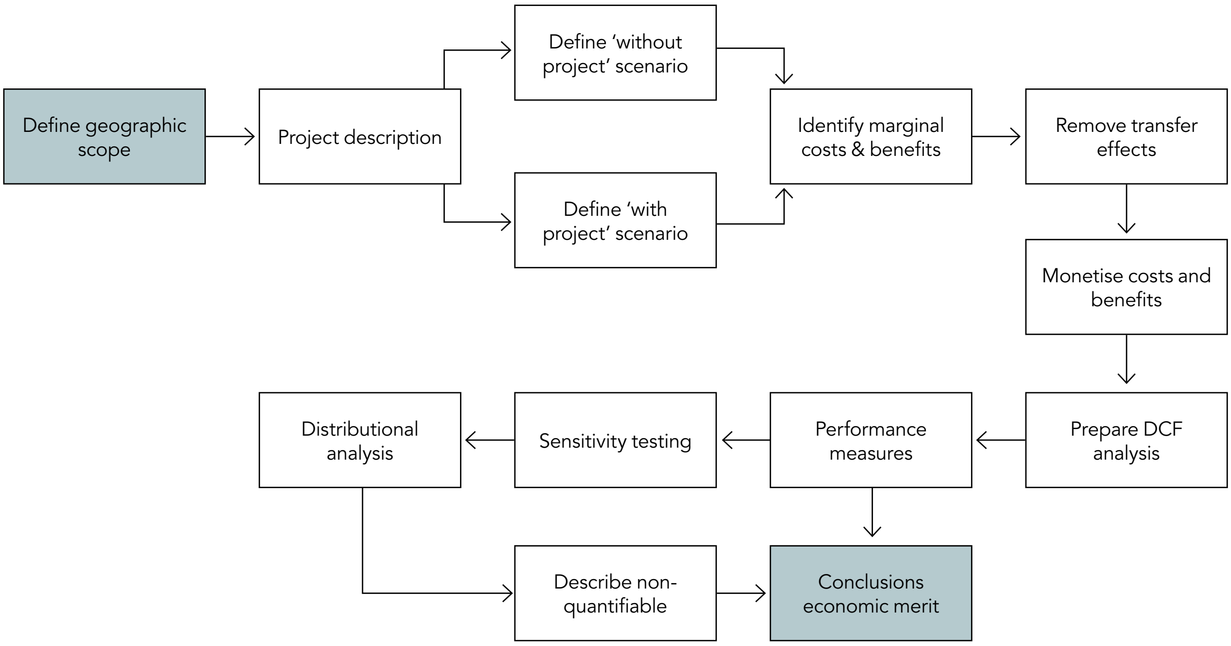
The simulations undertaken for this report are year-to-year recursive-dynamic simulations, in which it is assumed that deviations in the national real wage rate from its No Build level increase through time in inverse proportion to deviations in the national unemployment rate. That is, in response to a shock-induced increase (or decrease) in the unemployment rate, the real wage rate declines (or increases), stimulating (or reducing) employment growth. The coefficient of adjustment is chosen so that effects of a shock on the unemployment rate are largely eliminated after about 10 years.

Given the treatment of regional labour markets, if the national real wage rate rises (or falls) in response to a fall (or rise) in the national unemployment rate, then wage rates in all regions rise (or fall) by the same percentage amount, and regional employment adjusts immediately, with regional labour supplies adjusting to stabilise relative regional unemployment rates.

D2.3.2
Cost benefit analysis

CBA differs from EIA in that it takes into account external or unpriced impacts, such as congestion, time savings and the like, as well as impacts on the number or size of commercial transactions (such as more travel ticket sales and greater exports). Conventionally, CBA also deals only with the direct or first-round effects of the initiative under consideration, whereas EIA tracks successive rounds of multiplier effects.

Figure D2.1
Cost Benefit Analysis method



Source: SGS Economics and Planning, 2020

As specified in the Victorian Guide to Regulation, a CBA must address the full spectrum of environmental, social and business impacts of the proposal at hand. Positive and negative effects are quantified and monetised (i.e. expressed in dollar terms) as far as possible and then compared to arrive at a conclusion as to whether the proposal is likely to make the community better off or worse off in net terms compared with persevering with business-as-usual conditions.

The principal steps in the generic CBA method are summarised in the **Figure D2.1**.

These steps include:

- Differentiating between the outcomes under a 'business as usual' or No Build scenario (for example, continuing with the existing Melbourne Airport configuration) and those arising with alternative Build cases, including building M3R and alternative airport upgrades
- Identifying the economic, social and environmental costs and benefits that might arise in moving from the No Build to the Build case
- Quantifying and monetising these costs and benefits, where possible, over a suitable project evaluation period (in this case 26 years) and with due acknowledgment of ongoing benefits and costs
- Generating measures of net community impact using discounted cash flow techniques over the 26 years in question. This requires expression of future costs and benefits in present value terms using a discount rate that is reflective of the opportunity costs of resources diverted to the implementation of the Build case
- Testing the sensitivity of these measures to changes in the underlying assumptions utilised
- Supplementing this quantitative analysis with a description of costs and benefits that cannot be readily quantified and monetised.

All impacts of the proposed project versus No Build should be taken into account, whether or not they are traded effects or externalities.

Traded effects have a market price. Externalities, on the other hand, are unpriced costs and benefits sustained by third parties in any market transaction. The CBA must account for these impacts even though they are not directly mediated (bought and sold) in the market. The monetised value of these external effects needs to be imputed using a variety of techniques as advised by Department of Treasury and Finance in its Cost Benefit Analysis Toolkit (Department of Treasury and Finance, 2014).

The key characteristic of CBA is that the community benefit delivered by the investment at hand is judged by reference to the Kaldor-Hicks rule, which states that the initiative in question is worth undertaking if the gain in welfare by the beneficiaries is greater than the loss in welfare for those adversely affected. In other words, a particular Build case would be warranted if the beneficiaries could, if required, compensate those adversely affected and still be better off. This is where the term 'net community benefit' comes from. Whether such compensation is actually paid is not material.

There are some common pitfalls in assessment of net community benefit of projects like M3R. One is to confuse economic impact with economic benefit. As explained, the former deals with the commercial flow on effects of an initiative or program (for example, sales made, people employed and suppliers contracted), while the latter relates to an improvement in community welfare.

For example, a 10 million dollar construction contract to dig a long trench then fill it up again would generate the same economic impact (i.e. multiplier) as a 10 million dollar contract using the same equipment and workers to undertake earthworks for the improvement of parkland. The economic benefit, that is, boost to societal welfare, from the latter is clearly superior to the former.

Another pitfall is to construe construction and operational jobs as a 'benefit' of a proposal whereas they are typically factored into cost benefit analyses as a cost. This is because the labour in question has an opportunity cost (it could be deployed elsewhere to produce benefits for the community were it not for the project at hand). Employment is usually only counted as a benefit when the project creates jobs for people who would otherwise be permanently unemployed or underemployed.

For these reasons the Victorian Department of Treasury and Finance advises that the use of economic multipliers should generally be avoided in economic (CBA) evaluations. However, as explained, they are an integral element in EIAs.

A third common misapplication of economic thinking to the net community benefit test in urban policy and project evaluation is to implicitly or explicitly confine the analysis to the local district or host region of the development in question. In line with usual advice offered by Commonwealth and Victorian treasury departments, net community benefit should be assessed at the state level. Otherwise a net community benefit may be found for the local area, but this might be more than offset by transfers or external costs for neighbouring communities or the host metropolitan area or state, for example.

A Build case must be demonstrated to generate a net community benefit at the state and Commonwealth levels but not necessarily at the local or district levels.

D2.3.3
Scope of impact coverage EIA versus CBA

Because of their different aims and methods, the EIA and CBA of the impacts of the new north-south runway have overlapping but different coverage of effects as shown in the following Table D2.1.

Table D2.1
Coverage of Economic Impact Assessment (EIA) and Cost Benefit Analysis (CBA)

Impact	EIA	CBA
Costs		
Costs of additional runway construction	✓	✓
Additional landside airport operational costs	✓	✓
Additional airside operational costs once runway is built	✓	✓
External costs – noise nuisance / health impacts		✓*
Benefits		
Time savings / greater reliability for air travellers		✓
Induced additional air travel from greater availability of reliable flights (domestic airfares)	✓	✓
Reduced delays in airside operations		✓
Greater domestic tourism in Victoria	✓	
Greater tourism exports and business visitation (net)	✓	✓
Greater net freight exports from greater export capacity		✓**
Agglomeration driven productivity gains		✓**

Source: SGS Economics and Planning, 2020
**Covered elsewhere in M3R MDP **Covered qualitatively only*

D2.3.4
Assumptions

To assess the economic impacts of the new north-south runway, a number of assumptions have been made.

Under the No Build scenario, demand for air services at Melbourne Airport continues to grow at the same rate, but supply of air services is constrained by the lack of runway space. Under the Build scenario, air services are not constrained and continue to grow in line with demand. Demand for air services is based on projections prepared by Melbourne Airport in 2019. Air services demand is assumed to return to its pre-COVID trend before the third runway is operational.

Population growth by state is assumed to be in line with Australian Bureau of Statistics population projections (ABS, 2018). The economic assumptions from the analysis of the north-south runway have been updated to take into account the lower growth environment that has emerged between 2016 and 2020, with lower wage and productivity growth.

The additional runway projection deviates from the No Build case due to different assumptions for airport visitor spending in Victoria and construction expenditures directly associated with the new north-south runway. Simulation design for the alternative scenario is discussed in Section D2.3.6.

D2.3.5
Impact of COVID-19 on long-term passenger forecasts

For the purposes of this analysis it is assumed that passenger numbers will return to the trend predicted in the 2019 passenger number projections by the time the third runway is operational. This is consistent through analyses conducted for this project (such as noise and environmental impact modelling). To allow for the risk that passenger demand does not return to trend by 2026, a sensitivity analysis has been conducted.

D2.3.6
Design of the M3R simulation

The alternative simulation is based on estimates of construction expenditures and projections for airport visitor spending in Victoria, as generated by SGS. These give information by year (2019 to 2046) and type of visitor spending (international and interstate) but not by tourism product. In the modelling, the SGS generated expenditure projections were spread over four products in line with existing shares of tourism spending. These four products were:

- Accommodation hotels and cafes
- Road transport services
- Air transport services
- Recreation and other services.

Together, the industries producing these products are referred to as the tourism industry. Details of the industries used in VURM are shown in Table D2.2.

Changes in visitor spending are imposed via a combination of model-determined changes in visitor preferences for air travel to Victoria (demand-side changes) and changes in capital used for production in the tourism industries (supply-side changes). The demand and supply-side changes are calibrated to achieve the expenditure increases projected, while keeping the price of tourism services unchanged.

A key consideration in the simulation design is the extent to which the changes in visitor travel to Victoria are offset by changes in travel elsewhere. More specifically, if the expansion of Melbourne Airport leads to greater visitor spending in Victoria, to what extent does that lead to less visitor spending in the rest of Australia? The degree of this crowding out will clearly affect the Australia-wide consequences of M3R. There is no empirical information to assist in answering this question. Accordingly, for the current modelling we take a conservative approach: it is assumed, relative to No Build values, that increased visitor spending in Victoria is accompanied by reduced visitor spending in the rest of Australia that exactly offset the changes in Victoria. Thus, for Australia as a whole, the initial impact of the visitor expenditure changes is assumed to be zero – this is considered a conservative assumption.

D2.3.7
Behaviour of the macro-economy in policy simulations

D2.3.7.1
Operation of labour markets

At the national level, because the initial impact of the expenditure changes is zero, there is negligible impact on national employment and the national real wage rate. At the regional level, labour is assumed mobile between state economies. Labour is assumed to move between regions to maintain interstate unemployment-rate differentials at their No Build levels. Accordingly, regions that are relatively favourably affected by the expenditure changes will experience increases in their labour forces as well as in employment, at the expense of regions that are relatively less favourably affected.

D2.3.7.2
Determination of private consumption and investment

Private consumption expenditure is determined via a consumption function that links nominal consumption to Household Disposable Income (HDI). HDI includes labour and capital income net of income that accrues to foreigners. In the alternative simulations, the national average propensity to consume is an endogenous variable that moves to ensure that the balance on current account in the balance of payments remains at its No Build level.

Investment is allowed to deviate from its No Build value in line with deviations in expected rates of return on the industries' capital stocks. In the alternative scenario, VURM allows for short-run divergences in rates of return from their No Build levels. These cause divergences in investment and hence capital stocks that gradually erode the initial divergences in rates of return. Provided there are no further shocks, rates of return revert to their No Build levels in the long run.

D2.3.7.3
Government consumption and fiscal balances

In these simulations, public consumption is exogenously held at No Build values. The fiscal balances of each jurisdiction (federal, state and territory) as a share of nominal GDP are fixed at their values in the No Build projection. Budget balance constraints are accommodated by endogenous movements in lump sum payments to households.

D2.3.7.4
Production technologies and household tastes

VURM contains many variables to allow for shifts in technology and household preferences. In the policy scenarios, most of these variables are exogenous and have the same values as in the No Build projection. The exceptions are technology variables that are made endogenous to allow for changes in international and interstate visitor preferences in Victoria and the rest of Australia.

Table D2.2
Industries in VURM

Name	Description of major activity
1. Sheep & beef cattle	Primary agricultural activities related to sheep and cattle production
2. Crops	Primary agricultural activities associated with cropping
3. Dairy	Primary agricultural activities associated with dairy cattle
4. Other agriculture	Other primary agricultural production and services
5. Forestry	Forestry and logging
6. Fishing	Fishing and hunting
7. Coal mining	Mining of coal
8. Oil mining	Mining of oil
9. Gas mining	Mining of natural gas
10. Iron ore mining	Mining of iron ore
11. Non-ferrous ore mining	Mining of non-ferrous ore
12. Other mining	Other mining and services
13. Meat products	Manufactured meat products
14. Dairy products	Manufactured dairy products
15. Other food and drink products	Other food and drink products
16. Textiles, clothing & footwear	Textiles, clothing and footwear
17. Wood products	Manufacture of wood (including pulp) products
18. Paper products	Manufacture of paper products
19. Printing and publishing	Printing and publishing
20. Petroleum products	Manufacture of petroleum (refinery) products
21. Other refinery products	Other refinery products
22. Basic chemicals	Manufacture of basic chemicals and paints
23. Rubber and plastic products	Manufacture of plastic and rubber products
24. Non-metallic construction materials	Manufacture of non-metallic building products excl. cement
25. Cement	Manufacture of cement
26. Iron & steel	Manufacture of primary iron and steel
27. Alumina	Manufacture of alumina
28. Aluminium	Manufacture of aluminium
29. Other non-ferrous metals	Manufacture of other non-ferrous metals
30. Metal products	Manufacture of metal products
31. Motor vehicles and parts	Manufacture of motor vehicles and parts
32. Other equipment	Manufacture of other equipment and machinery
33. Other manufacturing	Manufacturing not elsewhere classified
34. Electricity generation - coal	Electricity generation from coal (black and brown) thermal plants
Name (cont.)	**Description of major activity (cont.)**
35. Electricity generation - gas	Electricity generation from natural gas thermal plants
36. Electricity generation – oil products	Electricity generation from oil products thermal plants
37. Electricity generation – hydro	Electricity generation from renewable sources – hydro
38. Electricity generation – other	Electricity generation from all other renewable sources
39. Electricity supply	Distribution of electricity from generator to user
40. Gas supply	Urban distribution of natural gas
41. Water supply	Provision of water and sewerage services
42. Household construction services	Residential building
43. Other construction services	Other construction services
44. Wholesale trade services	Provision of wholesale trade services
45. Retail trade services	Provision of retail trade services
46. Mechanical repairs	Mechanical repairs
47. Accommodation, hotels & cafes	Provisions of services relating to accommodation, meals and drinks
48 Road freight services	Provision of road transport services – freight
49. Road passenger services	Provision of road transport services - passenger
50. Rail freight services	Provision of rail transport services – freight
51. Rail passenger services	Provision of rail transport services - passenger
52. Pipeline services	Provision of pipeline services
53. Water transport services	Provision of water transport services
54. Air transport services	Provision of air transport services
55. Other transport services	Provision of other transport services
56. Communication services	Provision of communication services
57. Financial services	Provision of financial services
58. Dwelling services	Provision of dwelling services
59. Business services	Provision of business services
60. Government administration	Provision of government administration services
61. Education services	Provision of education services
62. Health services	Provision of health services
63. Community services	Provision of community services
64. Recreation and other services	Recreation and services not elsewhere classified

Source: Centre of Policy Studies, 2014

D2.4 STATUTORY AND POLICY REQUIREMENTS

D2.4.1 Infrastructure Australia

Infrastructure Australia's (IA's) Infrastructure Audit (2019) identifies airport capacity as one of the key challenges for transport in Australia's cities. The audit report highlights the increasing passenger demand at capital city airports, with Melbourne Airport passenger numbers projected to pass Sydney by the late 2030s and Brisbane Airport's passenger numbers to almost double by 2034. Additional airport capacity is being advanced in Australia's major cities - a new airport is being built in Western Sydney, Perth and Melbourne planning additional runways, and Brisbane opened a new runway in July 2020.

Growing transport congestion around major airports was also identified as an issue that could lead to less reliable travel times to airports. Investments in road and rail infrastructure have been investigated or undertaken in larger capital cities, including new rail connections from the airport to the city in Perth and Melbourne, and from Brisbane airport to the Gold Coast. The NSW Government has invested in road upgrades around Kingsford Smith Airport.

The audit also found that curfew regulations around airports reduce the impacts of aircraft noise on residents living around airports, but can come at the cost of airport efficiency as landside movements can only happen when the city's land transport networks are already at their busiest.

IA's Australian Infrastructure Plan (2016) recommends that any caps, curfews or restrictions on how infrastructure, including airports, operate should be avoided where possible. The plan notes that allowing for infrastructure to freely meet economic and social purposes will present more opportunities for growth and development, and that the regulations surrounding airports should be regularly reviewed to maintain their relevance. The importance of the flexible use of airport infrastructure to allowing Australia's cities to become more accessible to global business is also noted, as well as the need for airports to be managed through design and integrated planning that balances the need for expansion and development with local and community interests.

M3R at Melbourne Airport has been included in IA's Infrastructure Priority List (IPL) for several years, including the most recent version update in June 2022. This classifies the Next Steps for the M3R project as business case development and notes the preparation of this Major Development Plan and the 2022 Master Plan (Infrastructure Australia, 2022).

M3R was identified for the IPL as a response to the expected increase in demand for the airport in terms of both passenger and aircraft movements, and the projection that the airport with its current two runways would reach capacity in 2026. It notes by 2046 the airport would need to facilitate 83 million passengers and 429,000 aircraft movements, and that the capacity constraints would likely inhibit the functioning of the airport and increase delays, costs and emissions for airlines and disrupting the Australian aviation network.

D2.4.2 Infrastructure Victoria (IV)

Infrastructure Victoria's 'Victoria's Infrastructure Strategy 2021-2051' (2021) (the Strategy) builds on the previous five year infrastructure strategy and defines a series of social, economic and environmental objectives for Victoria's infrastructure in response to identified needs and stakeholder consultation.

While M3R and aviation is not addressed in the Strategy, the project aligns with the objectives of preparing for population change, enabling workforce participation, lifting productivity and driving Victoria's changing, globally integrated economy.

D2.5
DESCRIPTION OF SIGNIFICANCE CRITERIA

D2.5.1
Build and No Build Scenarios

As noted, two scenarios are considered in this report.

The first, called 'the No Build case' (or the existing condition), assumes that the M3R is not constructed, and projected growth in demand for air travel is accommodated until the constraints of the two-runway airport are reached, resulting in delays for aircraft and passengers in the long term.

The second scenario, called 'the Build case', assumes a new north-south runway is constructed and operational no earlier than 2026, thus avoiding the constraints induced in the No Build scenario. The Build assessment illustrates the potential economic impacts associated with realisation of the project (versus the constraints of the No Build scenario).

In the remainder of this sub-section, the framework for economic impact descriptors, impact likelihood and risk rating are explored.

D2.5.2
Significance assessment framework

The economic assessment has generally identified a range of positive impacts (or economic benefits) to Victoria as a result of the M3R Build scenario. There are no significant negative economic impacts.

The severity assessment therefore considers the magnitude of the economic benefits while the likelihood assessment focuses on the (qualitative) probability of those eventuating.

In lieu of the need to mitigate the risks of any negative impacts eventuating, the significance-assessment framework delves into the management processes which would help to ensure that certain positive impacts are delivered in association with M3R.

D2.5.2.1
Impact descriptors

Impacts during the construction phase (in particular increased employment) are likely to be short term, i.e. providing benefits only for the duration of construction. The economic impacts from the runway (including reduced delays, increases in fares sold, boosts to tourism and freight exports, and increased operating costs, noise and health costs) are likely to be medium to long-term impacts, beginning when the existing two runways reach capacity and continuing to increase as demand grows.

The only negative economic impacts likely to occur are the increased operating costs (which are minor as they only have local effects and require no mitigation) and noise and health impacts, which are dealt with in separate chapters of this MDP. Construction costs of M3R, while large, are short term and thus likely to be no more than moderate impacts. Impacts of time saved and reduced delays are likely to be of moderate impact - while travellers will mostly only be affected for a few minutes each, many travellers overall will benefit. Impacts on tourism and freight exports are likely to be moderate to high, as their impacts will be cumulative as demand for travel and freight grows. They are expected to potentially be worth billions of dollars by the 2040s, and focused in areas around Melbourne and Victoria. Increased ticket sales are expected to have a moderate impact, as while they are cumulative, they are not expected to be of the same value as increases in tourism or freight exports. Agglomeration and productivity benefits are also expected to be moderate.

The assessment of impact significance has applied the framework described in Chapter A8: Assessment and Approvals Process. For severity, bespoke criteria have been developed for the EIA and these are described in Table D2.3.

D2.6 EXISTING CONDITIONS

At present, Melbourne Airport has two runways. The airport handles about $18 billion worth of goods exports and imports per year.

Prior to COVID-19, domestic tourism in Victoria amounted to $16.5 billion per year, and international tourism brought 8.8 billion dollars into the state.

The broader airport site currently accommodates an estimated 18,567 Full-Time Equivalent (FTE) jobs (as of 2019).

In 2019, Melbourne Airport saw 670 flight movements per day on average and the runways had reached functional capacity. The lack of availability of slots, particularly in peak hours, is likely to reduce entry of new domestic and international carriers, ultimately reducing competition by entrenching incumbent airline operators. However, the capacity of Melbourne Airport to move people will be insufficient to meet demand from the mid-2020s onwards. Consequently, it is likely that airfares will increase while the risk of delays will also increase.

D2.6.1 Existing demographic conditions

Victoria's current population is over five million, representing around 20 per cent of Australia's population. Victoria also contains around the same proportion of Australia's total jobs.

The local region, shown in **Figure D2.2**, covers the Statistical Area Level 3 (SA3) of Keilor, Moreland – North, Sunbury, Tullamarine - Broadmeadows and Brimbank. Most are within the Statistical Area level 4 (SA4) regions of Melbourne-west and Melbourne-north west. This region contains around 9 per cent of Victorian employment.

Relative to Greater Melbourne, the local region has:

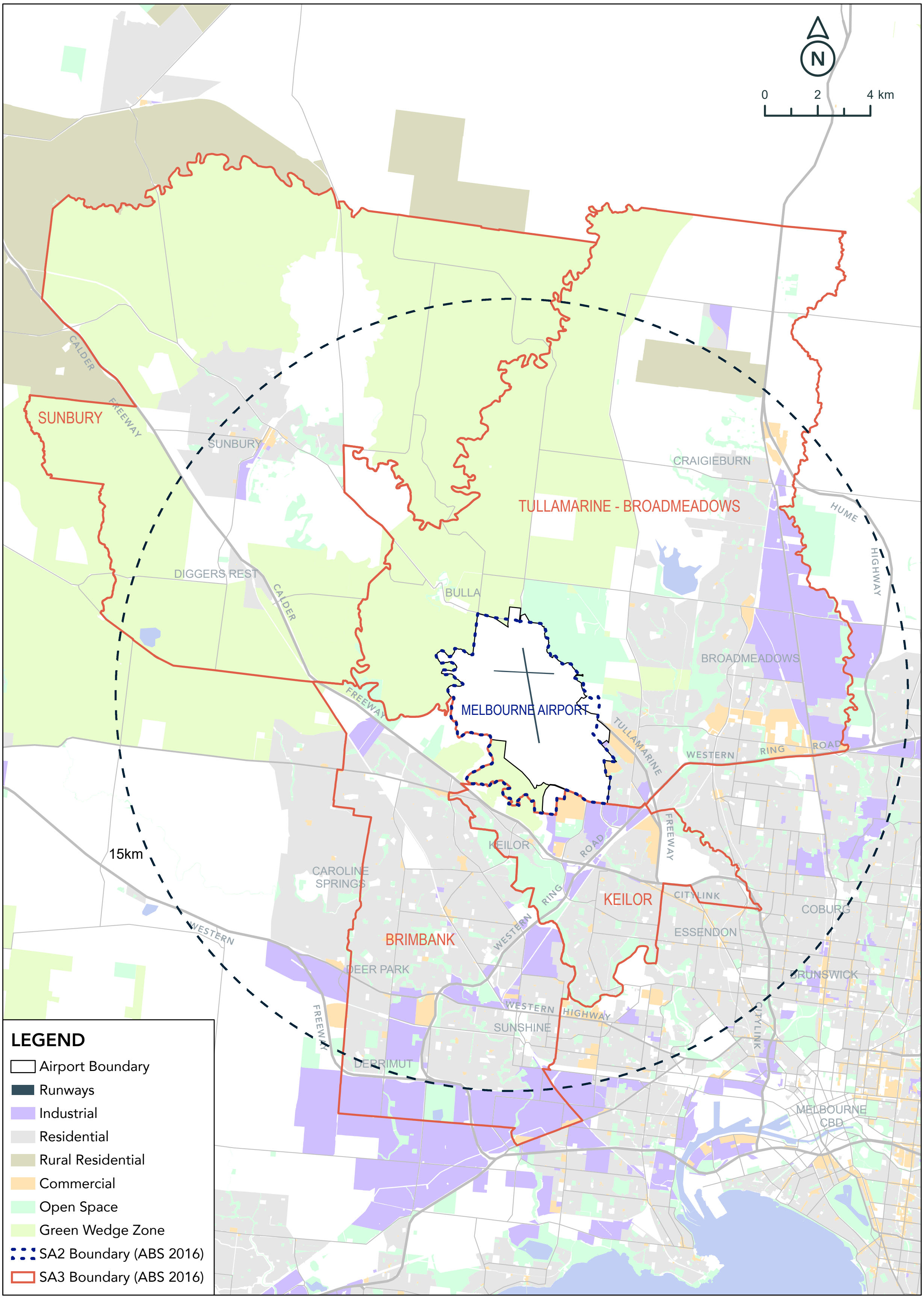
- A slightly higher share of those between the ages of 0 and 14 (20 per cent, as compared to 18 per cent in Greater Melbourne)
- A slightly lower share of working age population, i.e. those between the ages of 15 and 64 (67 per cent as compared to 68 per cent in Greater Melbourne)
- A lower share of people above the age of 65 (13 per cent as compared to 14 per cent in Greater Melbourne).

The most significant employment industries in the area are manufacturing, retail, transport and warehousing, construction, and healthcare.

Table D2.3
Severity criteria

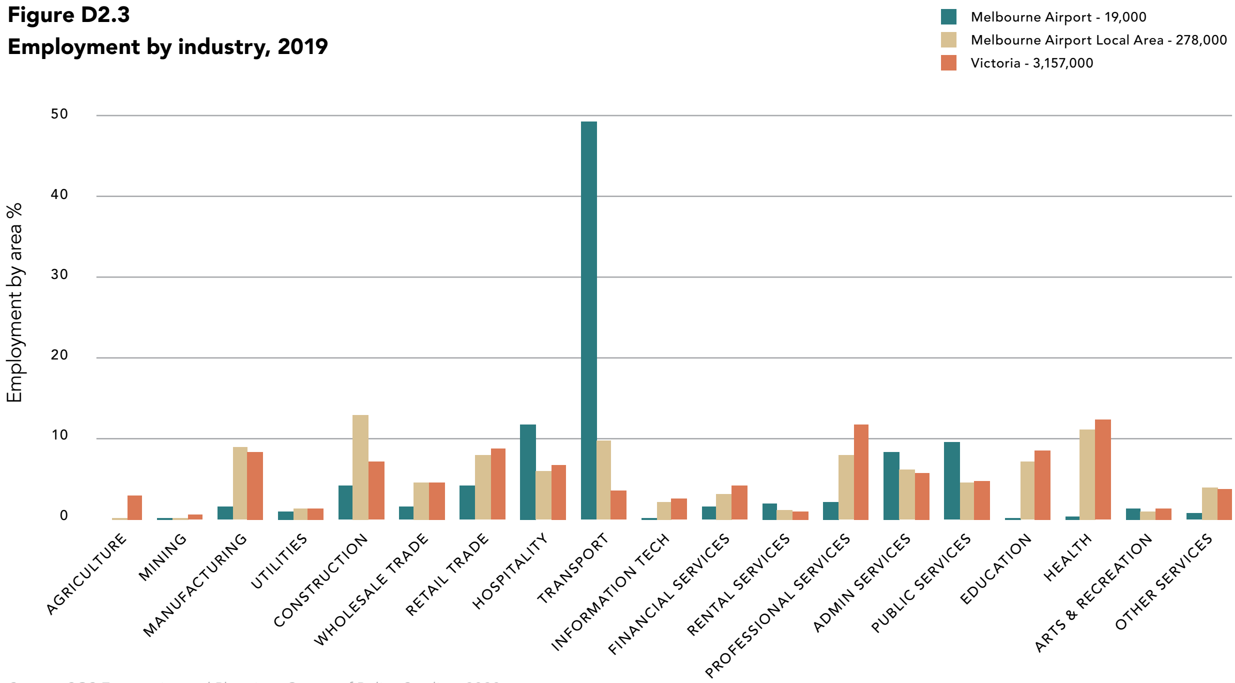
Severity	Definition
Major	Permanent or long term impacts for which mitigation measures are unlikely to remove the effects.
High	Impacts that are important at a state scale, but if adverse, will be potential concerns to the project. These tend to be permanent or otherwise long to medium term. May be adverse or beneficial.
Moderate	These impacts are important at a regional scale, and may be of short to medium term intensity. May be adverse or beneficial.
Minor	These impacts are at a local scale and are unlikely to require amelioration unless identified by a specific stakeholder group. May be adverse or beneficial.
Negligible	No effects or those which are beneath levels of perception, within normal bounds of variation. Impacts tend to be short term or temporary. May be adverse or beneficial.

Figure D2.2
Melbourne Airport zone and Melbourne Airport Local Area



Source: SGS Economics and Planning, 2020

Figure D2.3
Employment by industry, 2019



Source: SGS Economics and Planning, Centre of Policy Studies, 2020

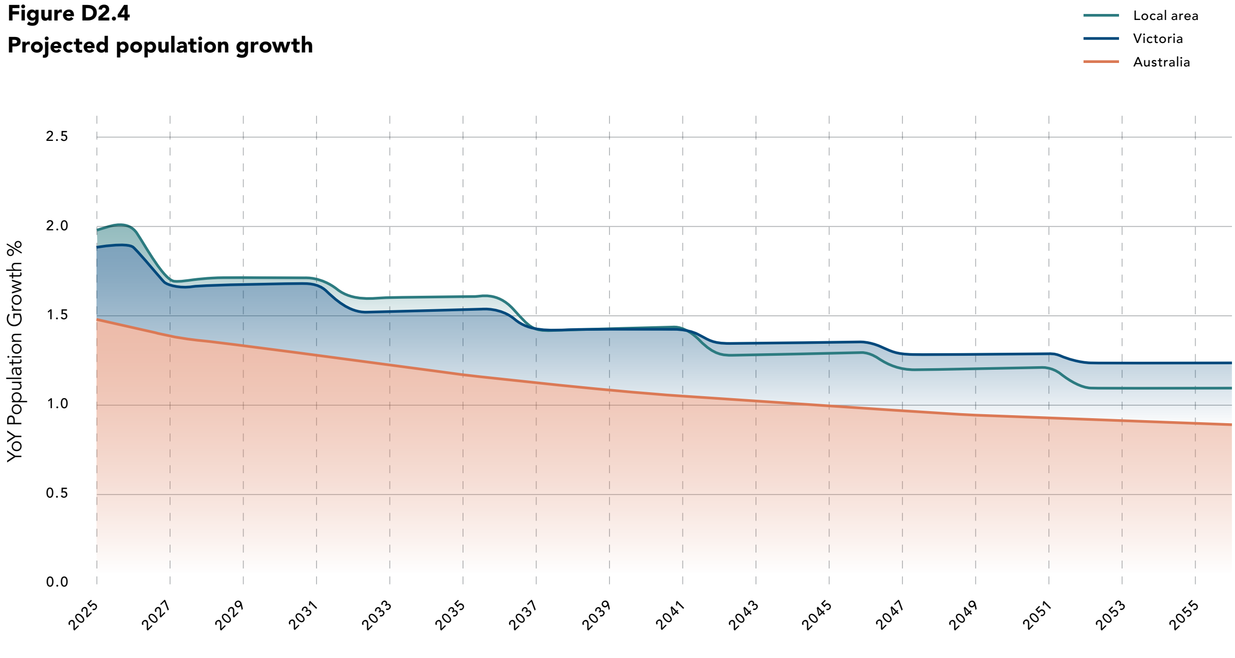
D2.6.1.1
Population growth

The local region is expected to expand significantly in the next few decades, and by 2046 expected to house over 750,000 residents. The release of greenfield areas for development will contribute significantly to the growing population in the area.

The region is projected to grow in population at a similar rate to the rest of Victoria but faster than Australia as a whole. Employment is expected to grow more slowly than the rest of Victoria, without the construction of a third runway.

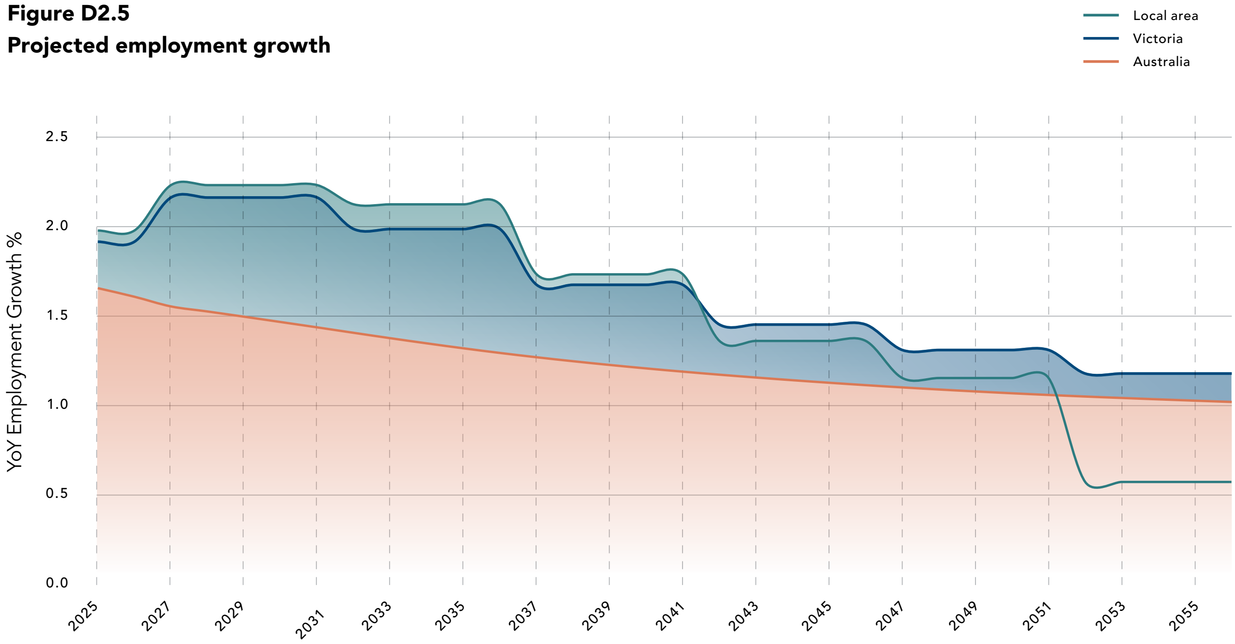
Melbourne Airport is considered an anchor employer in the region and is expected to be a significant contributor to employment growth if the airport's capacity is expanded.

Figure D2.4
Projected population growth



Source: Australian Bureau of Statistics, SGS Economics and Planning, 2020

Figure D2.5
Projected employment growth



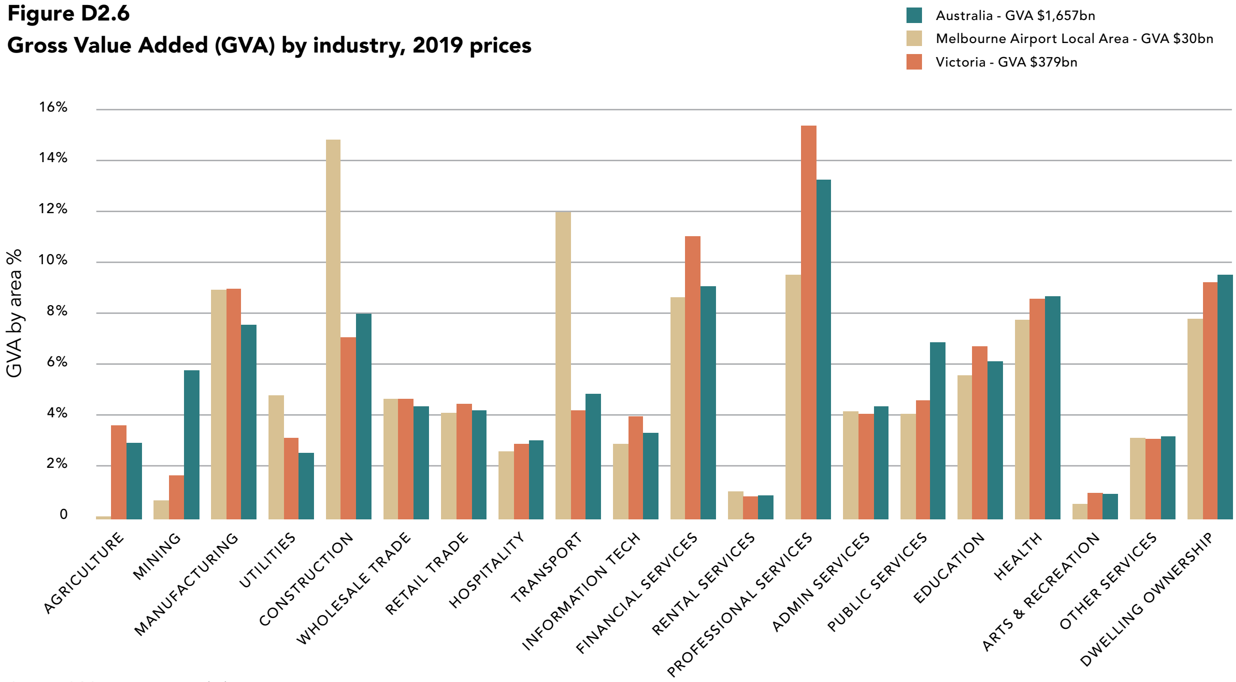
Source: SGS Economics and Planning, 2020

D2.6.2 Economic activity in the local region, Victoria and Australia

The parameter used to measure the value of economic activity is industry Gross Value Added (GVA) which includes the sum of wages paid to employees and gross operating surpluses generated by firms. In other words, the GVA measures labour and business surpluses that are retained within a region. (It does not include taxes paid to government.) GVA across different industries for the local region, Victoria and Australia is displayed in Figure D2.6.

The total value of all economic activity occurring across all industries in the local region is currently estimated at $30 billion, which represents approximately 8 per cent of the gross state product (GSP) of Victoria ($379 billion) and is in line with the region's share of total employment in Victoria.

Figure D2.6
Gross Value Added (GVA) by industry, 2019 prices



Source: SGS Economics and Planning, 2020

D2.6.3
Economic forecasts

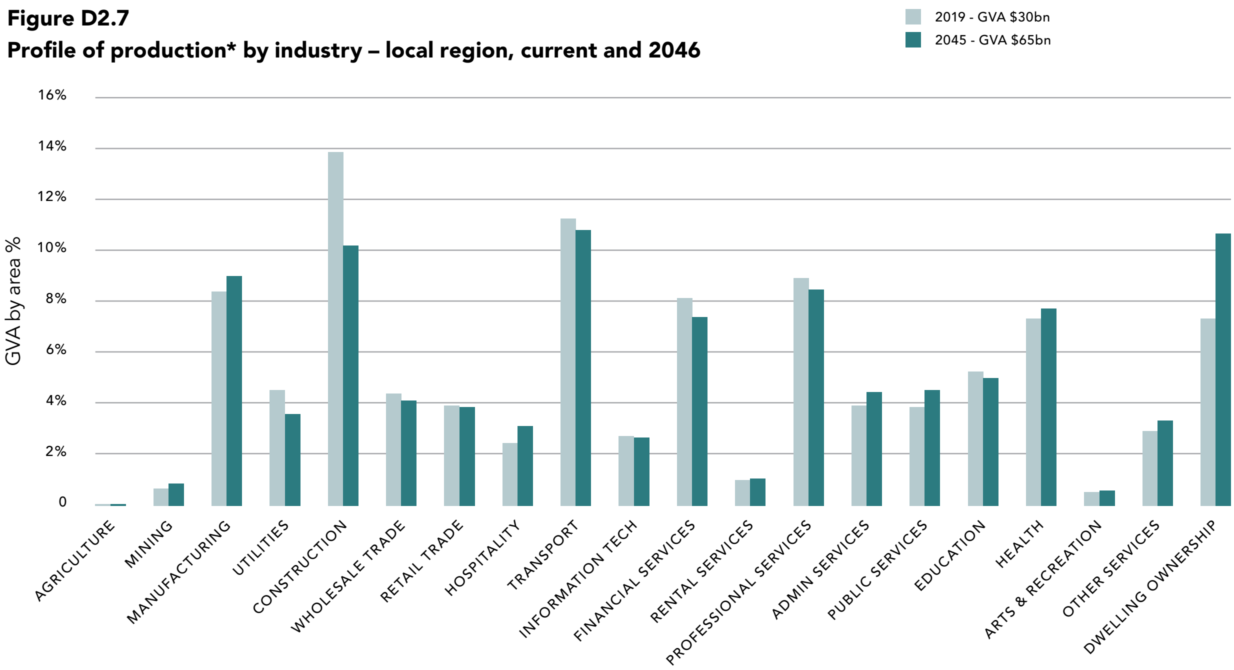
In the No Build scenario, regional output would be expected to grow to $66.1 billion by 2046 (i.e. more than doubling between 2019 and 2046). During this time it is expected that Victoria's GVA will grow from $379 billion to $852 billion.

Growth in output of most industries in the local region is expected to outpace the corresponding values for Victoria and Australia (refer to **Figure D2.7**).

These include the business services, accommodation and food services, and transport sectors.

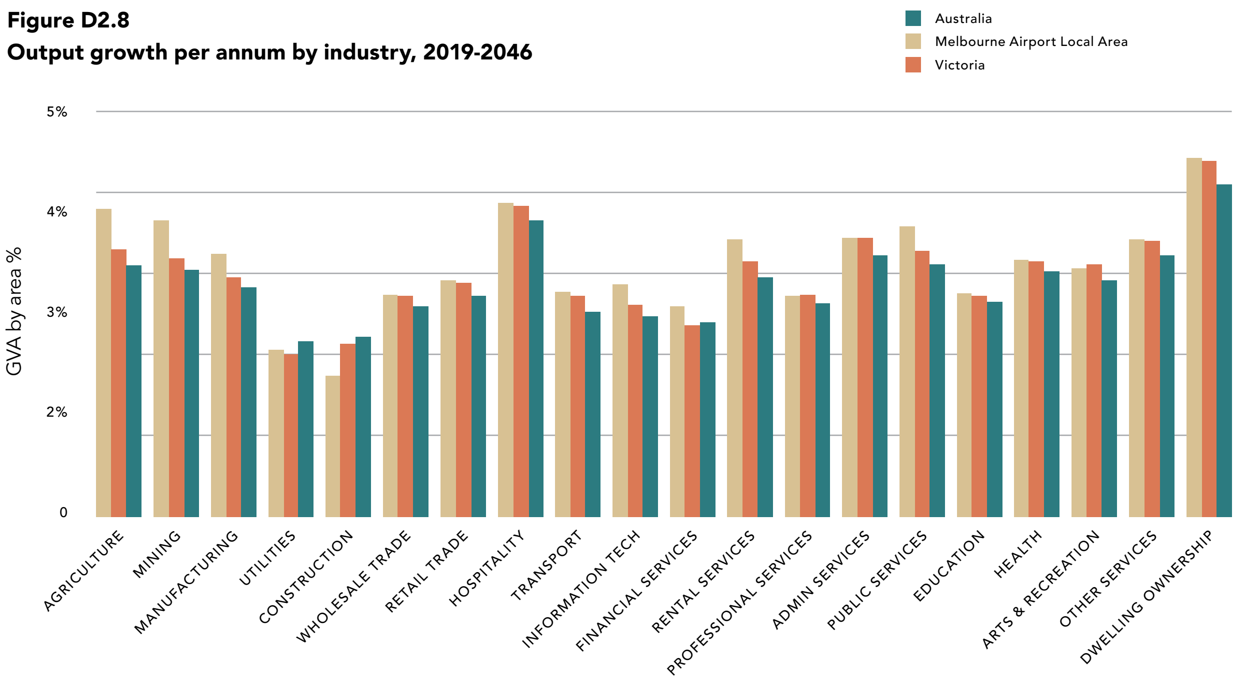
By 2046, the contribution of accommodation and food services, administrative services, public administration and safety, health care and social assistance, and ownership of dwellings is all expected to increase. In that year, the local region will contribute 8 per cent to the state-wide economy - a similar share to the present.

Figure D2.7
Profile of production* by industry – local region, current and 2046



*Source: SGS Economics and Planning, Centre of Policy Studies, 2020 * Real gross value added (GVA) by industry in (2017 prices) (excluding taxes)*

Figure D2.8
Output growth per annum by industry, 2019-2046



Source: SGS Economics and Planning, Centre of Policy Studies, 2020

Table D2.4
Employment and gross state product

Outcomes	2019	Opening	+5 Years	+15 Years	+20 Years
Employment					
Airport Site	18,567	22,164	23,674	26,289	27,616
Victoria	3,156,162	3,492,509	3,718,341	4,169,261	4,391,970
Gross State Product $m					
Airport Site	$2,462	$3,157	$3,620	$4,718	$5,346
Victoria	$379,445	$476,356	$554,389	$740,953	$847,419

Source: SGS Economics and Planning, Centre of Policy Studies, 2020

D2.6.4
Summary

This sub-section has explained the existing economic profile at Melbourne Airport, the broader region and Victoria under the No Build scenario, in which only two runways operate at Melbourne Airport. Table D2.4 summarises the employment and GSP outcomes under this scenario.

D2.7
ESTIMATION OF BUILD SCENARIO IMPACTS

D2.7.1
Quantification and monetisation

This section describes how the various impacts of M3R have been estimated and the sources of the data. Wherever possible, the same assumptions and information are used for both the economic impact analysis (EIA) and the cost benefit analysis (CBA) though, as explained, the use and interpretation of this information differs significantly between these two methods.

All references to future costs are expressed in 2019 value.

D2.7.1.1
Construction and upfront costs

The total construction cost of M3R is expected to be $1.8 billion, including escalation costs of 3 per cent per year. These costs will be incurred between 2020 and 2026 inclusive, with the bulk of the spend occurring in 2023–2025.

Airservices Australia will also incur significant costs associated with infrastructure and equipment through the construction period.

D2.7.1.2
Operating costs (airside and landside)

Melbourne Airport is expected to incur additional operating costs from the operation of M3R of approximately $2 million per year, for as long as the M3R is in operation. Every 20 years, a runway overlay will be required, expected to cost $20 million.

D2.7.1.3
External costs (noise, nuisance and health impacts)

As M3R is expected to increase the capacity for flights to and from the airport, it is expected there will be an increase in flight noise, an increase in emissions and possible flow-on health impacts. These are assessed in other sections of this MDP and so not considered further in this chapter.

D2.7.1.4
Induced air travel – increased passenger numbers

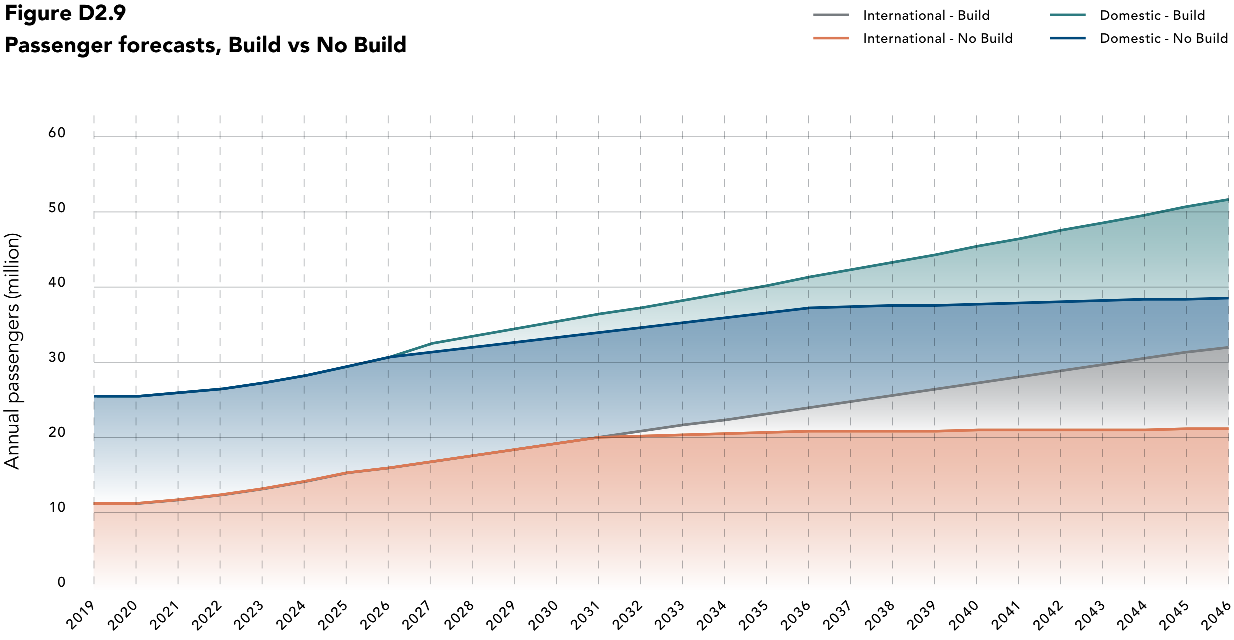
Melbourne Airport has prepared a series of passenger forecasts based on passenger numbers constrained by lack of runway capacity (constrained forecasts) in the No Build case, and unconstrained by lack of runway capacity (unconstrained forecasts) in the Build case.

The constrained hourly profiles were developed with the assumption that the maximum acceptable delay was 10-12 minutes per flight. These constraints are expected to be reached by 2026. To generate the two scenarios, Melbourne Airport developed projections on the assumption that Melbourne can currently handle about 922 daily Air Traffic Movements (ATMs) or equivalent to a total of 303,500 ATMs annually (APAM, 2019). These projections are shown in Figure D2.9.

As constraints are reached, carriers will adapt by:

- Moving flights away from peak times of day
- Increasing the price of peak period flights to encourage travellers to schedule flights for off-peak times of the day and/or year
- Up-gauging the fleet (i.e. increasing the size and therefore the number of seats on each aircraft) as far as physically and commercially possible.

Figure D2.9
Passenger forecasts, Build vs No Build



Source: APAM, 2019

As discussed, these solutions are expected to partially mitigate the capacity constraints in the short term but will still result in a reduced number of passengers and freight per annum in the mid to long-term.

As capacity is reached for certain times of the day and/or year, peak pricing strategies will favour high-revenue traffic. It is thus expected that low-cost carriers will be more likely to be shifted to the remaining off-peak times.

In 2019, Melbourne Airport was operating at full capacity for significant periods on most days. As demand returns to trend when the COVID-19 threat has abated, demand will grow to well beyond the current runway capacity by 2026.

If there are constraints on growth from M3R not being built, to some extent capacity can be managed by peak spreading (shifting flights to 'quiet' periods). However, this will not be possible for all flight demand.

Available capacity will be diverted towards higher value traffic, which is expected to result in fewer flights on low-cost carriers in the short term, and all carriers in the longer term.

Under a No Build scenario, the supply of flights will be insufficient to meet demand. M3R is expected to result in additional flight demand. The additional air travel generated by M3R is expected to contribute to a number of impacts: increased tourism exports, increased international and domestic travel through Melbourne and Melbourne Airport.

D2.7.1.5
Time saving and greater reliability for air travellers

As the airport approaches capacity with the existing two runways, it is expected to experience increased delays. At the times of the day when airports operate at capacity or close to capacity, minor events (such as essential aircraft repairs, delays with loading/unloading, or passenger difficulties) can cause delays that cascade, as there is little capacity to recover.

Passengers and airlines typically allow flexibility in their schedules for some minor delays, so generally a delay of even half an hour to an hour is bearable with minimal 'cost'.

Nonetheless sometimes these delays can result in significant costs - an additional delay of an hour in landing may cause passengers to miss connecting flights, resulting in a day's delay waiting for the next flight; or hundreds of dollars booking a new flight; or missing the event that was the original reason for the travel. Costs of delay times were drawn from Transport for New South Wales' Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives (2016). These provide estimates of costs of delay for business and leisure travellers. Uprated to 2019 dollars, these amount to a cost of delay of $182 per hour for business travellers and $58 per hour for leisure travellers (based on hourly travel time costs drawn from wages multiplied by a factor of 3.2 for the inconvenience and disutility of delay.

The time-savings benefit was calculated by estimating the amount of delays expected under the No Build and the Build Case, and multiplying this by the cost of delay, assuming 22.8 per cent of travellers were business travellers, based on Tourism Research of Australia (2019a) visitor surveys.

D2.7.1.6
Additional air travel (domestic)

Increased numbers of air travellers will result in a proportional increase in airline ticket sales, both from within Australia and from abroad. It is assumed that additional numbers of air passengers are likely to lean towards being low-cost and domestic travellers, as they are likely to be crowded out by higher value travellers if Melbourne Airport becomes increasingly congested. As noted earlier, when demand for runway space exceeds supply, low-cost carriers targeting holidaymakers are more likely to move their flights to off-peak times because their customers are more price-sensitive and less time-sensitive. International flights are expected to be more difficult to move, compared to domestic flights. This is because they must coordinate with departure and arrival times at overseas airports, many of which are international hubs. This includes taking into account time differences and curfews. Since this scheduling is done well in advance, if an international flight is delayed it could miss a slot at the arrival airport. Melbourne Airport's curfew-free status makes it an attractive destination, where international airlines can land and depart with flexibility.

The reduction in economic activity from airline ticket sales is likely to be partly offset by expenditure elsewhere in the economy through a substitution effect. Those who cannot find tickets through Melbourne Airport due to the runway shortage may choose to drive to their destination, thereby increasing sales of petrol, car maintenance and associated expenditure. Others may take a train, bus or ship, and consequently increase their expenditure on these modes of transportation – at least for domestic travellers.

This substitution effect is, however, quite limited, and some trips may simply not be taken at all, particularly on low-cost carrier flights. The people deterred from visiting Melbourne by air may instead decide to fly to another city, or spend the time and money on other activities.

Research on airfare comparison websites (such as Fare Detective in early 2020, i.e. prior to COVID-19's impact on travel) showed that the average return airfare for a Sydney to Melbourne flight was approximately $245. As discussed earlier, the airfares most likely to be subject to reduced availability are expected to be on low-cost airlines, so it is likely that only the relatively low fares will no longer be available. Accordingly, a price of $200 was adopted as the cost of each lost return airfare and $100 for a lost one-way airfare.

Since some travellers deterred by a lack of flights through Melbourne Airport may choose to fly through Avalon Airport, drive or catch a bus/train, not all lost flights through Melbourne Airport can be assumed to be completely lost fares. To be conservative, it is assumed that half of the lower number of airfares through Melbourne Airport will be offset by a higher number of Avalon fares or land-based transport expenditure. The total cost of lost fares was estimated as 50 per cent of the difference between the number of domestic travellers under the No Build and Project scenarios, multiplied by $100.

D2.7.1.7
Reduced delays in airside operations

Similar to improved reliability for air travellers, it is expected that commissioning M3R will result in less likelihood that minor events can cause delays which then cascade over a number of flights, thereby delaying all airport operations and requiring planes to circle airports for longer, airport employees to work longer-than-expected hours etc.

The reduced delays in airside operations have been estimated by aviation consultants To70. They estimate that the ultimate total costs of delay without M3R would start at $178 million per year in 2026 and grow to $3.595 billion by 2046 (based on unconstrained demand). With a third runway built, these delays would range from a significantly lower $114 million in 2026 to $502 million in 2046.

D2.7.1.8
Increased tourism expenditure

Passenger numbers flying into and out of Melbourne Airport are projected to increase as a result of M3R, as the additional capacity allows for more flights and potential visitors are undeterred by known delays at the airport.

To estimate the additional tourism expenditure expected from the increase in flights, this study has employed data from overseas arrivals and departures (ABS, 2019) to estimate the share of international passengers who were travelling for short or long stays, and the purpose of visits. Data from visitor surveys by Tourism Research Australia was then used to estimate the expenditure for each type of visitor.

The National Visitor Survey (NVS), conducted by Tourism Research Australia (2019a), found that in the year ending September 2019, domestic overnight travellers spent $79.1 billion across Australia, on a total of 410 million nights.

To project how tourism expenditure would grow in line with domestic flight growth, the total domestic tourist expenditure for tourists who flew to their destination in Victoria was divided by the number of domestic passengers through Melbourne. This was used to obtain a per-passenger estimate of tourism spend, so total tourism expenditure could grow in line with passenger numbers. Given the low economic growth of recent years, growth in domestic per-person tourism spend was assumed to stay in line with inflation to 2030, and then grow at 0.5 per cent per year after this.

It should be noted that in the event M3R is not built, some of this tourism from air travel would have occurred anyway but by car, bus or rail. If trips to Melbourne are not undertaken at all, other domestic travel may occur. Furthermore, air travellers who travel elsewhere are likely to still travel within Australia, so there will be no increase in national domestic tourism expenditure between the No Build and the Build case – it will simply be transferred from one place to another. For this reason, domestic tourism expenditure was not considered in the CBA only in the EIA. (This is the economic substitution theory whereby if air travel is not available, while travellers may opt to travel by car, bus, rail or boat, they may alternatively spend their money on other forms of discretionary consumption.)

The International Visitor Survey (IVS) is also conducted by Tourism Research Australia (2019b). It found that in the 2018-2019 financial year, international visitor expenditure in Victoria was just over $6 billion. Almost all of this tourism is facilitated by air travel.

For the estimation of tourism expenditure, only short-term visitors (i.e. those who intend to stay for less than a year) were included. The total number of visitors to Victoria in 2018-19 was obtained from the IVS, and used to identify the relationship between the number of international air passengers per year and the number of traveller visits to Australia. These travellers were separated into: travellers for conventions, business, to visit friends and family, holidays, employment and education (based on overseas arrivals and departures data). This was combined with Melbourne Airport projections to estimate the total number of traveller visits by type out to the 2040s.

The IVS was used to identify how much travellers in each of these categories spent in Victoria during their stay, on average. This was multiplied by the number and type of travellers, and expenditure per traveller scaled so that the total international tourist expenditure in 2018 to 2019 estimated in the model matched with tourist expenditure estimated by the IVS. Since it is only the marginal traveller who will be deterred from travelling to Melbourne, estimated per-tourist expenditure was reduced to 30 per cent of the average. That is, it is assumed that the international visitors deterred from travelling by airport congestion or higher prices will be either budget or short-stay travellers.

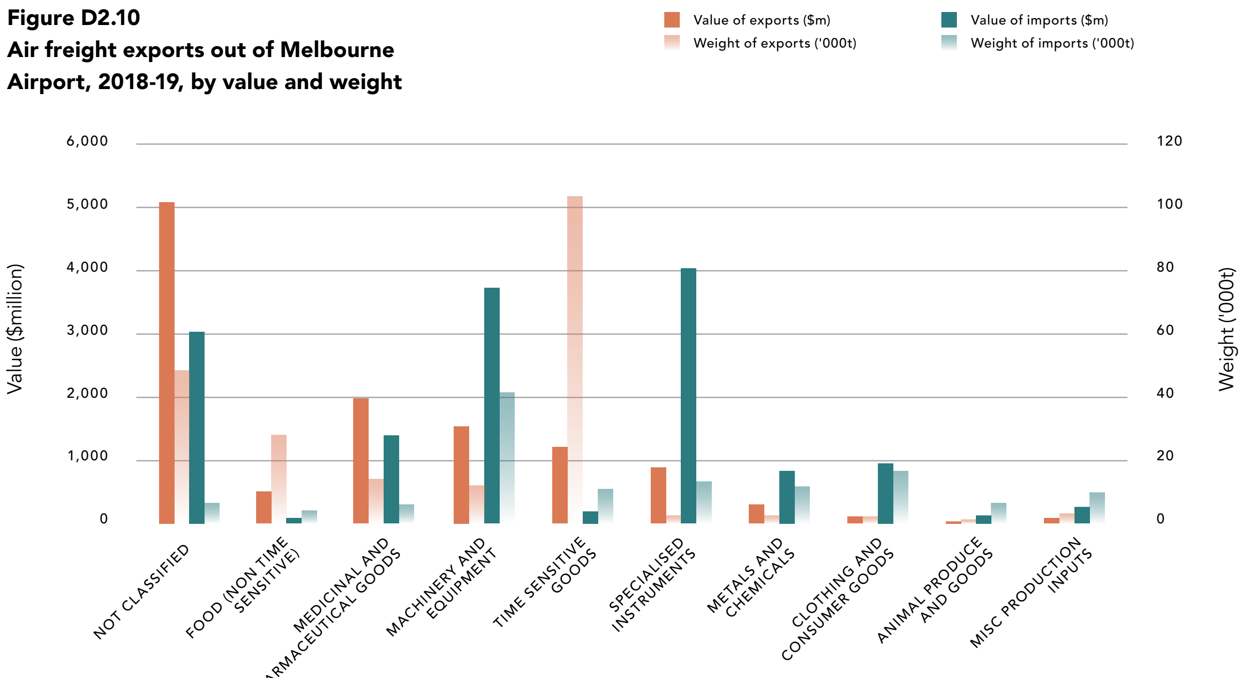
Increases in domestic tourist expenditure and international tourist expenditure have both been included in the EIA, but only the increase in international tourist expenditure has been calculated in the CBA. This is because most of the domestic tourist expenditure incurred as a result of M3R either would have occurred in Australia anyway, either through travellers taking alternative transport or pursuing alternative consumption options.

D2.7.1.9
Greater net freight exports

Air freight tends to be used for high-value commodities and perishables. In 2018-19, around 345,000 tonnes of freight moved through Melbourne Airport. The total value of air-freight exports out of Melbourne was $11.8 billion, and air-freight imports were worth $14.7 billion. Figure D2.10 shows the main classifications of air-freight exports and imports by weight and value.

In principle, the additional flights available as a result of M3R will allow for more freight to be transported. However, in some ways air-freight capacity is a byproduct of passenger flights (planes are designed to carry significant freight as well as a limited number of passengers; and the demand for international passenger flights is forecast to grow). There has been no evidence of a shortage of capacity for air freight on these flights, as lower value and non-time sensitive goods can easily travel by cargo ship for a lower price.

Figure D2.10
Air freight exports out of Melbourne Airport, 2018-19, by value and weight



Source: BITRE, 2020

If demand for air freight grows faster than air-freight capacity at Melbourne Airport, it will not be difficult for some of this to transfer to Avalon or Western Sydney airports, which have fewer constraints on capacity. There is insufficient evidence to demonstrate there will be a future shortage in air-freight capacity through Melbourne Airport if the third runway is not built, that cannot be absorbed by other airports. For this reason, the benefits of a potential increase in air-freight capacity through Melbourne Airport have not been quantified for this assessment.

Additional capacity for passenger flights under a Build scenario means that additional freight capacity will be available via Melbourne Airport if required but it is not possible to say whether it will be needed.

D2.7.1.10
Increased employment

During construction, an additional 650 plus construction-related jobs are expected to be created in the Melbourne Airport local area. There will be flow-on impacts to other industries in the area, including accommodation and food services, retail trade and transport, postal and warehousing.

In its first year of operational use, M3R is forecast to create 500 additional jobs, most will be directly associated with on-airport operations and support functions.

As use of the extra runway capacity increases over time, at least 2,000 new jobs will be created annually. These jobs are expected to predominantly be in accommodation services, other construction, business services, wholesale trade and retail trade; and will be diffused throughout Victoria. Some new retail and accommodation jobs will be located at the airport due to increased flights; and a boost to the tourism industry will result in further jobs added in tourist areas around Melbourne and Victoria.

In terms of employment more generally, it is important to note that the infrastructure expansion provided at Melbourne Airport (in the Build scenario) constitutes an improvement in the infrastructure systems of Victoria. In concert with the planned rail link from Melbourne Airport to the CBD and the completion of the Melbourne Metro, there will be a cumulative enhancement of the state's ability to connect with the global economy, helping to improve productivity outcomes for all employees and businesses in the long term. However, this portfolio effect has been factored into neither the EIA nor the CBA.

D2.7.1.11
Agglomeration driven productivity gains

The development of M3R is expected to result in an increase in the number of workers in the airport site in the longer term. This is firstly due to first the increase in staff required to manage the additional flights and passengers that are expected with increased capacity; and secondly due to the increasing attractiveness of the location for other businesses in freight, logistics, professional services and tourism-supporting businesses, for example.

This increased level of employment will have significant positive impacts on the Effective Job Density (EJD) of the area (known as an EJD uplift). Effective job density is the number of jobs that are accessible within a set commuting time across the city, where good jobs and transport links are associated with higher EJD. Generally, the greatest EJD in a city is in the central business district followed by other major employment centres, with decreasing EJD in suburbs further from the CBD. M3R will result in increased employment in the airport precinct and surrounds, which are in the middle to outer suburbs of Melbourne. It can therefore be expected to lead to an increase in EJD in those suburbs which typically have a lower EJD than the more centrally located suburbs.

The indirect employment increases across Victoria will also result in a modest EJD uplift across the state although the majority of agglomeration benefits (i.e. greater productivity from businesses and people clustering together in a location, thereby creating local markets, reducing transport costs and creating knowledge spillovers) from the new north-south project are realised locally at Melbourne Airport site.

A firm in or within close proximity of a high-EJD area could potentially capture significant agglomeration economies, eventually resulting in productivity uplift.

While agglomeration is a significant benefit of transport projects, it can be difficult to quantify the benefits of individual projects, as opposed to the transport infrastructure surrounding them, with a high degree of certainty. Because of this, and for the sake of conservatism, agglomeration benefits were not incorporated in the EIA or CBA.

D2.7.1.12
Impact on road travel

The rise in passenger and freight volumes as a result of M3R can be expected to increase use of road transport into and out of the airport. This will take the form of increasing the number and size of freight trucks, more frequent passenger buses to the city, and more taxis, rideshares and private vehicle trips to and from the airport. The planned construction of the Melbourne Airport Rail is expected to help mitigating this impact by allowing for a quicker, easier and more comfortable journey to and from the airport than currently available by bus, taxi and private car. A separate travel-impacts study is being conducted as part of this project in Chapter B8: Surface Transport and so has not been considered in this analysis.

D2.7.1.13
Impact on real-estate property values

An assessment of historic and potential property value impact was undertaken by Chris Eves and Andrea Blake of Queensland University of Technology (QUT) in 2016. The analysis of property sales data covered a 25-year

Table D2.5
Economic impact analysis findings: Victoria ($m)

Analysis criteria	Opening		+5 years		+15 years		+20 years	
	$m	% change	$m	% change	$m	% change	$m	% change
Real GSP	476,370	0	554,768	0.07	643,202	0.19	851,978	0.54
Employment (thousands of persons)	3,492	0	3,722	0.11	4,195	0.62	4429	0.84

Source: Centre of Policy Studies, 2020

Table D2.6
Total jobs increase in airport zone – local region

Industry sectors	Opening	+5 years	+15 years	+20 years	Suburbs most affected
Accommodation and food services	135	813	937	1,262	Tullamarine - Broadmeadows
Construction	126	494	613	768	Tullamarine - Broadmeadows
Transport, postal and warehousing	376	957	1,694	2,254	Tullamarine - Broadmeadows
Retail trade	80	492	379	504	Tullamarine - Broadmeadows
Manufacturing	7	84	34	59	Brimbank

Source: SGS Economics and Planning, Centre of Policy Studies, 2020

period (from 1990 to 2015). The study replicated similar studies for Brisbane and Gold Coast, assessing the long-term impact on values with varying exposure to aircraft noise.

In total, 320,000 sales across 62 suburbs of Melbourne (including suburbs affected by flight paths) were analysed.

The assessment found that the location of residential properties under a Melbourne flight path had no significant long-term impact on annual movements in house prices. It was found that house price growth in a number of flight path-affected suburbs had outpaced that of other Melbourne suburbs with similar socio-economic profiles that were not under a flight path.

More specifically, the study found that there was negligible impact to property value regardless of whether a property was located directly under a flight path, within aircraft noise contours or adjacent to the airport.

The report concluded that socio-economic profile, distance to the Melbourne CBD and accessibility to infrastructure and services were the most significant influences on property values as opposed to aircraft noise.

A follow-up study to this report was conducted by Professor Chris Eves (now of RMIT University) in 2020, this time analysing property sales data from 1990-2019 in 72 Melbourne suburbs. This focused on the long-term investment performance of suburbs located within designated noise contours or subject to significant levels of aircraft noise complaints. It found that suburbs with exposure to aircraft noise had the same sales trends as comparable suburbs with low or no aircraft noise complaints. Investment performance was very similar, regardless of exposure to aircraft noise. Other factors such as views, access to services, distances to work, transport reliability, etc also influence house prices and the home purchase decision.

D2.7.2
Findings of the economic impact assessment

The EIA was conducted to assess the economic impacts of M3R on Victoria, Australia, and subregions of Victoria.

D2.7.2.1
Impacts on Victoria

The EIA suggests that M3R is likely to generate a significant economic impact for Victoria. It provides a boost of $2.26 billion during the construction period, and is expected to provide an additional 10,700 direct and indirect jobs over the construction period in Victoria.

Once construction is completed, international and domestic tourism are expected to grow faster under the Build scenario than the No Build scenario. **Table D2.5** shows Victoria's gross state product in millions of dollars and employment in thousands of people from 2026-2046 under the Build scenario, and the percentage change or increase this represents over a No Build scenario.

D2.7.2.2
Impacts on Australia

The impacts on Australia are considerably more muted, as much of the economic uplift in Victoria occurs at the expense of economic activity in other states and territories. The impact on real GDP for Australia over the construction period is expected to be $453 million, with a total of 2,300 net new annual jobs created as a result.

D2.7.2.3
Impacts on sub-state regions

Modelling undertaken by CoPS has been disaggregated to investigate the impacts on sub-state regions.

During the construction period, impacts on all affected Victorian areas are generally positive. The bulk of the employment benefits are in the construction industry, with some flow-on effects in wholesale trade, retail trade and manufacturing. Three quarters of these new jobs are expected to be based in Melbourne. Of these, the construction industry jobs will primarily be based in the airport zone. The new jobs added in retail, manufacturing and wholesale are likely to be more diffused around Melbourne.

Once the new north-south runway is operational (at the earliest in 2026), most industries in Victoria can expect greater economic value added and employment. The industry that experiences the greatest impact is transport, postal and warehousing, which expects an additional 957 jobs in the five years post opening. Other industries that experience significant employment impacts are accommodation and food services (813) and construction (494).

By five years post-opening, 2,840 new jobs are expected to be located in the Melbourne Airport zone; by 20 years post-opening, 4,847 additional jobs are expected within the Melbourne Airport zone. The most affected industry is transport, postal and warehousing (2,254 new jobs) followed by accommodation and food services (1,262 new jobs). To a great extent, these jobs are expected to be diffused throughout the airport zone, although some are more concentrated in specific areas than others. Table D2.6 shows the most affected areas.

D2.7.3
Findings of the cost benefit analysis

This section details the results of the CBA. The marginal costs and benefits of the Build case (over and above the No Build case) for Victoria have been calculated from 2019 to 2046, over a period of 26 years including the construction period.

Table D2.7 shows the findings of the CBA. Under all discount rates, the project produces benefits that are much greater than the costs. At a 7 per cent discount rate (a standard discount rate for the appraisal of transport infrastructure projects), the Benefit Cost Ratio (BCR) is 9.24 and the Net Present Value (NPV) of benefits is $11.69 billion. In simple terms, for every dollar invested in the new north-south runway, there will a nine-dollar return for Victoria.

Table D2.7
Cost Benefit Analysis

Impact	Value ($m)		
Discount rate (real)	**4%**	**7%**	**10%**
Construction	$1,590	$1,398	$1,236
Operating costs	$29	$20	$15
Present value of costs	*$1,619*	*$1,419*	*$1,251*
Induced additional air travel	$2,541	$1,451	$861
Traveller time saved	$842	$468	$269
Greater tourism exports	$12,071	$6,497	$3,599
Reduced delays	$4,171	$2,348	$1,367
Present value of benefits	*$23,797*	*$13,112*	*$7,463*
Benefit Cost Ratio	**14.70**	**9.24**	**5.96**
Net Present Value	**$22,178**	**$11,693**	**$6,211**

Source: SGS calculations, 2020

D2.7.3.1
Sensitivity analysis

These findings are reliant on the assumption that passenger demand for flights will continue to grow with relatively little constraint under the Build case, but constrained under the No Build case. A major potential risk of this is the fallout from COVID-19. This current analysis assumes demand for air travel will return to trend before the new runway is operational, however the profile and volume of the public demand for air travel may unpredictably and/or permanently change.

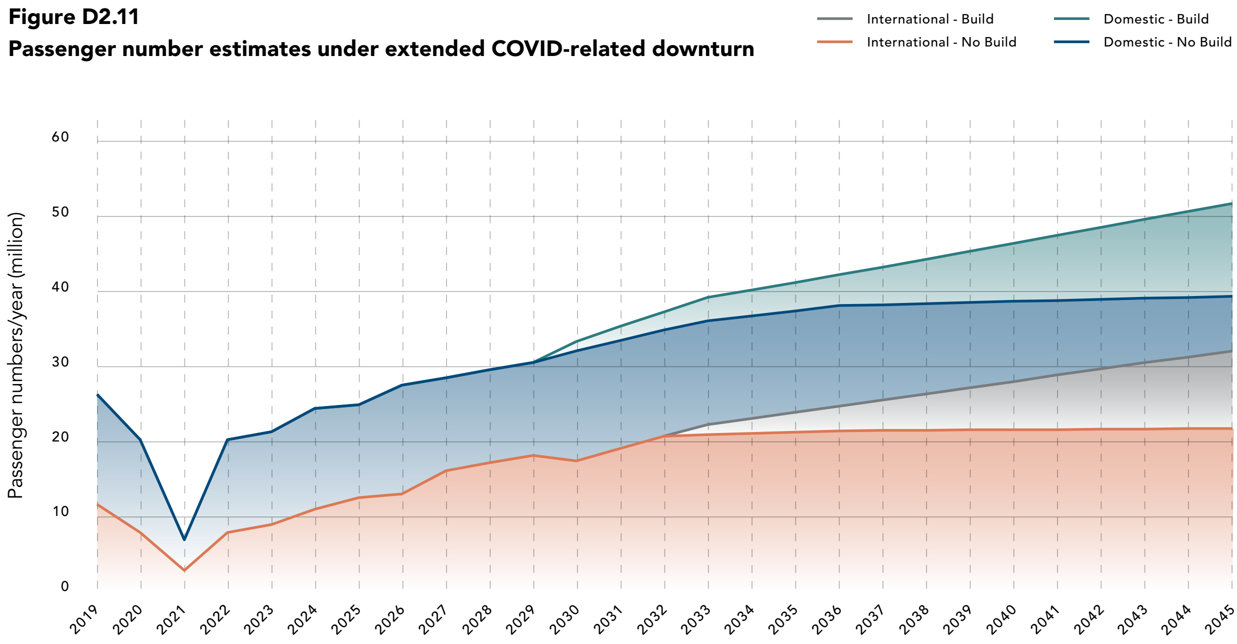
It is important for the economic impact assessment to consider the possibility that air travel may not return to trend per current modelling expectations. For this reason, a sensitivity analysis has been conducted with reduced passenger demand based on high-level estimates by SGS of a more conservative possible recovery of air travel when COVID-19 ceases to be a problem (assuming that air travel remains relatively subdued through all of 2020 then returns to trend by 2033). Under this scenario, demand is insufficient for there to be a difference in Build and No Build demand until 2030.

This sensitivity analysis, conducted with the reduced passenger demand, demonstrates the following reductions in benefits:

- Delay-cost savings for airside operations are halved
- Value of additional air travel is reduced to $100 per return flight

This significantly reduces the net benefits of the project. However, the net benefits are still positive at all discount rates. This suggests that even if the benefits of additional

Figure D2.11
Passenger number estimates under extended COVID-related downturn



Source: APAM, 2019; SGS Economics and Planning, 2020

tourism, delay cost savings are not fully realised, the project can still be justified based on additional airline tickets sold (producer and consumer surplus) and travel time savings.

Table D2.8
Cost Benefit Analysis – sensitivity analysis

Impact	Value ($m)		
Discount rate (real)	**4%**	**7%**	**10%**
Construction	$1,531	$1,310	$1,128
Operating costs	$29	$20	$15
Present value of costs	*$1,559*	*$1,330*	*$1,143*
Induced additional air travel	$1,164	$645	$369
Traveller time saved	$800	$436	$245
Greater tourism exports	$11,925	$6,394	$3,525
Reduced delays	$2,086	$1,174	$683
Present value of benefits	*$18,060*	*$9,822*	*$5,506*
Benefit Cost Ratio	**11.58**	**7.38**	**4.82**
Net Present Value	**$16,500**	**$8,492**	**$4,363**

Source: SGS calculations, 2020

The economic impact assessment model was also re-estimated based on these reduced passenger numbers. The simulations found that there would be an increase in projected gross state product and employment under the Build scenario even if COVID still had a dampening impact on passenger numbers beyond 2026. By 2031, an additional 3,904 jobs can be expected in Victoria under the Build scenario, and an additional 36,832 jobs are expected in Victoria by 2046 under the Build scenario, even if the reduction in travel demand from COVID continues to the early 2030s. This is only slightly less than the expected increase in jobs if demand for air travel returns to trend by 2026.

D2.7.3.2
Distributional effects

The quantified benefits are likely to be widely distributed across Melbourne and Victoria, with most communities gaining worthwhile advantages over the No Build scenario.

Induced additional air travel, traveller time saved and reduced delays will be broadly diffused in accordance with the current pattern of air travel originations across Victoria. There is likely to be a significant concentration in central and eastern Melbourne.

The benefits of greater tourism exports will be spread in accordance with the distribution of expenditure of tourists. Regional areas can expect to see the greatest increase in tourism compared to the No Build scenario, based on employment activity in accommodation and food services. In regional Victoria, the Hume is expected to see the greatest increase in tourism due to its proximity to the airport, followed by the Grampians.

The Melbourne Airport site is the greatest contributor to employment in the freight industry (with nearly 8 per cent of all Victorian jobs), followed by Melbourne CBD (many of these are head-office jobs in the transport industry) and Dandenong. Other areas within the local region likely to receive a significant share of increased employment from greater freight include Keilor, Brimbank and Tullamarine-Broadmeadows.

D2.7.4
Summary of overall impacts

This section has articulated the impacts on the Victorian and national economy as a result of the Build scenario where the new north-south runway is added to increase runway capacity at Melbourne Airport. The following three tables should be read jointly. They summarise:

- Total employment and GSP attributable to the airport site under the No Build scenario for 2026, 2031, 2041 and 2046
- Additional employment generated under the Build project for opening, +5 years, +15 years and +20 years (notionally 2026, 2031, 2041 and 2046).

The difference between Build (**Table D2.9**) and No Build (**Table D2.10**) is given in **Table D2.11**. Note that direct impacts do not necessarily capture airport-site activity only. In some cases, 'work' on the runway construction could still be completed away from the airport (such as the engineering design of the runway). Similarly, some activities could occur within the airport site that may have no direct relationship to the runway (although still being connected in some way to the airport's economic interests more broadly).

D2.8
AVOIDANCE, MANAGEMENT AND MITIGATION MEASURES

All of the M3R impacts discussed in the previous section can be considered as economic benefits. However, should the benefits not be fully realised there is an opportunity cost to the Victorian economy from the loss of both potential employment and GSP gains.

As such, there are three key measures which should be taken as a means of safeguarding the flow-on benefits of the M3R program and investment, including:

- Ensure local planning controls protect flight paths and airport environs from development encroachment; particularly residential development. The Melbourne Airport Environs Overlay (coded 1 and 2) is currently used to enforce appropriate land use outcomes through the *Victorian Planning Provisions (VPP)* under the *Victorian Planning and Environment Act 1987*
- Ensure transport connections to and from the airport and associated business parks/industrial precincts/employment centres can accommodate forecast demand. Although most benefits described in this chapter rely on adequate surface transport infrastructure investments, it is particularly important for freight
- Melbourne Airport can also engage in partnerships that play a role in helping to market tourism opportunities for visitors that will extend visitation and increase expenditure opportunities in Victoria. This will help accentuate the benefit of increased capacity at the airport to attract business and tourist visitors.
- To maximise demand for the new capacity the project will provide, APAM will continue to work with key aviation stakeholders, passenger and freight industry bodies and the Victorian Government to promote Melbourne Airport for passenger and freight services.
- In accordance with its Environment, Social and Governance strategy, APAM will implement sustainable procurement priorities to maximise the opportunities for local economies and employment opportunities.

D2.9
CONCLUSION

M3R is expected to have significant and wide-ranging economic benefits. Its construction will provide a one-off boost to employment in Victoria, much of which will be concentrated in the construction sector. When the project is completed, a number of benefits are expected to be achieved (compared to a No Build scenario in which Melbourne Airport remains a two-runway airport). They are:

- Greater reliability for air travellers
- Induced additional air travel and therefore reduced fare prices
- Reduced cost of delays in airside operations
- Greater tourism exports in Victoria
- Agglomeration-driven productivity gains
- Productivity gains through greater connectivity.

The economic impact analysis found that by 2046 an additional 37,000 jobs would be in place that would not exist in the No Build scenario. Most of these new jobs are expected to be in the transport, postal and warehousing industry and the accommodation and food services industry.

The cost-benefit analysis found that the most likely outcome for the project is a 9.24 dollar return for Victoria for every dollar invested. The largest benefits are expected to come from greater tourism exports and reduced travel delays. The sensitivity analysis, (modelling a slower-than-expected return to previous travel demand following COVID-19) showed benefits ranging between $4.82 and $11.58 for Victoria for every dollar invested.

Many of the economic benefits of the project will be felt in and around the Melbourne Airport region. Obviously the construction boost to economic activity is located there. When the M3R is built, key tourism and freight industries located around Melbourne Airport will receive an economic uplift. The Statistical Area Level 3 (SA3) of Tullamarine-Broadmeadows can expect to see the greatest impacts. In contrast, other benefits such as induced additional air travel, reduced cost of delays and greater reliability for air travellers are expected to be more diffused around Melbourne and Victoria.

Table D2.9
No Build (BAU) scenario outcomes

Outcomes	2019	Opening	+5 years	+15 years	+20 years
Employment					
Airport site	18,567	22,164	23,674	26,289	27,616
Local area	277,237	286,988	298,076	322,769	335,810
Victoria	3,156,162	3,492,509	3,718,341	4,169,261	4,391,970
GSP $m					
Airport site	$2,462	$3,157	$3,620	$4,718	$5,346
Local area	$27,854	$37,563	$43,550	$57,905	$66,110
Victoria	$379,445	$476,356	$554,389	$740,953	$847,419

Source: SGS Economics and Planning, Centre of Policy Studies, 2020

Table D2.10
Total employment and GSP at Melbourne Airport and Victoria in Build (BAU) scenario

Outcomes	2019	Opening	+5 years	+15 years	+20 years
Employment					
Airport site	18,567	22,161	24,145	28,633	30,837
Local area	277,237	286,952	299,261	328,644	343,643
Victoria	3,156,161	3,492,481	3,722,245	4,195,184	4,428,802
GSP $m					
Airport site	$2,462	$3,158	$3,649	$4,870	$5,570
Local area	$27,854	$37,569	$43,614	$58,311	$66,759
Victoria	$379,445	$476,370	$554,768	$743,729	$851,978

Source: SGS Economics and Planning, Centre of Policy Studies, 2020

Table D2.11
Total additional employment and GSP at Melbourne Airport and Victoria in Build (BAU) scenario

Outcomes	2019	Opening	+5 years	+15 years	+20 years
Employment					
Airport site	0	-3	471	2,344	3,222
Local area	0	-35	1,185	5,876	7,833
Victoria	0	-28	3,904	25,923	36,832
GSP $m					
Airport site	$0	$2	$30	$152	$224
Local area	$0	$6	$64	$406	$649
Victoria	$0	$15	$379	$2,777	$4,559

Source: SGS Economics and Planning, Centre of Policy Studies, 2020

Table D2.12
Impact Assessment Matrix

Economic aspect & baseline condition	Assessment of original impact						Mitigation and/or management measures	Assessment of residual impact				
	Original Impact	Mitigation inherent in design/ practice	Duration	Significance				Residual Impact	Duration	Significance		
				Severity	Likelihood	Impact				Severity	Likelihood	Impact
Construction												
Employment	Positive impact – direct and indirect construction jobs creation (expected 650+)	N/A	Short term	Beneficial	Almost certain	Beneficial	N/A	-				
Gross State Product	Positive impact – increased economic activity associated with construction and production	N/A	Short term	Beneficial	Almost certain	Beneficial	N/A	-				
Operation												
Employment	Positive impact for airport/operational jobs (direct) and diffuse (Victorian) related industries (initially 500 p/a increasing to 2000+ p/a)	N/A	Long term	Beneficial	Almost certain	Beneficial	N/A	-				
Gross State Product	Positive economic activity impact - increased economic activity associated with increased aviation business opportunity (direct) and diffuse Victorian related industries (indirect)	N/A	Long term	Beneficial	Almost certain	Beneficial	N/A	-				
Freight trade		N/A	Long term	Beneficial	Likely	Beneficial	N/A	-				
Tourism		N/A	Long term	Beneficial	Almost certain	Beneficial	N/A	-				
Property values	Concern about negative impacts of additional noise for residents near the airport on property values	RMIT study analysed comparative property value trend scenarios – concluded negligible impact of aircraft noise on property valuations	Long term	Negligible	Rare	Negligible	N/A	-				

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Chapter D3
Health Impact

Summary of key findings:

As with any major transport infrastructure project in a big-city urban environment, some negative health effects, as well as beneficial ones, are expected to occur as a result of Melbourne Airport's Third Runway (M3R). Health effects have been assessed for the following:

Noise

- Impacts due to daytime aircraft noise are expected – particularly annoyance and interference with communication, such as making speech hard to understand. The potential health effects of high levels of annoyance due to daytime aircraft noise are projected to be of a moderate level of severity. Most of this effect will occur in the lower ANEC contour bands due to the higher numbers of people living within them
- Impacts specific to night-time noise are also expected, especially sleep disruption. Although airport operating options and mitigations are available to reduce the overall impacts of sleep disturbance and noise-induced awakenings (compared to not building M3R), overall night noise impacts have been assessed as minor to moderate
- The M3R Build scenario provides a significant benefit over the No Build scenario in permitting alternative runway operation modes. These options will allow significant noise mitigation and noise sharing opportunities that will minimise night-time noise over the Greater Melbourne urban area
- The severity of the potential health effect of myocardial infarction (also known as a heart attack) arising from aircraft noise is projected to be negligible.

Air Quality

- Health risks associated with air quality impacts attributable to aircraft are assessed as minor or negligible for all the air quality indicators that were studied.

Childhood learning

- The severity of the potential health effect on schools, early childcare centres and kindergartens, aged care facilities and libraries from additional N70 overflights due to communication interference is projected to be moderate
- When comparing the 2046 Build scenario to the No Build scenario, the projected effect on reading comprehension is projected to be negligible.

Employment

- Employment is a key determinant of health. Beneficial effects on health are projected to result from the jobs that will created by M3R
- Additional employment arising from M3R construction is forecast to be 10,700 direct and indirect jobs, 500+ of which are expected to be created in the Melbourne Airport local area each year
- By comparing the Build and No Build scenarios for 2046, the number of additional jobs arising from operations is ~37,000 direct and indirect jobs. Nine out of 10 jobs are expected to be filled by people who live in Melbourne.

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D3.1 INTRODUCTION

This chapter presents the findings of an assessment of the potential health effects of Melbourne Airport's Third Runway (M3R) project.

The study independently assessed both the beneficial health impacts and the adverse health impacts of M3R on the airport's local communities. For the potential health effects of adverse significance that were identified, the chapter discusses appropriate measures to prevent, reduce and/or mitigate.

This chapter draws on impacts and benefits described in the MDP chapters **B3: Soils, Groundwater and Waste**, **B10: Air Quality**, **C4: Aircraft Noise and Vibration**, **D2: Economic Impact Assessment** and **D4: Social Impact**. It also refers to other relevant chapters but does not include all their content.

In this assessment:

- Direct effects are those that might arise from people's exposure to noise and air-pollutant emissions from ground-based airport activities, aircraft and associated road traffic
- Indirect effects are related to the employment opportunities offered by the project's construction and operation, and the subsequent employment generated off-airport.

The potential health pathways in this assessment examine the effects arising from changes in air quality, noise and employment.

This assessment was done by Robert Quigley of Quigley and Watts Ltd via AECOM Pty Ltd. The scope, focus and outputs were subject to independent expert peer review by Dr Andrew Buroni and Tara Barratt (RPS Ltd). Spreadsheets showing mortality and hospitalisation rates, and the development of the burden of disease, were produced by independent consultant Dr Matt Soeberg.

D3.2 METHODOLOGY AND ASSUMPTIONS

This assessment followed the approach of the Health Impact Assessment Guidelines (enHealth, 2001) for producing health impact assessments (HIAs) within Australia. The stages of the research and analysis process were:

- Defining and understanding its scope
- Understanding the background and context
- Engaging with key community and health stakeholders
- Assessing potential health impacts
- Considering ways to avoid and mitigate, or enhance, the health impacts.

The above stages were informed by data collected from:

- Site visits to Melbourne Airport and surrounding study areas (see **Section D3.2.2**)
- A review of M3R design and operational phase information
- Literature review of other airport HIAs and studies regarding the potential health effects of airport/ aircraft operations on communities
- Mapped information showing the location of various facilities and infrastructure in the study area
- Consultation with health and community stakeholders to inform the scope and focus of this chapter including:
  - Meeting with the Melbourne Airport Community Aviation Consultation Group
  - Interview with the independent Chair of the Community Aviation Consultation Group
  - Interview with Melbourne Airport's Community Engagement Coordinator
  - Interview with Jobs Victoria
- Meetings and discussions with relevant specialists producing the supporting M3R MDP impact assessments.

D3.2.1 M3R scenarios assessed and exposure pathways

The M3R scenarios assessed are consistent with those described in **Chapter A8: Assessment and Approvals Process**. Initial work by the assessors of air quality, noise and economic impacts confirmed that the two scenarios giving most insight into M3R's potential health impacts are:

- M3R construction effects
- The 2046 Build versus No Build scenario for 20 years after opening.

Together, these provide the basis for understanding the worst-case potential health impacts of M3R.

Although scenarios for 2026 and 2031 were assessed, their data is not presented in this chapter because their results were substantially lower than for 2046 and so added little understanding of M3R's potential effects.

As described in **Section D3.2.3** and **Section D3.2.4** (on the air quality and noise assessment methods), health effects have been assessed using a conservative approach. This means that this assessment most likely overestimates the possible effects.

For completeness, and to undertake a sensitivity analysis, where upper and lower confidence intervals exist (e.g. for air quality concentration response functions) potential health effects were calculated using these upper and lower 'bounds'. However, because these calculations do not alter the chapter's conclusions, their findings are not presented here. In statistics, confidence levels refer to the probability that a given parameter will fall between a range of estimates known as an 'upper bound' and a 'lower bound'.

The assessment determines if there are any pathways of exposure between the source of any 'hazards', in this case M3R, and the 'receptors' (the community). This is important, as a hazard by itself does not constitute a risk. It is only when there is a hazard, a receptor and a pathway of exposure that there is any potential for a risk to health.

For example, while air pollution concentrations may be very high near an emitting industrial facility, a health risk will occur only if people ('the receptors') spend time close to ('the pathway') the facility ('the source').

Finally, the concentration and mode of exposure to a specific hazard attributable to M3R, where the evidence base supports such potential effects, is calculated to establish any potential health effects.

D3.2.2 Study areas and populations assessed

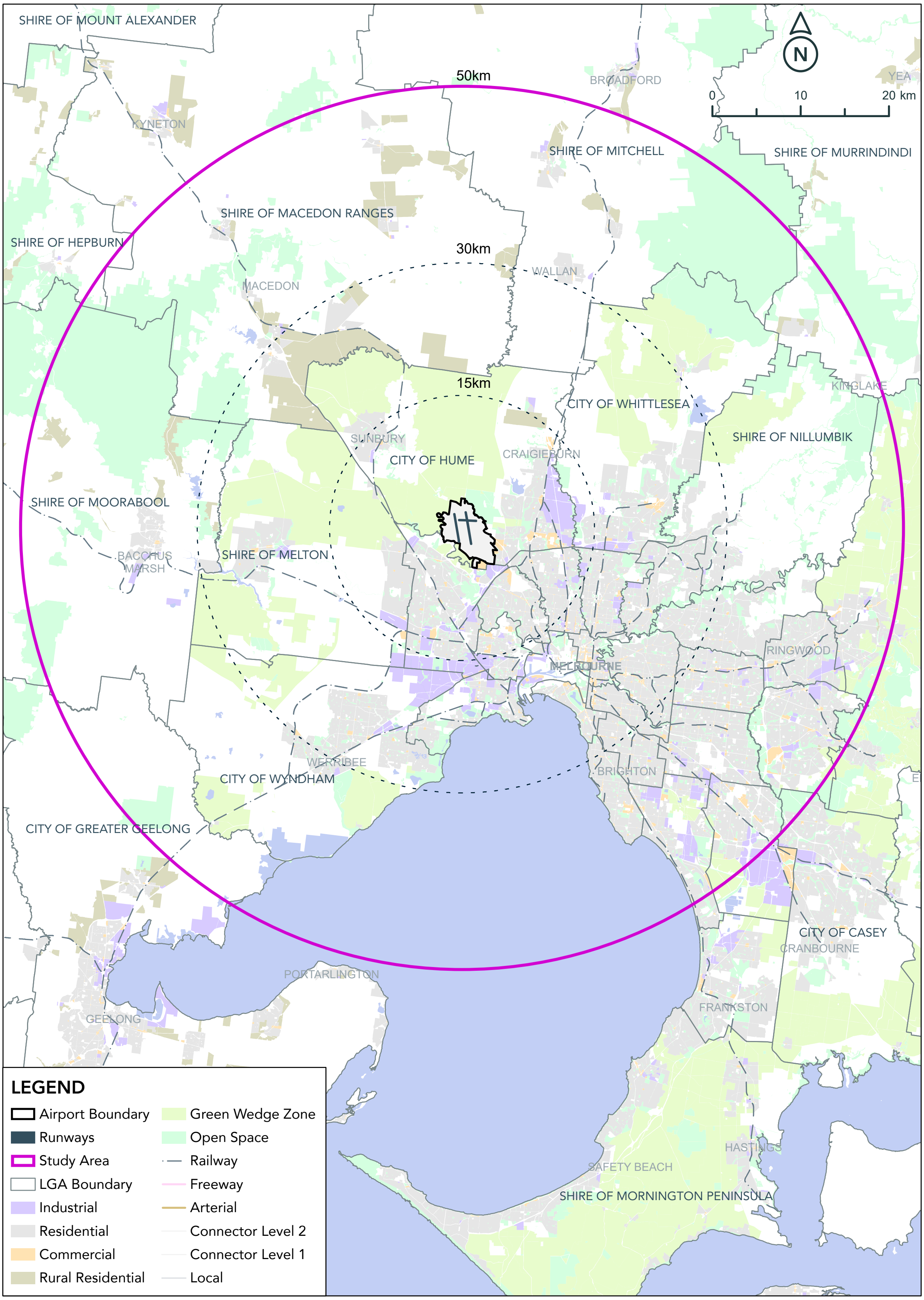
The potential health impacts on the population of two study areas were assessed, for noise and air quality.

Study area one is within a 15 kilometre radius of Melbourne Airport and study area two is located between 15 and 50 kilometres from the airport (see **Figure D3.1**). A third study area, the state of Victoria, was assessed for employment effects.

Exposure has been assessed along this 'environmental pathway' (WHO, 2005):

Source → Emissions → Concentrations → Exposure → Dose → Health effects

Figure D3.1
Health assessment study areas one and two



D3.2.2.1
Study area one

Study area one is the zone within a 15 kilometre radius measured from Melbourne Airport's Aerodrome Reference Point (ARP, i.e. the designated geographical location of an aerodrome) and those areas where 70 decibel noise contours (N70) extend beyond the 15 kilometre radius. It encompasses the existing airport air quality monitoring sites.

Study area one is used as the existing health baseline because data able to detect statistically significant differences in outcomes is available only at the macro Local Government Area (LGA) level. However, because LGAs do not align perfectly with study area one's boundary, a practical 'best fit' approach using health data sets from the six LGAs with most of their area located within study area one was used. These LGAs are:

- Hume
- Melton (most of the Melton township is not within study area one but it is included because a large area of the Melton LGA is)
- Brimbank
- Maribyrnong
- Moonee Valley
- Moreland.

D3.2.2.2
Study area two

Study area two comprises the zone that lies between 15 and 50 kilometres from Melbourne Airport's ARP and is located outside the majority of the N70 contour. This is consistent with the study area defined in Chapter C4: Aircraft Noise and Vibration.

D3.2.2.3
Study area three

Study area three is the entire state of Victoria and used only for employment effects.

D3.2.2.4
Sensitive populations and specific populations to assess

For the health pathways scoped into the assessment (noise, air quality, employment) – and where data allowed – impacts upon people who may be sensitive to exposure, and directly affected populations, were assessed. They include:

- School children (particularly the noise impact on reading comprehension)
- Communities with existing high health burdens
- Households directly affected (based on counts of the number of households within noise contours and estimated population)
- Suburbs directly affected (including households and public buildings) for noise
- Suburbs surrounding Melbourne Airport for air quality.

D3.2.3
Air quality assessment method

Airport HIAs typically study air quality health effects (see BAC, 2007; Environmental Resources Management, 2008; RPS, 2013; RPS, 2015; Mott MacDonald, 2014; KR/AF and Arup, 2013; Sunshine Coast Council, 2014; Pacific Environment Ltd, 2015).

The air quality data used to inform this HIA were sourced from **Chapter B10: Air Quality** which includes M3R's operational effects on air quality.

Consideration was given to jet aircraft engines (on the ground and airborne), road vehicles (on the airport and the surrounding road network), Ground Support Equipment (GSE) and aircraft Auxiliary Power Units (APU).

For the purpose of this assessment, air quality data was modelled to show the concentration of air pollutants at the nearest isolated residence/s to M3R. Residents further away are expected to have lesser effects due to the dispersion of any air pollution.

Because all residents in the assessment's calculations were assumed to be exposed to inhalation of the highest concentrations of air pollutants, this exposure pathway is a worst-case assessment and likely overestimates effects. This means that, with more accurate exposure data, any adverse findings would likely be assessed as having a lower significance. This approach is one typically used in international HIAs and for previous Australian airport HIAs.

Impacts on surrounding suburbs were assessed at 'statistical area level 2'. This is the smallest area for the release of Australian Bureau of Statistics (ABS) non-census estimated resident population data. Assessment of these impacts is therefore conservative due to this larger catchment size.

The assessment of health effects is also considered conservative because it does not consider the effects of air quality mitigation discussed in **Chapter B10: Air Quality** (e.g. air quality emission reductions associated with aircraft fleet changes have occurred in the past and are likely to do so in the future).

The air quality assessment results are compared with the legislative standards that are protective of the environment and health (**Section D3.3**). Following this comparison, an appropriate range of quantitative calculations was completed – in addition to the regulatory assessment process – to establish any potential change in hospitalisations or mortality arising from changes in air quality attributable to M3R.

Concentration-Response Functions (CRF) facilitate the quantitative calculation of the potential health effect from air quality and population data. The CRFs selected here draw on the strongest epidemiological data for long-term health effects from the US and Europe.

For short-term health effects, an Australian/New Zealand meta-analysis (EPHC, 2005) is used to provide CRFs. These daily 24-hour CRFs are suggested for use in Australia by a leading group of air quality specialists working on behalf of the Victorian Government's Environment Protection Authority (Jalaludin and Cowie, 2012). They also allow consideration of a range of daily health effects that is substantially wider than previous Australian airport HIAs.

Although National Environment Protection Measure (NEPM) standards apply to one-hour maximum and annual average nitrogen dioxide (NO_2) concentrations for 'burden of disease' (i.e. mortality and hospitalisations) calculations, the relationships are more reliable for 24-hour and annual average concentrations.

To calculate the annual burden of disease for particulate matter less than 10 micrometers (PM_{10}) less than 2.5 micrometers ($PM_{2.5}$) and NO_2, different data are requited. An example burden-of-disease calculation is:

For the pollutants benzene and formaldehyde, international agencies recommend to different assessments. These have been completed for M3R.

The first is a comparison against the Victorian State Environmental Protection Policy (SEPP) Air Quality Management (AQM) standard for air toxics.

The second is a calculation of lifetime risk of cancer via inhalation of air toxics. It uses unit-risk factors published by international agencies to estimate the increase in risk caused by exposure to one microgram per cubic metre of an air toxic (Office of Environmental Health Hazard Assessment, 2017):

- For benzene, the unit risk factor is 2.9 by 10^{-5} (0.000029) per microgram
- For formaldehyde, the unit risk factor is 6.0 by 10^{-6} (0.000006) per microgram.

For this HIA, the unit risk factor is multiplied by the modelled annual average concentration (from the Build versus No Build scenarios) to determine the increase in lifetime cancer risk attributable to M3R for each population assessed (see **Section D3.6.1.6** for information on possible cancer risks').

Change in rate of events (i.e. mortality or morbidity rate) = Change in concentration of pollutant X Increase in relative risk (i.e. concentration response function) X **Baseline incidence rate** X **Number of people exposed**

D3.2.4
Noise assessment method

The MDP has identified three potential operating strategies for M3R: mixed mode, segregated mode Option 1 and segregated mode Option 2 (see **Chapter C2: Airspace Architecture and Capacity** for details).

Where these operating strategies converge, a 'composite' prediction encapsulating the worst-case of the three has been used (e.g. noise impacts during the day and evening in 2046 with M3R). However, where the operating strategies are predicted to result in divergent outcomes, each operating strategy has been assessed separately (e.g. at night, when segregated modes are predicted to be in operation more frequently).

Noise data and household counts to inform the assessment of health effects have been sourced from **Chapter C4: Aircraft Noise and Vibration**. Some noise assessment levels (e.g. L_{Aeq} and $L_{Aeq\ night}$) and consequent household counts were specifically modelled for this chapter. An appropriate range of quantitative calculations (sourced from the literature review for this chapter and other Australian airport HIAs) was done. The findings expand upon the regulatory assessment process to establish any potential change in health outcomes.

ABS shows an average of 2.7 people per household in the Greater Melbourne area. Where an assessment requires analysis of the number of people affected, this multiplier has been used to convert the estimated numbers of dwellings to estimated numbers of people.

Chapters C4: Aircraft Noise and Vibration and **D4: Social Impact** use noise metrics such as ANEC (24-hour average exposures) and N60 and N70 contours to explain the change in indoor and/or outdoor noise exposure – and the noise-exposure pathway – that may be experienced by people due to M3R.

However, different metrics are sometimes presented in this chapter than those presented in the noise and social chapters. This is because different outcomes are being assessed and these values are important (e.g. health effects may accrue more predominantly from long-term exposure than seasonal or rare events). For example, the noise chapter includes L_{Amax}, N60 and N70; and the social chapter also includes L_{Aeq} and $L_{Aeq,night}$. However, the same underlying datasets, definitions, assumptions (e.g. take-off and landing scenarios) and reference years that were studied apply across all chapters.

D3.2.4.1
Annoyance assessment

Although most community annoyance studies are cross-sectional (i.e. looking at a given population's data at a single point in time) with a consequent limited ability to establish causation (enHealth, 2004), the percentage of people 'highly annoyed' remains a widely accepted health outcome of aircraft noise (enHealth, 2004; World Health Organisation (WHO), 2011, 2018).

Noise annoyance is assessed at the population level by a questionnaire using categories such as 'highly annoyed', 'annoyed', etc. The indicator typically used as a cut-off for investigating potential health effects is 'highly annoyed' (WHO, 2011).

People annoyed by noise experience a range of negative responses including feelings of resentment, displeasure, discomfort, dissatisfaction and offence (UK Civil Aviation Authority, 2016). This wide variation in individual responses prompted the development of population noise-annoyance curves in which aggregated data form consistent relationships.

Overseas, the UK Civil Aviation Authority calculates annoyance using LA_{eq} 16-hour decibel bands (UK Civil Aviation Authority, 2016) while WHO's Environmental Noise Guidelines for Europe (2018) uses the day evening night sound level (L_{den}) decibel bands.

The L_{den} noise metric considers noise across the entire 24-hour day but with penalties (in the form of weighting) to account for increased sensitivity to noise in the evening and night-time periods. Although the concept of L_{den} is similar to ANEC/F it is based on LA_{eq} and uses slightly different time periods and weightings.

In this assessment, the health impacts of annoyance are adequately described and assessed through the ANEC/F and N-above metrics, as is standard practice in Australian airport HIAs. In addition, consideration of discrete night-time noise metrics such as the N60 night and LA_{eq} night provides greater resolution of noise during this noise- sensitive time period – noting that the airport then operates differently by applying Noise Abatement Procedures (NAPs).

To test sensitivity, the LA_{eq} 16-hour decibel bands were compared to ANEC contours with greater numbers of highly annoyed people resulting from noise presented in the ANEC contours. This provided the most conservative measure. Therefore, ANEC contours are also used as the basis for annoyance assessment in this chapter. ANEC contours and the base data for this assessment are also presented in **Chapter C4: Aircraft Noise and Vibration**.

Finally, annoyance is also expected to occur in ANEC contours below 20 – although annoyance in these contours is not typically calculated in Australian settings (BAC, 2007; Sunshine Coast Council, 2014; Pacific Environment Ltd, 2015). This is because exposure prediction at lower sound levels may be significantly inaccurate (Australian Standard AS2021-2015).

Table D3.1 shows the ANEC contours and corresponding percentage of people 'seriously affected' (i.e. highly annoyed) used in this chapter's calculations.

Table D3.1
Percentage of 'highly annoyed' people (Australian Standard AS2021-2015)

ANEC contour (median)	Percentage of seriously affected (i.e. highly annoyed people)
20-25 (23)	17
25-30 (28)	26
30-35 (33)	37
Above 35	49

D3.2.4.2
Sleep disturbance assessment method

Miedema and Vos (2007) analysed 24 field studies from different countries about peoples' responses to aircraft sleep disturbance. They developed scales, per decibel band, describing the percentage of people 'sleep-disturbed' and 'highly sleep-disturbed'.

Several effects categorised under sleep disturbance are risk factors for health problems. They include changes in motility, duration of sleep stages, difficulty getting to sleep, reduced sleeping time, and use of sleep-inducing drugs (WHO, 2009; Civil Aviation Authority, 2014).

Miedema and Vos (2004) also used nine aircraft noise studies to develop an exposure-effect model for self-reported chronic sleep disturbance at night. Their work allows the percentage of the population who are sleep-disturbed and highly sleep-disturbed to be calculated from the LA_{eq} night decibel measure (the average sound-pressure level over night-time). Compared to the European WHO (2018) Environmental noise guidelines, the values used in this chapter are the most conservative.

Sleep disturbance was assessed in this HIA using the period 11pm to 6am (consistent with the National Airports Safeguarding Framework). Table D3.2 sets out the noise exposure levels and consequent percentages of those expected to be 'sleep-disturbed' or 'highly sleep-disturbed'.

D3.2.4.3
Noise-induced awakenings assessment method

Night-time noise-induced awakenings can be approximated from the frequency of overflights where maximum noise levels exceed 60 decibels.

Chapter C4: Aircraft Noise and Vibration states the number of events exceeding 60 decibels (A-weighted) (dB(A)) external to a building. This would typically result in a maximum noise level of 50 dB(A) inside a building with its windows open to a normal extent. At 50 (A) LA_{max} or an equivalent noise level in an alternate metric, approximately three per cent of aircraft noise events were found to cause awakenings in field trials (Bullen et al, 1997). The N60 contours calculated for the night-time period reasonably describe the number of events that may, in some circumstances, cause awakenings. They have therefore been adopted for assessment of night-time noise from aircraft.

The same is true for daytime noise-induced awakenings for institutions where people may be sleeping (such as day-care centres, hospitals, aged residential-care facilities) and shift workers.

D3.2.4.4
Myocardial infarction assessment method

Myocardial infarction is commonly known as a heart attack. There is evidence linking myocardial infarction to transport noise (road, rail, aircraft). A substantial review of aircraft noise and health effects (Civil Aviation Authority, 2013) summarised cardiovascular effects as:

> *'In terms of cardiovascular impact there are mixed conclusions from the various reviews and papers on the evidence for effects. Some reviewers consider that there is sufficient evidence, others that the evidence does not convincingly demonstrate an association. Based on existing evidence, it is possible that exposure to aircraft noise may be a risk factor for cardiovascular disease and all would agree that further research is needed to examine the impact of noise on cardiovascular health. For myocardial infarction, the WHO Environmental Burden of Disease report suggests that night-time effects may be of the same magnitude as day-time effects and therefore proposes an odds ratio of 1.1 for 60-65 decibels (A-weighted) Lnight and an odds ratio of 1.2 for 65-70 decibels (A-weighted) L_{night}.'*

The 'odds ratios' – a description of the level of association between an exposure and an outcome – referred to have been used in calculating potential myocardial infarction effects. UK Civil Aviation Authority (2016) research describes the association with aircraft noise and cardiovascular disease measures as continuing to evolve.

Table D3.2
Sleep disturbance at various noise exposure levels

$L_{Aeq\ night}$ (decibels)	Percentage of sleep disturbed people	Percentage of highly sleep disturbed people
45-49	8.9	5.1
50-54	12.2	7.4
55-59	16.4	10.4
60-64	21.3	14.1
65-70	27.0	18.6
70+	33.4	23.8

There is emerging evidence to suggest that cardiovascular effects (i.e. myocardial infarction and hypertension) are more strongly linked to night-time noise exposure than daytime or total (24-hour) noise exposure. For example, WHO (2018) describes the quality of evidence associating ischaemic heart disease and L_{den} (a 24-hour noise metric) as very low quality. enHealth (2018) describes the quality score of the evidence base for hypertension and noise as 'low', with most studies focused on road traffic noise rather than aircraft noise.

The same is true regarding the quality of the evidence base for stroke, rated as 'very low'.

Finally, for cardiovascular outcomes enHealth (2018) says 'the magnitude of the reported effects across studies is small'.' Taking all this into account, the focus of this chapter is on potential myocardial infarction arising from night-time noise, in line with other Australian airport HIAs and those around the world.

D3.2.4.5
Communication interference assessment method

A maximum external overflight level of 70dB(A) has been adopted for this assessment for the following reasons:

- An internal noise level of 60 dB(A) is the sound-pressure level of a noise event likely to interfere with conversation or listening to the radio or television
- The Commonwealth's then Department of Transport and Regional Services (2000) described how a single external noise event would be attenuated by approximately 10 dB(A) by the walls of a house with its windows open.

Chapter C4: Aircraft Noise and Vibration describes how the N70 contours change throughout the year due to variations in day-to-day, week-to-week airport operations. For this quantitative assessment, annual N70 contours have been used.

The number of institutions (such as day care, primary and secondary schools, hospitals, aged residential-care facilities and community centres, and libraries) exposed to individual instances of noise interference with speech and communication each day is reported in this chapter.

The modelling shows the number of times a day that an institution has an overflight exceeding 70 dB(A) (represented by the N70 contour). For schools, the modelling is for 9am to 3pm, matching their time of operation. The detailed data underpinning this assessment can be found in **Chapter D4: Social Impact**.

Table D3.3 shows how frequently an N70 category event will occur.

D3.2.4.6
Reading comprehension in children: assessment method

Research applicable to this assessment includes the Road Traffic and Aircraft Noise Exposure and Children's Cognition and Health (RANCH) study (Stansfeld et al., 2005). It studied 2,844 children from 89 schools in three countries, around London Heathrow, Madrid Barajas and Amsterdam Schiphol airports. The children were aged between eight years 10 months and 10 years 10 months.

This was a well-designed cross-sectional study that measured noise exposure (analysis via LA_{eq} 16-hour outdoor, dB(A)) and considered several cognitive and health outcomes. Major 'confounding factors' such as age were controlled in the analysis.

Table D3.3
Median frequency of overflights: 9am to 3pm and 6am to 7pm

N70 category overflights 9am to 3pm (median)	Minutes in the period 9am to 3pm	Median frequency of overflights
5-9 (7)	360	One per 51 minutes
10-19 (14.5)		One per 25 minutes
20-49 (34.5)		One per 10 minutes
50-99 (74.5)		One per 5 minutes
100-199 (149.5)		One per 2 minutes
200-499 (349.5)		One per 1 minute
N70 category overflights 6am to 7pm (median)	**Minutes in the period 6am to 7pm**	**Median frequency of overflights**
5-9 (7)	780	One per 111 minutes
10-19 (14.5)		One per 54 minutes
20-49 (34.5)		One per 23 minutes
50-99 (74.5)		One per 10 minutes
100-199 (149.5)		One per 5 minutes
200-499 (349.5)		One per 2 minutes

The study showed a linear exposure-effect association between aircraft noise and impairment of reading comprehension between 37 decibels and 67 decibels. In other words, as noise exposure increased from low to high levels, reading comprehension decreased. However, the magnitude is described as 'small' by the study authors, with a 20-decibel change being equivalent to one-fifth of a standard deviation of the mean reading comprehension score.

Two more studies have shown that the effects of aircraft noise on children's learning ceased once noise levels were reduced, i.e. that the effect is reversible.

For this assessment, the LA_{eq} 9am to 3pm outdoor decibels data were modelled (2046 Build versus No Build) and plotted against the locations of primary schools in the study area.

The change in LA_{eq} 9am to 3pm for each school exposed to greater than 37 decibels(A) in the 2046 Build scenario was contrasted against the relevant reading comprehension delay. 37 dB(A) was chosen as the lower cut-off because the RANCH study showed no effect on reading comprehension from aircraft noise below this level, and noise less than 37 dB(A) would be negligible within urban and suburban environments. While the effect is robust, quantitative findings for individual schools are overly precise and so a qualitative description of the findings is presented in Section D3.6.2.6.

A small number of schools in the study area were both primary and secondary schools (i.e. P-12) but despite having secondary pupils they were also included in the analysis - special development schools were also included.

D3.2.5
Employment assessment method

Several airport HIAs – e.g. Stansted G1, Belfast City, Birmingham, London City –qualitatively assessed the health effects of income and employment effects (RPS, 2015) and one quantitatively (Environmental Resources Management, 2008). No previous Australian airport HIA has considered the health effects of employment (Mott MacDonald, 2014; Sunshine Coast Council, 2014), instead focusing on only physical environment effects.

For this chapter, data to inform the qualitative and quantitative assessment of employment on health have been sourced from Chapter D2: Economic Impact Assement. Jobs Victoria data was used for the qualitative assessment of employment on health. The data was analysed to identify both qualitative and quantitative health effects from employment, describe barriers to employment and recommend mitigations where required.

D3.2.5.1
Qualitative employment assessment method

The potential health effects of employment have typically been assessed qualitatively in previous HIAs. That is, estimating whether the effect is likely positive or negative and while not measuring the size of effect, other airport HIAs do make comment on the likelihood of the effect occurring (Arup and Partners Ltd, 2012; RPS, 2015). This is a practical approach for dealing with certain employment impacts that cannot easily be quantified.

D3.2.5.2
Quantitative employment assessment method

A large-scale meta-analysis considered data from 20 million people from 42 previous studies in 15 countries including Australia and New Zealand (Roelfs et al., 2011). This study concluded that the mean hazard ratio for mortality and unemployment (adjusted for age and other covariates) is 1.63. That is, people who are unemployed have a mortality rate 63 per cent higher than people who are employed. This is a large effect that further demonstrates the critical nature of the social determinants of health, and is the mortality hazard ratio used in this chapter.

Consequently, it is possible to estimate mortality effects for indirect new employment opportunities arising from the 2046 Build scenario.

The other piece of data needed for a quantitative employment assessment is the base case mortality rate (per 100,000 persons) for those aged 18 to 64 years. The M3R calculation is made by multiplying the base-case mortality rate by the unemployed mortality hazard ratio, multiplied by the number of job opportunities created. The difference is the mortality avoided.

The number of jobs created by M3R is sourced from Chapter D2: Economic Impact Assement. The number of jobs created is different from the other jobs statistics in that it is more a 'flow' than a 'stock' measure. This means that unless the airport made an explicit commitment to employing unemployed people, the direct impact would likely be zero. Instead, the raw number of jobs created by M3R will, all else being equal, lead to an increase in the overall level of employment across the economy. This in turn will filter down to an approximate level of employment opportunities for the unemployed. That is, as the newly created M3R jobs are filled, the person taking that job creates an opportunity for a new employee at their former job – and so on, until it provides an opportunity for a person not employed (i.e. a person entering or re-entering the workforce).

The benefit relating to unemployment is therefore an indirect employment benefit.

Finally, the role of Jobs Victoria is explicitly focused on this aspect of gaining employment for unemployed people (i.e. for roles made vacant by people moving into the new M3R operation roles). As M3R construction jobs are temporary (i.e. only available over a fixed time frame) and require specialist skills (e.g. construction skills) and are more likely to support existing jobs rather than create new ones, the indirect employment benefit across the economy is less assured. Therefore, construction jobs are not included in the quantitative analysis of health effects that considers long-term health outcomes (however they are discussed further in the qualitative analysis).

D3.2.6
Consideration of ways to avoid and mitigate, or enhance, the health impacts of M3R

The opportunities for avoidance, mitigation or enhancement measures have been considered throughout this HIA, beginning with a preliminary assessment undertaken at the same time as the scoping exercise. This allows any measures to be incorporated into the design from the outset and throughout.

D3.3
STATUTORY REQUIREMENTS

D3.3.1
Statutory framework for this health assessment

The statutory framework for this assessment is provided in Chapter A8: Assessment and Approvals Process. For context, the *Airports Act 1996* (Cth) (Airports Act), the National Airports Safeguarding Framework (NASF) and the Melbourne Airport Master Plan are included in the statutory framework relevant to this HIA.

The statutory framework relevant to air quality assessment with respect to health is described in Section D3.3.3.

This chapter's sections on health (Section D3.3.2), noise (Section D3.3.4) and employment (Section D3.3.5) have no directly relevant legislation, nor are there particular measures that must be completed in a health assessment. Instead, the relevant regulatory context supporting the statutory framework for health, noise and employment is presented.

D3.3.2
Regulatory context: health

The *Public Health and Wellbeing Act 2008* (Vic) (PHWB Act) is a major legislative driver in improving the health and wellbeing of Victorians.

It recognises that the Victorian Government has a significant role in promoting and protecting the public health and wellbeing of people living in Victoria. The Act requires that a Victorian Government public health and wellbeing plan be prepared every four years. It establishes six principles to guide public health efforts in Victoria:

1. Evidence-based decision-making: The best available, relevant and reliable evidence should be used to inform decisions regarding use of resources and selection of interventions that promote and protect public health and wellbeing
2. Precautionary principle: Where a health risk poses a serious threat, lack of full scientific certainty should not be used as a reason to postpone measures to prevent or control the health risk
3. Primacy of prevention: The prevention of disease, illness, injury, disability and premature death is preferable to remedial measures
4. Accountability: Decisions relating to the PHWB Act should be made in transparent, systematic and appropriate ways that include promoting a good understanding of public health issues to Victorians and providing the opportunity to participate in policy and program development
5. Proportionality: Decisions made and actions taken relating to the PHWB Act should be proportionate to the identified health risk sought to be prevented, minimised or controlled
6. Collaboration: Public health and wellbeing in Victoria, and at the national and international levels, can be enhanced through collaboration between all levels of government and industry, business, communities and individuals.

There are also several guidelines and plans that are not statutory but which inform the scope of work of this HIA because they help to determine best practice. They include:

- Health Impact Assessment Guidelines (enHealth, 2001): Provide guidance on how to produce a HIA, including the necessary steps, in Australia
- Environmental Health Risk Assessment Guidelines (enHealth, 2012): Provide guidance on how to undertake a health-risk assessment, particularly assumptions underpinning quantitative assessment of human health effects
- Victorian Public Health and Wellbeing Plan 2015-2019 (Department of Health and Human Services, 2015) and the 2019-2023 Plan (Department of Health and Human Services, 2019): Set out the priorities for action in Victoria to improve health and wellbeing including healthy eating, tobacco, alcohol, mental health, violence and injury, and reproductive health. Mental health is indirectly related to M3R via the pathway of noise exposure.

Legislation that imposes controls to prevent or minimise air, water, soil and noise pollution plays an important role in protecting human health and ecosystems. It includes the *Environment Protection Act 1970* (Vic) and consequent SEPPs.

The standards and guidelines relevant to air quality and noise are presented briefly below but discussed in greater detail in the relevant chapters (Chapter B10: Air Quality and Chapter C4: Aircraft Noise and Vibration) and apply to land outside Melbourne Airport's boundary.

D3.3.3
Regulatory context: air quality

Commonwealth and state legislative requirements underpin **Chapter B10: Air Quality**. However, state legislation does not apply at Melbourne Airport because it is on Commonwealth land. Nevertheless, consideration has been given to the requirements of state legislation where relevant and to be thorough.

At the Commonwealth level, the National Environment Protection Council (NEPC) has set out National Environment Protection Measures.

The NEPM Ambient Air Quality (AAQ) (NEPC, 1998) is used in Australian jurisdictions to monitor and assess ambient air quality. In 1998, standards for ambient air quality were set for six primary air pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulphur dioxide (SO_2), lead and particulate matter.

NEPC (2016) strengthened the air quality reporting standards for particulate matter PM_{10} and amended the previous 'advisory reporting standard' for $PM_{2.5}$ to a 'performance standard' (i.e. requiring the same level of reporting compliance as other pollutants). The revision also includes new objectives for $PM_{2.5}$ by 2026. New standards for the NEPC were proposed for sulphur dioxide, nitrogen dioxide and ozone in an Impact Statement by the NEPC in May 2019.

The NEPC (2003) and NEPC (2016) air-quality monitoring standards are set out in **Table D3.4**.

The NEPM (Air Toxics) 2011 (NEPC, 2011) was established to facilitate a consistent approach to the monitoring and reporting of five key hydrocarbons that impact on human health; benzene, toluene, formaldehyde, xylenes and polycyclic aromatic hydrocarbons (PAHs). The NEPC (2011) monitoring investigation levels for the primary hydrocarbons are also described in **Table D3.4**.

State legislative requirements are set by the SEPP (AAQ) (Victorian Government, 1999) and the SEPP Air Quality Management (AQM) (Victorian Government, 2001).

These adopted the original (1998) objectives and goals of NEPC (2003). The Victorian Government (2016) adopted the changes set out in the amended NEPC (2016), in relation to the new standards for PM_{10} and $PM_{2.5}$. The Victorian Government (1999) air quality monitoring standards and Victorian Government (2016) variations relevant to this assessment are set out in **Table D3.4** alongside the corresponding NEPM standards.

To determine whether M3R meets the SEPP (AQM) legislation requiring air quality impact assessments to be cumulative, the predicted air quality impacts for a given facility are added to the existing background air pollutant (or 'indicator') levels (see **Chapter B10: Air Quality** for further information).

For burden-of-disease calculations, the air quality measures calculated the difference between the Build and No Build scenarios (considering background air quality for each scenario).

D3.3.4
Regulatory context: noise

There are no quantitative criteria legislated for the evaluation of aircraft noise in Australia. The assessment of noise has therefore followed recent best practice as described in **Chapter C3: Aircraft Noise Modelling Methodology**.

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) is the Commonwealth Government's central piece of environmental legislation. The EPBC Act also addresses actions that have a significant environmental impact on Commonwealth land or that are carried out by a Commonwealth agency – including a change of airspace (and thus aircraft noise).

Table D3.4
NEPM standard and SEPP (AQM) criteria relevant to M3R

Pollutant	Averaging period	Assessment criteria	Reference
PM_{10}	24-hour average	50 µg/m³	NEPM (NEPC, 2016)
	Annual average	20 µg/m³	NEPM (NEPC, 2016)
$PM_{2.5}$	24-hour average	25 µg/m³	NEPM (NEPC, 2016)
	24-hour average	20 µg/m³	NEPM (NEPC, 2016) goals for 2026
	Annual average	8.0 µg/m³	NEPM (NEPC, 2016)
Sulphur Dioxide	1-hour average	200 ppb (523µg/m³)	Victorian Government (1999)
Carbon monoxide	1-hour average	29 mg/m³	Victorian Government (1999)
Nitrogen Dioxide	1-hour average	120 ppb (226 µg/m³)	Victorian Government (1999)
Formaldehyde	Three-minute average	40µg/m³	Victorian Government (2001)
Benzene	Three-minute average	53 µg/m³	Victorian Government (2001)

The Airports Act requires that each airport lessee company, such as Australia Pacific Airports Melbourne (APAM), develop a Master Plan. This is an important document for managing environmental matters – including noise.

The airport Master Plan is required to include measures relevant to noise. They include an endorsed ANEF, flight paths, and plans for managing aircraft noise intrusion in areas forecast to be subject to exposure above the significant ANEF levels. Similarly, an MDP must also include plans for managing aircraft noise intrusion above the significant ANEF levels (under the Airports Act, 'significant ANEF levels means a noise above 30 ANEF levels').

D3.3.5
Regulatory context: employment

Although there are several regulations concerning employment in Victoria, none are directly relevant to the potential health effects explored in this chapter.

D3.4
DESCRIPTION OF SIGNIFICANCE CRITERIA

The severity criteria appropriate to this health impact assessment are described in **Table D3.5**.

Development of these criteria has been related to similar criteria described in **Chapter D4: Social Impact**. It has also incorporated the relevant aspects of the whole-of-environment assessment requirement as defined in *Significant Impact Guidelines 1.2 – Actions on, or impacting upon, Commonwealth land and Actions by Commonwealth Agencies* (Significant impact guidelines 1.2) (DSEWPaC, 2013).

Table D3.5
Severity criteria

Impact categories	Description
Major	• The impact is considered critical to the decision-making process, including very large changes in manifest health conditions such as hospitalisations, cancer or mortality • Impacts tend to be permanent or irreversible or otherwise long-term and can occur over large-scale areas affecting very large populations • People can no longer safely live/work/learn/recreate within an area because of impacts associated with operation of the airport
High	• The impact is considered likely to be important to decision-making, including large changes in manifest health conditions such as hospitalisations, cancer or mortality • Impacts tend to be permanent or irreversible or otherwise long to medium-term • Impacts can occur over large or medium-scale areas affecting large populations • Many dwellings are located within ANEF/C contours of 30 or greater (significant noise level as per the Airports Act) • Public buildings are located within ANEF/C contours of 30 or greater (significant noise level as per the Airports Act) • People can continue to live/work/learn/ recreate within an area but many people are severely impacted by the operation of the airport.
Moderate	• The effects of the impact are relevant to decision-making including the development of environmental mitigation measures • Impacts can range from long-term to short-term in duration • Impacts can occur over medium-scale areas or otherwise represents a significant impact at the local scale affecting specific subpopulations • People continue to live/work/learn/recreate within the area but some are severely or moderately affected by impacts, e.g. highly annoyed, highly sleep-disturbed, communication interference or reading comprehension.
Minor	• Impacts are recognisable/detectable but acceptable • These impacts may be raised as local issues but are unlikely to be of importance in the decision making process. Nevertheless, they are relevant in the consideration of standard mitigation measures • People can continue to live/work/learn/recreate within the area but with measurable yet small effects.
Negligible	• Minimal change to the existing situation. For example, impacts which are beneath levels of detection or impacts that are inconsequential given existing context.
Beneficial	• Effects of the impact are beneficial to health.

D3.5 EXISTING CONDITIONS: COMMUNITY PROFILE AND HEALTH BASELINE

D3.5.1 Geographic setting

The setting for the health assessment is Melbourne Airport, which is approximately 22 kilometres north-west of the Melbourne Central Business District (CBD). There are urban areas to the east and south of Melbourne Airport made up of industrial and residential developments. Figure D3.1 shows Melbourne Airport and the health study area as discussed in Section D3.2.2.

D3.5.2 Demographic profile of the study areas

Full details on the demographic profile of the study areas, their deprivation data (Index of Relative Socio-Economic Advantage and Disadvantage, IRSAD) and the geographic areas that could be affected more than others (for example by noise contours) are described in Chapter D4: Social Impact.

Chapter D4: Social Impact describes how areas around the airport have different IRSAD scores, some relatively high (indicating socio-economic advantage, such as those towards the CBD) and some relatively low (indicating socio-economic disadvantage such as those to the east and south-west. A variety of socio-economically advantaged and disadvantaged areas are found around the airport.

While it could be inferred that the health status of socio-economically disadvantaged populations may be worse than the more socio-economically advantaged suburbs, health data does not exist at the ABS's statistical area 1 level which would allow statistical significance to be determined. The most disadvantaged suburbs (with the lowest IRSAD scores) are not those areas directly bordering the airport.

Therefore, for the health indicators section of the health profile, the reliance on LGA data in Section D3.5.3 is maintained.

D3.5.3 Existing profile of the study areas

D3.5.3.1 Overall health status of the community

The Victorian Population Health Survey (Department of Health, 2019) shows that for the six LGAs in the community baseline assessment, 84 per cent of the 648 indicators (544 indicators) are the same as the Victorian averages, five per cent (32 indicators) better and nine per cent (60 indicators) worse.

Given that Australia and Victoria have some of the world's best health statistics, this shows that the communities which would experience any potential effects of M3R are in good health overall.

The 60 indicators below the Victorian averages are presented in Table D3.6. Forty-six of them (77 per cent) reflect lifestyle-related issues and consequent chronic diseases such as obesity.

Table D3.6
Health indicators in LGAs which are below the Victorian averages

Health indicator grouping	Health indicators in LGAs which are below the Victorian averages (# of indicators per category)					
	Hume	Moreland	Moonee Valley	Brimbank	Melton	Maribyrnong
Fruit and vegetable intake Physical activity Smoking Alcohol	Fruit and vegetable intake (11) Physical activity (2) Smoking (1)	Alcohol (2)	Physical activity (1) Alcohol (1)	Vegetable intake (3) Physical activity (3) Smoking (1)	Fruit and vegetable intake (5) Smoking (1) Alcohol (1)	0
Chronic diseases and obesity	Heart disease (1) Obesity (2) Daily consumption of sugar sweetened beverages (1)	Type 1 diabetes (1)	0	Stroke (1) Weekly consumption of takeaway meals or snacks (1)	Obesity (3) Daily consumption of sugar sweetened beverages (1) Weekly consumption of takeaway meals or snacks (1)	Weekly consumption of takeaway meals or snacks (1) Access health check for blood lipid or blood glucose (1)
Mental health and wellbeing	Mental health (2) Self-reported health status (1) Life satisfaction (2) Life worthwhile (1)	0	0	Self-reported health status (2)	0	Mental health (2)
Dental health	0	0	0	Self-reported dental health status (2) Self-reported gum disease (1)	Avoided visiting a dental professional due to cost (1)	0

D3.5.3.2
Local services and facilities

Situated within the boundary of Melbourne Airport are the terminal buildings and associated food, retail, airport office facilities and the Melbourne Airport Business Park. Beyond Melbourne Airport, many facilities and amenities are available to the local communities within study area one. These include:

- Education facilities
- Community services
- Places of worship
- Hospital and health services
- Aged residential-care facilities.

These services are assessed for potential effects from airspace noise within this chapter.

D3.5.3.3
Background incidence of mortality and hospitalisations for relevant conditions

Specific data was requested from the Australian Institute of Health and Welfare regarding mortality data, and from the Victorian Agency for Health Information regarding hospitalisation data. Baseline mortality rates and baseline hospitalisation rates are calculated from the provided data and for transparency are presented in each assessment calculation (see Section D3.6).

D3.5.4
Existing conditions: air quality

Two air quality monitoring programs operate at the airport. They cover the two broad categories of air pollutants:

- Criteria pollutants (NO_2, SO_2, O_3, CO, PM_{10} and $PM_{2.5}$)
- Air toxics - including benzene, toluene, xylene, formaldehyde and PAHs.

The existing conditions were summarised during the baseline assessment as:

- CO concentrations are low, with no exceedances of the NEPM standard
- NO_2 concentrations are low, with no exceedances of the NEPM standard
- SO_2 concentrations are very low, with no exceedances of the NEPM standard
- PM_{10} exceedances (more than 50 micrograms per cubic metre) occurred but were related to Melbourne-wide issues due to bushfire smoke. Otherwise, 24-hour average values varied, but are typically within a range of eight to 35 micrograms per cubic metre
- $PM_{2.5}$ exceedances (more than 25 micrograms per cubic metre) also occurred but again were related to Melbourne-wide issues due to bushfire smoke. Otherwise, 24-hour average values varied, but are typically within a range of five to 18 micrograms per cubic metre
- Benzene concentrations are low, with all analytical results below the laboratory limits of detection, with no exceedances of the NEPM standard
- Formaldehyde concentrations are low, with results typically around 10 micrograms per cubic metre, with no exceedances of the NEPM standard.

Further details are described in Chapter B10: Air Quality.

D3.5.5
Existing conditions: aircraft noise

Melbourne Airport operates curfew-free, 24-hours per day, seven days a week. Existing aircraft noise is detailed in Chapter C4: Aircraft Noise and Vibration, showing that aircraft operations occur over almost all of the study area. These overflights differ in operation type, altitude, noise level and frequency. Although almost all of the Greater Melbourne Basin is overflown at some stage, most flights are reasonably concentrated along specific arrival and departure paths.

The day and evening N70 contours extend north, south, east and west of the existing runways.

The prevalence of arrivals onto the north-south runway (particularly from the north to runway 16) is evident in the contours. To the north, the N70=5 contour extends approximately 15 kilometres from the runway – corresponding to arrivals approaching the runway with a steady, shallow glide slope (relative to most departure climb rates).

In the east-west direction, the bias toward runway 27 (i.e. departures to the west and arrivals from the east) is evident. The N70=5 contour extends approximately 15 kilometres from runway 27, with N70 contours as high as 100 extending 11 kilometres to the west. Although the N70=5 extends similarly to the east its contours are narrower, consistent with arrival operations. It is noteworthy that the N70=100 contour does not extend particularly far east of the airport, indicating fewer 70 dB(A) events to the east compared to other directions.

The night-time N-above contours generally extend along the extended runway centre lines in each direction. The most significant noise emissions are north and south of the airport, with reduced emissions levels to the east and west.

Further details are described in Chapter C4: Aircraft Noise and Vibration.

D3.5.6
Existing conditions: employment

Melbourne's current population is nearly five million, representing 20 per cent of Australia's total population and about the same proportion of Australian jobs. The Melbourne Airport local region contains approximately nine per cent of state-wide employment. Two of the industries in the Melbourne Airport local area (transport and construction) have twice the percentage of jobs that would be expected if the area correlated with the Victoria average.

D3.6 ASSESSMENT OF POTENTIAL IMPACTS

This section describes the findings of the assessment of M3R's potential health effects for air quality, noise and employment.

This assessment determines the effect of the 2046 M3R Build versus the 2046 No Build scenario. As can be seen from projected annual aircraft movements, the largest difference is in the 2046 scenario (see **Figure D3.2**) which therefore gives the greatest insight into potential effects on health.

D3.6.1 Air quality

This section assesses the potential health effects of air quality modelled to occur during M3R operation. Current and potential future airport operations were included in air quality models within **Chapter B10: Air Quality** – including particulate and gaseous emissions (e.g., PM_{10}, $PM_{2.5}$, oxides of nitrogen and hydrocarbons) from jet aircraft engine exhausts, road vehicles on the airport and surrounding roadways, airport ground support equipment during operations and aircraft auxiliary power units.

As described in **Section D3.3**, the statutory framework requires assessment against certain air quality standards. The health assessment has considered several additional air quality measures to further explore and communicate health outcomes.

Health impacts from exposure to poor air quality include hospitalisations and mortality. This study aimed to identify whether exposure for local communities was significant regarding health outcomes.

D3.6.1.1 PM_{10} assessment of M3R operation: 2046 Build v No Build

The following individual assessments of PM_{10} exposure were done:

- Comparison of PM_{10} concentrations against NEPM (AQM) standards for both annual average exposure and 24-hour average exposure for the 2046 Build versus No Build scenarios
- Calculation of potential mortality effects from PM_{10} exposure for both annual average exposure and 24-hour average exposure for the 2046 Build versus No Build scenarios
- Calculation of potential hospitalisation effects for 24-hour average of the 2046 Build versus No Build scenarios.

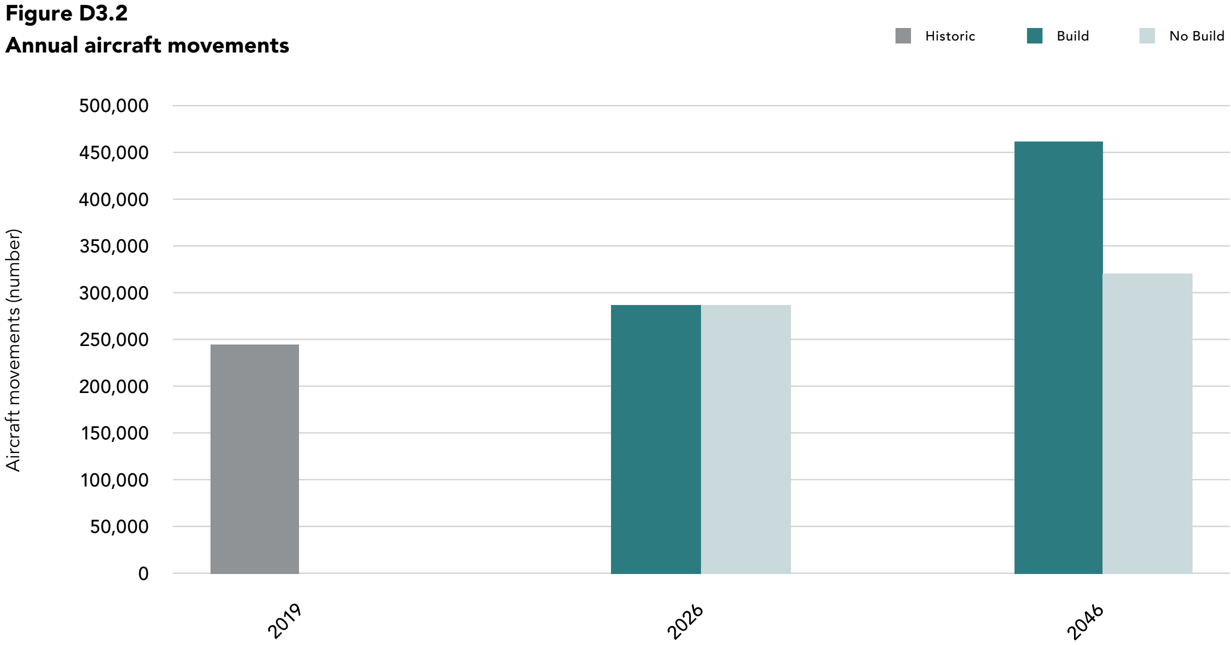
The following paragraphs summarise the outcomes of each of the PM_{10} assessments. For full air quality data sets refer to **Chapter B10: Air Quality**.

Comparison against the NEPM (AQM) for PM_{10}

The total annual average PM_{10} concentrations are forecast to be below the SEPP (AQM) – equivalent to the NEPM (AQM) – standard of 20 micrograms per cubic metre at all modelled receptors in the 2046 Build and No Build scenarios.

All modelled receptors are in the range of 18.9 to 19.0 micrograms per cubic metre, where the health risks are considered acceptable. For reference, of the highest value of 19.0 micrograms per cubic metre PM_{10},18.9 micrograms per cubic metre PM_{10} is from ambient background concentration and 0.1 microgram per cubic metre PM_{10} is from the 2046 Build scenario.

Figure D3.2
Annual aircraft movements



Source: M3R and MP Forecasts v1

The 24-hour average PM_{10} concentrations are forecast to be below the NEPM standard of 50 micrograms per cubic metre at all modelled receptors in 2046 Build and No Build scenarios. All modelled receptors are in the range of 45.6 to 46.2 micrograms per cubic metre, where the health risks are considered acceptable. For reference, of the highest value of 46.2 micrograms per cubic metre PM_{10}, 45.6 micrograms per cubic metre PM_{10} is from ambient background concentration and 0.6 microgram per cubic metre PM_{10} from the 2046 Build scenario.

Calculation of potential mortality effects for PM_{10}, annual average

While PM_{10} annual average concentrations are lower than the NEPM standard, it is best practice to calculate if there are any residual effects from long-term (i.e. annual) exposure. For all suburbs, the severity of the potential health effect is negligible (Table D3.7).

Calculation of potential mortality effects for PM_{10} 24-hour average

While PM_{10} 24-hour average concentrations are lower than the NEPM standard, it is best practice to calculate if there are any residual effects from short-term (i.e. daily) exposure. For all age groups calculated, for all suburbs, the severity of the potential health effect is negligible (see Table D3.8).

Calculation of potential hospitalisation effects for PM_{10} 24-hour average

Daily PM_{10} has the potential to affect daily hospitalisation rates - six individual hospital admissions were assessed across different age ranges in the life course (using the CRF methodology described in Section D3.2.3). Across the six hospital admissions, across all suburbs and age ranges, the severity of the potential health effect is negligible.

Table D3.7
Annual all-cause mortality from PM_{10} annual average exposure

Suburb (SA2)	Population, all ages	Maximum change in annual PM_{10} exposure (µg/m^3)	Relative risk increase per µg/m^3	Baseline rate: all-cause mortality, all ages	Absolute mortality brought forward per annum per suburb	Change in life expectancy across population
Greenvale Bulla	14,245	0.01	0.0039	523/100,000	0.003	1 to 3 sec
Gladstone Park Westmeadows	17,815	0	0.0039	523/100,000	0	0
Tullamarine	6,763	0	0.0039	523/100,000	0	0
Keilor	8,673	0.02	0.0039	534/100,000	0.004	2 to 6 sec
Taylors Lakes	18,574	0	0.0039	534/100,000	0	0

Table D3.8
Annual cardiovascular mortality, all ages combined, from PM_{10} 24-hour average exposure

Suburb (SA2)	Population, all ages	Maximum change in annual PM_{10} exposure (µg/m^3)	Relative risk increase per µg/m^3	Baseline rate: all-cause mortality, all ages	Absolute mortality brought forward per annum per suburb	Change in life expectancy across population
Greenvale Bulla	14,245	0.05	0.0024	148/100,000	0.0025	1 to 3 sec
Gladstone Park Westmeadows	17,815	0	0.0024	148/100,000	0	0
Tullamarine	6,763	0	0.0024	148/100,000	0	0
Keilor	8,673	0.12	0.0024	146/100,000	0.0036	2 to 6 sec
Taylors Lakes	18,574	0.08	0.0024	146/100,000	0.0052	1 to 4 sec

D3.6.1.2
$PM_{2.5}$ assessment of M3R operation: 2046 Build v No Build

The following individual assessments of $PM_{2.5}$ exposure were done:

- Comparison of $PM_{2.5}$ concentrations against NEPM (AQM) standards for both annual average exposure and 24-hour average exposure for 2046 Build versus No Build scenarios
- Calculation of potential mortality effects from $PM_{2.5}$ exposure for both annual average exposure and 24-hour average exposure for the 2046 Build versus No Build scenarios
- Calculation of potential hospitalisation effects for 24-hour average of the 2046 Build versus No Build scenarios.

The following paragraphs summarise the outcomes of each $PM_{2.5}$ assessment. For full air quality data sets refer to Chapter B10: Air Quality.

Comparison against the NEPM (AQM) standard and 2026 goals for $PM_{2.5}$

The total annual average $PM_{2.5}$ concentrations are forecast to be above the SEPP (AQM) standard (equivalent to NEPM standard) of 8.0 micrograms per cubic metre for all receptors in 2046 Build and No Build scenarios.

All receptors are in the range of 9.40 to 9.44 micrograms per cubic metre. The background/ambient annual average $PM_{2.5}$ is 9.43 micrograms per cubic metre contributing 99.9 per cent of the $PM_{2.5}$ concentration in air, meaning the 2046 Build versus No Build contributes just 0.01 p of the $PM_{2.5}$ concentration in air.

In contrast, the average $PM_{2.5}$ 24-hour concentrations are forecast to be below the NEPM standard of 25 micrograms per cubic metre at all modelled receptors in 2046 Build and No Build scenarios. All modelled receptors are in the range of 9.54 to 10.22 micrograms per cubic metre.

Regarding the 2026 goals, the average $PM_{2.5}$ 24-hour maximum concentrations are forecast to be below the NEPM 2026 goals of 20 micrograms per cubic metre at all modelled receptors in 2046 Build and No Build scenarios. As above, all modelled receptors are in the range of 9.54 to 10.22 micrograms per cubic metre.

Calculation of potential mortality effects for $PM_{2.5}$, annual average

Given receptors are above the NEPM standard for $PM_{2.5}$ annual average (of 8.0 micrograms per cubic metre) it is important to calculate if there might be any health effects from long-term (i.e. annual) exposure. For all suburbs, the severity of the potential health effect is categorised as negligible (see Table D3.9).

The potential effect on mortality due to $PM_{2.5}$ exposure (annual mean) is also calculated for:

- Cardiopulmonary disease mortality, aged 30+ years
- Ischaemic heart disease mortality, aged 30+ years
- Lung cancer mortality, aged 30+ years.

For all calculations above (all suburbs) the severity of potential health effect is negligible.

Calculation of potential mortality effects for total 24-hour average $PM_{2.5}$

Although average $PM_{2.5}$ 24-hour maximum concentrations are lower than the NEPM standard and 2026 goals (NEPC, 2016) it is best practice to calculate if there are any residual effects (per annum) from short-term (i.e. daily) exposure. For all age groups calculated and for all suburbs, the health significance is categorised as negligible (see Table D3.10). Calculations are also undertaken for cardiovascular mortality and the severity of the potential health effect is categorised as negligible.

Calculation of potential hospitalisation effects for 24-hour average $PM_{2.5}$

Daily $PM_{2.5}$ has the potential to affect daily hospitalisation rates and so 14 different hospital admissions are assessed across different age ranges spanning the full life course (using the CRF methodology described in Section D3.2.3). Across the 14 hospital admissions calculated, across all suburbs and age ranges, the severity of the potential health effect is negligible.

D3.6.1.3
Nitrogen dioxide (NO_2) assessment: 2046 Build v No Build

The following individual assessments of NO_2 exposure were done:

- Comparison of NO_2 concentrations against SEPP (AQM) standards for one-hour average exposure of 2046 Build versus No Build scenarios
- Calculation of potential mortality effects from NO_2 exposure for both annual average exposure and 24-hour average exposure for the 2046 Build versus No Build scenarios
- Calculation of potential hospitalisation effects for 24-hour average for the 2046 Build versus No Build scenarios.

The following paragraphs summarise the outcomes of each of the NO_2 assessments. For full air quality data sets refer to Chapter B10: Air Quality.

Table D3.9
Annual all-cause mortality from $PM_{2.5}$ annual average exposure

Suburb (SA2)	Population, ages 30+ years	Maximum change in annual $PM_{2.5}$ exposure (μg/m³)	Relative risk increase per μg/m³	Baseline rate: all-cause mortality, all ages	Absolute mortality brought forward p/a per suburb	Change in life expectancy across population
Greenvale Bulla (AQ ref Bulla)	7,756	0.01	0.006	481/100,000	0.022	2 to 4 seconds
Gladstone Park Westmeadows (AQ ref Threadneedle St)	11,236	0.00	0.006	481/100,000	0.00	0 seconds
Tullamarine (AQ ref Janus St)	4,341	0.00	0.006	481/100,000	0.00	0 seconds
Keilor (AQ ref Arundel Rd)	5,775	0.01	0.006	485/100,000	0.016	1 to 4 seconds
Taylors Lakes (AQ ref Keilor Village)	11,178	0	0.006	485/100,000	0	0

Table D3.10
Annual mortality from $PM_{2.5}$ 24-hour average exposure

Suburb (SA2)	Population, all ages	Maximum change in annual $PM_{2.5}$ exposure (μg/m³)	Relative risk increase per μg/m³	Baseline rate: all-cause mortality, all ages	Absolute mortality brought forward per annum per suburb	Change in life expectancy across population
Greenvale Bulla (AQ ref Bulla)	14,245	0.06	0.0024	493/100,000	0.010	4 to 11 seconds
Gladstone Park Westmeadows (AQ ref Threadneedle St)	17,815	0.00	0.0024	493/100,000	0.00	0.00
Tullamarine (AQ ref Janus St)	6,763	0.00	0.0024	493/100,000	0.00	0.00
Keilor (AQ ref Arundel Rd)	8,673	0.12	0.0024	497/100,000	0.012	7 to 22 seconds
Taylors Lakes (AQ ref Keilor Village)	18,574	0.08	0.0024	497/100,000	0.018	5 to 15 seconds

Comparison against the SEPP (AQM) for NO_2

The one-hour average NO_2 concentrations are forecast to be below the SEPP (AQM) standard of 190 micrograms per cubic metre at all modelled receptors in 2046 Build and No Build scenarios. All modelled residential receptors for the 2046 Build are in the range of 67.9 to 114.3 micrograms per cubic metre, where the health risks are considered acceptable.

Calculation of potential mortality effects for annual average NO_2

Although the 99th percentile hourly average NO_2 concentrations are lower than the SEPP (AQM) standard it is best practice to calculate whether there are any residual effects from long-term (i.e. annual) NO_2. For all suburbs, the health significance is categorised as Negligible (Table D3.11).

Potential annual mortality due to annual NO_2 exposure for people aged 30+ years is also calculated for annual cardiovascular mortality and annual respiratory mortality. This shows that between 87 and 90 per cent of all-cause mortality is due to cardiovascular mortality, while respiratory mortality contributed seven to eight per cent of all-cause mortality.

Calculation of potential mortality effects for 24-hour average NO_2

While the 99th percentile hourly average NO_2 concentrations are lower than the SEPP (AQM) standard, it is best practice to calculate if there are any residual effects from short-term (i.e. daily) exposure. For all suburbs, the health significance is minor. The highest value is for Keilor, where the health significance is minor: a less than 106-minute reduction in life expectancy shared between the entire population of 8,673 people (see Table D3.12).

The potential mortality due to daily NO_2 exposure for people of all ages is also calculated for cardiovascular disease mortality and respiratory disease mortality, showing that approximately 25 per cent of all-cause mortality is due to each of cardiovascular disease mortality and respiratory disease mortality.

Calculation of potential hospitalisation effects for 24-hour NO_2

Daily NO_2 has the potential to affect daily hospitalisation rates and so seven different hospital admissions were assessed across different age ranges spanning the life course (using the CRF methodology described in Section D3.2.3). Across the seven hospital admissions calculated, across all suburbs and age ranges, the severity of the potential health effect is negligible.

D3.6.1.4
CO assessment of M3R operation: 2046 Build v No Build

The one-hour average CO concentration is forecast to be below the SEPP (AQM) standard (Victorian Government, 1999) (29 micrograms per cubic metre) at all modelled receptors in all scenarios. All modelled receptors are less than 1.2 milligrams per cubic metre (full data is available in Chapter B10: Air Quality). The SEPP (AQM) is set at a level where the health risks are considered acceptable.

D3.6.1.5
SO_2 assessment of M3R operation: 2046 Build v No Build

The one-hour average SO_2 concentrations are forecast to be below the SEPP (AQM) standard (Victorian Government, 1999) (523 micrograms per cubic metre) at all modelled receptors in all scenarios. That is, all modelled receptors are less than 53 micrograms per cubic metre (full data is available Chapter B10: Air Quality). The SEPP (AQM) is set at a level where the health risks are considered acceptable.

D3.6.1.6
Air toxics (formaldehyde and benzene) assessment of M3R operation: 2046 Build v No Build

Formaldehyde comparison against SEPP (AQM) standard

The three-minute average formaldehyde concentrations are forecast to be below the SEPP (AQM) standard (Victorian Government, 2001) (40 micrograms per cubic metre) at all sensitive receptors in the 2046 Build scenario.

The highest modelled residential receptor in the 2046 Build scenario is 22.0 micrograms per cubic metre, 55 per cent of the standard (full data is available in Chapter B10: Air Quality). Despite not exceeding the standard, it is still considered important to carry out additional calculations of any potential health risk.

Formaldehyde comparison against Air Quality Assessment Criteria

The annual average formaldehyde concentrations are forecast to be below the draft Air Quality Assessment Criteria (Environment Protection Authority Victoria, 2021) of 9.8 micrograms per cubic metre at all modelled residential receptors, in all scenarios.

The highest modelled residential receptor in the 2046 Build scenario is 0.107 micrograms per cubic metre, 1.1 per cent of the standard. Despite not exceeding the assessment criteria, it is still considered important to carry out additional calculations of any potential health risk.

Formaldehyde lifetime cancer risk

When comparing the 2046 Build scenario with the No Build scenario, the differences for modelled residential receptors are in the range of 0.002 to 0.034 micrograms per cubic metre for annual average formaldehyde. Taking the highest value (0.034), multiplied by the unit risk factor for formaldehyde, the maximum predicted increase in lifetime risk of cancer is 2.0×10^{-7} (0.0000002). The severity of the potential health effect is therefore concluded to be negligible.

Table D3.11
Annual all-cause mortality from NO_2 annual average exposure

Suburb (SA2)	Population, 30+ years	Maximum change in annual $PM_{2.5}$ exposure (µg/m³)	Relative risk increase per µg/m³	Baseline rate: all-cause mortality, all ages	Absolute mortality brought forward per annum per suburb	Change in life expectancy across population
Greenvale Bulla (AQ ref Bulla)	7,756	0.2	0.004	511/100,000	0.03	0 to 1 min
Gladstone Park Westmeadows (AQ ref Threadneedle St)	11,236	0.5	0.004	511/100,000	0.11	1 to 3 min
Tullamarine (AQ ref Janus St)	4,341	0.3	0.004	511/100,000	0.03	1 to 2 min
Keilor (AQ ref Arundel Rd)	5,775	0.7	0.004	522/100,000	0.08	1 to 4 min
Taylors Lakes (AQ ref Keilor Village)	11,178	0.1	0.004	522/100,000	0.02	11 to 32 sec

Table D3.12
Annual all-cause mortality from NO_2 24-hour average exposure

Suburb (SA2)	Population, all ages	Maximum change in annual $PM_{2.5}$ exposure (µg/m³)	Relative risk increase per µg/m³	Baseline rate: all-cause mortality, all ages	Absolute mortality brought forward per annum per suburb	Change in life expectancy across population (minutes)
Greenvale Bulla (AQ ref Bulla)	14,245	14.92	0.0019	523/100,000	2.11	13 to 38
Gladstone Park Westmeadows (AQ ref Threadneedle St)	17,815	32.34	0.0019	523/100,000	5.73	28 to 83
Tullamarine (AQ ref Janus St)	6,763	22.98	0.0019	523/100,000	1.54	20 to 59
Keilor (AQ ref Arundel Rd)	8,673	40.34	0.0019	534/100,000	3.55	35 to 106
Taylors Lakes (AQ ref Keilor Village)	18,574	10.37	0.0019	534/100,000	1.95	9 to 27

Benzene comparison against SEPP (AQM) standard

The three-minute average benzene concentrations are forecast to be below the SEPP (AQM) (Victorian Government, 2001) standard of 53 micrograms per cubic metre at all modelled residential receptors in all scenarios. The highest modelled residential receptor in the 2046 Build scenario is 2.7 micrograms per cubic metre, five per cent of the standard (full data is available in Chapter B10: Air Quality). Despite not exceeding the standard, it is still considered important to carry out additional calculations of any potential health risk.

Benzene comparison against Air Quality Assessment Criteria

The annual average benzene concentrations are forecast to be below the draft Air Quality Assessment Criteria (Environment Protection Authority Victoria, 2021) of 9.6 micrograms per cubic metre at all modelled residential receptors, in all scenarios. The highest modelled residential receptor in the 2046 Build scenario is 0.014 micrograms per cubic metre, 0.1 per cent of the standard. Despite not exceeding the assessment criteria, it is still considered important to carry out additional calculations of any potential health risk.

Benzene lifetime cancer risk

When comparing the 2046 Build scenario with the No Build scenario, the differences for modelled residential receptors are in the range of 0.000 to 0.004 micrograms per cubic metre for annual average benzene. Taking the highest value (0.004), multiplied by the unit risk factor for benzene, the maximum predicted increase in lifetime risk of cancer is 1.2×10^{-7} (0.00000012). The severity of the potential health effect is therefore concluded to be negligible.

D3.6.2 Noise

This section assesses the potential health effects of altered noise due to M3R's operation in the 2046 Build versus No Build scenario. Although there are no quantitative criteria legislated for the evaluation of aircraft noise in Australia, the legislative framework for M3R MDP is described in Chapter A8: Assessment and Approvals Process.

Melbourne Airport is regulated under the Commonwealth Airports Act. In the case of environmental protection, the *Airports (Environment Protection) Regulations 1997* (Cth) (AEP Regulations) are also relevant and applicable. In addition, noise assessment for this project has been modelled on the recent assessment of similar projects (that is, having regard to other recent Australian projects for similar airfield infrastructure assessments). This collective approach is further described in Chapter C3: Aircraft Noise Modelling Methodology.

As described in Section D3.3.4, no specific noise legislation exists against which M3R could be assessed. Instead, frameworks and guidelines are available. Therefore, the health assessment complements the noise assessment by considering the magnitude and distribution of noise exposure upon communities.

The focus of this report is on non-auditory health effects that may be associated with exposure to aircraft noise. The pathways and strength of the evidence base differ for various noise health effects - the health and wellbeing effects studied in this report are those included in authoritative evidence bases and previous airport HIAs (from around the world and in Australia). They include:

- Annoyance
- Sleep disturbance
- Noise-induced awakenings
- Cardiovascular effects (i.e. myocardial infarction)
- Reading comprehension in children
- Interference with speech and communication.

D3.6.2.1 Annoyance assessment: 2046 Build v No Build

The potential effects of annoyance from noise were calculated by comparing the 2046 Build composite versus No Build scenario (Table D3.13).

The modelled ANEC contours show that an estimated 1,900 additional people are projected to be 'highly annoyed' by aircraft noise in the 2046 Build versus No Build scenario.

Figures showing the geographic areas and dwelling counts under each ANEC contour are presented in Chapter C4: Aircraft Noise and Vibration. It is important to note that most of the annoyance effect is seen in the lower ANEC contours (20-25 and 25-30). There are no regulations to restrict flights within these ranges. Due to the number of people affected, the severity of the potential health effect is categorised as moderate. Appropriate mitigation is discussed in Section D3.7.

D3.6.2.2 Sleep disturbance assessment: 2046 Build v No Build

The potential effects on sleep disturbance from noise have been calculated by comparing the 2046 Build scenarios against the No Build scenario for 'highly sleep-disturbed' people. At night, the two potential operating strategies are predicted to produce distinctly different outcomes. Analysis of the two options is therefore presented separately.

The analysis shows the difference between options 1 and 2 in terms of the share of sleep disturbance predicted when compared to the No Build scenario. The potential number of people 'highly sleep-disturbed' for options 1 and 2 are projected to be approximately 141 and 797.

Due to the number of people affected, the severity of the potential health effect is categorised as moderate.

Table D3.13
Estimated number of 'highly annoyed' people, 2046 Build versus No Build

ANEC Contour	Corresponding percentage of highly annoyed	Number of dwellings		Number of people highly annoyed		
		Build Composite	No Build	Build Composite	No Build	Difference
20-25	17	4,477	1,418	2,055	651	1,404
25-30	26	708	30	497	21	476
30-35	37	27	8	27	8	19
35 and above	49	1	0	1	0	1
Total						**1,900**

Note: Assumes 2.7 people per dwelling

Table D3.14
Estimated number of 'highly sleep-disturbed' people: 2046 Build Option 1 versus No Build

$L_{Aeq\ night\ 11pm\ to\ 6am}$ (decibels)	Percentage of highly sleep disturbed people	Difference of number of dwellings in noise contour	Difference of number of people in noise contour	Number of highly sleep-disturbed people
45-49	5.1	-1,236	-3,337	-170
50-54	7.4	756	2,041	151
55-59	10.4	568	1,534	159
60-64	14.1	1	3	0
65-69	18.6	0	0	0
70+	23.8	0	0	0
Total	–	**89**	**240**	**141**

Table D3.15
Estimated number of 'highly sleep-disturbed' people: 2046 Build Option 2 versus No Build

$L_{Aeq\ night\ 11pm\ to\ 6am}$ (decibels)	Percentage of highly sleep disturbed people	Difference of number of dwellings in noise contour	Difference of number of people in noise contour	Number of highly sleep-disturbed people
45-49	5.1	3,746	10,114	516
50-54	7.4	1,321	3,567	264
55-59	10.4	44	119	12
60-64	14.1	12	32	5
65-69	18.6	0	0	0
70+	23.8	0	0	0
Total	–	**5,123**	**13,832**	**797**

D3.6.2.3
Potential for noise induced awakenings: 2046 Build v No Build

Noise-induced awakenings can be assessed from the frequency of overflights at night when maximum noise levels exceed a given threshold. That threshold is typically N60 i.e. the number of overflights exceeding 60 dB(A). This noise level equates to about 50 dB(A) inside a house with its windows open. And at this level, in field trials approximately three per cent of aircraft overflights have been found to cause awakenings.

N60 data is presented in contours, with each contour showing the number of houses that would experience a particular number of night overflights. Some households are projected to experience more N60 overflights in the 2046 No Build scenario compared with Build between the times of 11pm and 6am, and some are projected to experience fewer N60 overflights. The N60 contours are:

- Houses experiencing five to 19 overflights: It is projected that approximately 34,000 fewer dwellings (compared to No Build scenario) are predicted to be impacted by five to 19 N60 overflights with Option 1. Approximately 17,793 fewer dwellings would be so impacted with Option 2 which involves more equitable distribution of operations and noise
- Houses experiencing 20 to 49 overflights: Both options are predicted to see an increase in the number of dwellings impacted by more than 20 N60 overflights, 9,658 additional dwellings are within the 20-49 contour for N60 overflights in Option 1, and 3,971 additional dwellings in Option 2
- Houses experiencing 50 to 99 overflights: Approximately nine to19 additional dwellings are predicted to be in the N60 50-99 contour with either option.

Overall numbers

There is a substantial overall reduction in households – of between 13,813 and 24,330 fewer dwellings overall by 2046 – projected to be within the five-or-greater contours for N60 overflights between 11pm to 6am compared to the No Build scenario.

It is likely that the small proportion of people who are sensitive to night noise-induced awakenings would take action (such as closing a window) to mitigate sleep disruption. In these circumstances, the assumed 10 dB reduction through a building's walls (which results in N60 externally to describe the number of 50 dB(A) events internally) would be further reduced.

D3.6.2.4
Myocardial infarction assessment: 2046 Build v No Build

Cardiovascular disease includes ischaemic heart disease, hypertension (high blood pressure) and strokes. Ischaemic heart diseases include angina (the chest pain or discomfort when an area of heart muscle does not get enough oxygen-rich blood) and myocardial infarction (commonly known as a heart attack) (WHO, 2011).

The potential effects on myocardial infarction from noise, comparing the 2046 Build versus No Build scenarios, have been calculated (Table D3.16) for an age-standardised rate of 421 hospital admissions per 100,000 population (NHF, 2015).

The effect on myocardial infarction from night-time noise when comparing the 2046 Build versus No Build scenario is 0.0013 events for Option 1 (equating to one new case of myocardial infarction every 769 years) and 0.012 events for Option 2 (equating to once new case every 83 years) across the entire population. The severity of the potential health effect is therefore concluded to be negligible.

Table D3.16
Number of potential myocardial infarction hospital admissions from night-time aircraft noise 2046 Build v No Build

	Noise band L_{night} dB(A)	Households exposed		Increase in Odds Ratio	Potential cases		Difference in number of potential myocardial infarction hospital admissions – night-time aircraft noise
		No Build	Option 1 Build*		at 421 per 100,000	at 463 or 505 per 100,000	
Option 1	60-64	8	9 (+1)	0.1	0.0126	0.0139	0.0013
	65+	0	0 (0)	0.2	0	0	0
	Total	**8**	**9 (+1)**	-	-	-	**0.0013**
Option 2	60-64	8	20 (+12)	0.1	0.131	0.143	0.012
	65+	0	0	0.2	0	0	0
	Total	**8**	**20 (+12)**	-	-	-	**0.012**

**(difference from No Build)*

D3.6.2.5
Communication interference effects from noise assessment: 2046 Build v No Build

enHealth (2004) concluded that 'speech cannot be used to communicate effectively when background sound drowns out the voice'. To avoid communication interference, Standards Australia (2015) recommends L_{max} indoors of 60 dB(A) in Australian dwellings (Australian Standard AS2021- 2015).

This assessment calculated potential effects on the following institutions:

- Schools
- Early childcare/kindergartens
- Hospitals, hospice and respite care facilities
- Aged-care facilities
- Libraries
- Maternal and child health centres.

Chapter D4: Social Impact sets out the details for how each of these institutions is potentially affected by the three different operating models: mixed mode, Option 1, Option 2. For some institutions, the assessment shows no change as they remain in the same N70 contour for the Build versus No Build scenario. However, others are projected to be:

- In a lower N70 category of overflights in the 2046 Build operating models (i.e. moving to a category with fewer overflights – some even move to zero)
- In a higher N70 category of overflights in the 2046 Build operating models (i.e. moving to a category with a higher number of overflights)
- Newly receiving N70 overflights in the 2046 Build operating models
- No longer receiving N70 overflights in the 2046 Build operating models.

Table D3.17 summarises the number of facilities located within the N70 regions for overflight for the 2046 Build versus No Build scenarios, for the time day and evening periods. The frequency of these events is reflected based upon the methodology described in**Section D3.2.4.5**

Table D3.17
Rates of overflight for community facilities 2046 No Build vs Build options

N70 Contour (6am to 11pm)	2046 No Build						2046 Build																	
							Mixed mode						Option 1						Option 2					
Facility Type	**5-9**	**10-19**	**20-49**	**50-100**	**100-199**	**200+**	**5-9**	**10-19**	**20-49**	**50-100**	**100-199**	**200+**	**5-9**	**10-19**	**20-49**	**50-100**	**100-199**	**200+**	**5-9**	**10-19**	**20-49**	**50-100**	**100-199**	**200+**
Schools (9am-3pm)	2	2	1	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
College (9am-3pm)	0	0	2	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0
Education Facility (9am-3pm)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Places of worship	2	1	0	0	3	0	5	2	0	2	2	2	5	2	0	2	0	4	5	1	2	1	2	2
Retirement village	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Library	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	2
Hospital, Hospice, Respite Care	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1
Maternal and Child Health Centres	1	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0
Correctional facility	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Community centre / neighbourhood house	0	1	0	0	0	0	6	4	2	0	0	2	6	5	1	0	0	2	6	4	3	0	0	2
Senior Citizens centres	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Childcare and kindergarten	4	1	6	2	3	0	16	6	4	2	2	2	17	1	4	3	1	2	13	8	4	2	2	2
Aged care	2	1	2	1	0	0	4	0	3	1	2	0	3	0	3	2	1	0	2	2	3	1	2	0
Subtotals	11	6	12	3	9	0	32	12	12	6	6	9	32	8	11	8	2	11	27	15	15	5	6	9
Totals	**41**						**77**						**72**						**77**					
Frequency of overflight	51 minutes	25 minutes	10 minutes	5 minutes	< 5 minutes		51 minutes	25 minutes	10 minutes	5 minutes	< 5 minutes		51 minutes	25 minutes	10 minutes	5 minutes	5 minutes		51 minutes	25 minutes	10 minutes	5 minutes	5 minutes	

Communication interference in schools assessment

Table D3.17 demonstrates the predicted noise impact and frequency for N70 overflights for schools for the 2046 Build versus No Build for the time period from 9am to 3pm.

Given enHealth Council (2004), Standards Australia (2015) and Department of Transport and Regional Services (2000) all recommend the same L_{max} indoors of 60 dB(A), the severity of the potential health effect is moderate. Mitigation is discussed in Section D3.7 and Chapter D4: Social Impact.

Communication interference in childcare and kindergartens assessment

Table D3.17 demonstrates the predicted noise impact and frequency for N70 overflights for childcare and kindergarten facilities for the 2046 Build versus No Build for the time period from 9am to 7pm.

Given enHealth Council (2004), Standards Australia (2015) and Department of Transport and Regional Services (2000) all recommend the same L_{max} indoors of 60 dB(A), the significance of the health effect is moderate. Mitigation is discussed in Section D3.7 and Chapter D4: Social Impact Section D4.7.3.

Communication interference in hospitals, hospice and respite care assessment

Table D3.17 demonstrates the predicted noise impact and frequency for N70 overflights for hospital, hospice and respite care facilities for the 2046 Build versus No Build for the time period from 6am to 11pm.

There is one facility located in the N70 contour in all 2046 Build scenarios.

The significance of the health effect is negligible.

Communication interference in aged care facilities assessment

Table D3.17 demonstrates the predicted noise impact and frequency for N70 overflights for aged care facilities for the 2046 Build versus No Build for the time period from 6am to 11pm.

Given enHealth Council (2004), Standards Australia (2015) and Department of Transport and Regional Services (2000) all recommend the same L_{max} indoors of 60 dB(A), the severity of the potential health effect is moderate. Mitigation is discussed in Section D3.7 and Chapter D4: Social Impact Section D4.7.3.

Communication interference in libraries assessment

Table D3.17 demonstrates the predicted noise impact and frequency for N70 overflights for libraries for the 2046 Build versus No Build for the time period from 6am to 11pm.

Given enHealth Council (2004), Standards Australia (2015) and Department of Transport and Regional Services (2000) all recommend the same L_{max} indoors of 60 dB(A), the severity of the potential health effect is moderate. Mitigation is discussed in Section D3.7 and Chapter D4: Social Impact Section D4.7.3.

Communication interference in maternal and child health centres assessment

Table D3.17 demonstrates the predicted noise impact and frequency for N70 overflights for maternal and child health centres for the 2046 Build versus No Build for the time period from 6am to 11pm.

Given enHealth Council (2004), Standards Australia (2015) and Department of Transport and Regional Services (2000) all recommend the same L_{max} indoors of 60 dB(A), the severity of the potential health effect is minor.

D3.6.2.6 Reading comprehension in children assessment: 2046 Build v No Build

Some studies on the effect of aircraft and road traffic noise show a 'linear exposure-effect association' between aircraft noise and the impairment of reading comprehension. That is, as noise exposure increases (across a range from low levels to high levels) reading comprehension may decrease.

In the RANCH study, the effect size of a one-fifth standard deviation of reading comprehension occurred with a 20dB(A) change in noise. Although this effect size is described as 'small' by the original study authors (Stansfeld et al., 2005) it has been included in this HIA.

The study done for M3R assessed primary, primary-secondary (P-12) and special development schools (greater than 37 dB(A) in the 2046 No build scenario) for any dB(A) increase in noise (LAeq 9am to 3pm).

The increase in aircraft noise between the 2046 Build and No Build scenarios shows no schools with a greater than 20dB(A) increase in noise LAeq. Therefore the severity of the potential health effect is concluded to be negligible.

D3.6.2.7 Migraine assessment

Participants at the Melbourne Airport Community Aviation Consultation Group raised the importance of migraines as part of the health assessment. It was therefore included in the study. As shown in Table D3.18, migraines may be triggered by over 30 factors and stimuli (NHS, 2016).

Identification of trigger factors and/or precipitants is often recommended as a basic strategy in preventing and treating migraine and tension-type headache. Trigger factors increase the probability of headache in the short term. Potential trigger factors have been examined most frequently in migraine and less often in tension-type headache. Data from prospective and controlled studies has shown that virtually all aspects of life have been suspected of triggering migraine or tension-type headache although scientific evidence for many of these triggers is poor (Wober and Wober-Bingol, 2010).

For individuals who are concerned about how existing aircraft noise and the M3R Build scenario might affect migraines, stress and anxiety may also be potential triggers. Unfortunately, it is extremely difficult to identify the underlying cause of migraines for any given individual, and no definitive association can be drawn between M3R and migraines.

Similar conclusions are also drawn in the WHO (2009) Night Noise Guidelines: as above, the WHO could not exclude an effect of noise in causing some acute psychological symptoms. This lack of empirical evidence linking aircraft noise and migraines precludes its inclusion in authoritative assessments (enHealth, 2004; WHO, 2012; European Environment Agency, 2010; Civil Aviation Authority, 2014; WHO, 2018).

Major project consultations, such as this MDP, in and of themselves could result in varying degrees of stress and anxiety in affected populations that could, if unaddressed, lead to manifest health disorders. As stated earlier, it is extremely difficult to identify the underlying cause of migraines for an individual person and therefore no association is drawn between the MDP process and migraines. Community involvement in the planning process, and provision of factual and robust information tailored to local community requirements to understand how and where community health is assessed and addressed, is one way to mitigate any potential stress and anxiety.

D3.6.3 Employment

Social and economic factors are the most significant determinants of health and wellbeing. They contribute to up to half of the typical health-status measures. In contrast, the contributions of the physical environment such as air quality and noise exposure are far less significant. These contribute approximately 10 per cent to health status – five times less than the contribution to health status from social and economic factors (Canadian Institute for Advanced Research, 2002). Of social and economic factors, employment and income are the two most dominant.

D3.6.3.1 Employment: qualitative assessment of health effects

The Melbourne Airport 2022 Master Plan discusses employment. It cites Melbourne Airport as a major employer in its own right, as the centrepiece of a major employment cluster, and as an enabler of wider employment for the state (e.g. tourism, freight). Likely substantial growth in jobs is highlighted and tourism spend is also a major contributor.

The employment and income effects of the Build scenario will be both direct and indirect, occur during construction and operation, and have implications at the local, state and national levels.

How employment affects community health

The social effects of having a job are experienced at three levels: by an individual, their family and communities. Having a job is critical to an individual's health and wellbeing, to others in the household, and to sustaining a vibrant community in which the household is situated (Ministry for Primary Industries, 2014).

The World Bank Development Report (2013) surmises:

> *'Jobs are transformational. They are more than just the earnings and benefits they provide. They are also the output they generate and part of who we are and how we interact with others in society. Jobs boost living standards, raise productivity and foster social cohesion.'*

Good jobs are those that improve the wellbeing of the individual who holds the job (without harming others). The best jobs for society are those that not only serve the individual person but which also produce positive spill-over benefits to the community (World Bank, 2013).

Table D3.18
The triggers of migraine

Emotional triggers	Physical triggers	Dietary triggers	Environmental triggers	Medication
Stress, anxiety, tension, shock, depression, excitement.	Tiredness, poor quality sleep, shift work, poor posture, neck or shoulder tension, jet lag, low blood sugar, strenuous exercise (if unaccustomed).	Missed, delayed or irregular meals, dehydration, alcohol, the food additive tyramine, caffeine products, specific foods (e.g. chocolate, citrus, cheese).	Bright lights, flickering screens such as a television or computer screen, smoking (or smoky rooms), loud noises, changes in climate (such as changes in humidity or very cold temperatures), strong smells, a stuffy atmosphere.	Some types of sleeping tablets, the combined contraceptive pill, Hormone Replacement Therapy (HRT).

Individual physical and mental health benefits from employment

There is consistent and high-quality evidence that being out of work (i.e. unemployed) is bad for the physical and mental health of people of all ages. The opposite is also evident – a job is good for physical and mental health (Royal Australasian College of Physicians, 2011; Waddell and Burton, 2006).

When people move off social welfare and into a job, their physical and mental health improves. It is concluded by evidence-based documents (Royal Australasian College of Physicians, 2011; Royal College of Psychiatrists, 2014; Waddell and Burton, 2006) that 'These findings are not just associations. For people, being in-work causes, contributes to or accentuates…' outcomes such as (Winkelmann et al., 1998):

- Lower death rates (i.e. the number of deaths in a population over a specific time period calculated for all-causes of death or specific diseases/events) particularly from cardiovascular disease and suicide
- Better physical health – particularly lower rates of cardiovascular disease, lung cancer and respiratory infections
- Better mental health, psychological wellbeing and self-esteem
- Lower rates of long-standing illness
- Lower rates of poor general health
- Lower rates of somatic complaints (mental disorder where symptoms suggest physical illness or injury but no medical cause can be found)
- Lower rates of disability
- Lower GP consultation rates, use of medication, and admissions to hospital
- Higher self-respect.

In contrast to the positive effects of employment, Aylward (2010) did a comprehensive review of studies that showed long-term unemployment led to a:

- Health risk similar to smoking 10 packets of cigarettes per day
- 40-fold increase in risk of suicide for young men out of work for longer than six months compared to those in work
- Six-fold increase in risk of suicide for all population groups out of work longer than six months compared to those in work
- For young people in particular, unemployment causes or accentuates depression, anxiety and/or low self-esteem.

These in turn affect physical health outcomes for many young people. These include heavy tobacco, alcohol and drug use, as well as higher death rates from suicide and accidents (Royal Australasian College of Physicians, 2011).

Although there has been considerable debate about the causality of unemployment in mortality outcomes, recent work supports causality (Clemens et al., 2014; Meneton et al., 2015; Roelfs et al., 2011).

Importantly for this assessment, the adjusted effects from Roelfs et al. (2011) showed no significant changes in the association over the past four decades. The authors suggest the association is stable enough for use in future-focused assessments (such as HIA). The authors also said that policy differences between countries did not statistically alter the association (Roelfs et al., 2011), meaning the findings may be applied across countries.

Family health benefits from employment

The influence of having at least one person in the household with a job extends to a family's children. The impact on them from a parent in a job paying a living wage is (Royal Australasian College of Physicians, 2011):

- A lower likelihood of chronic illnesses and psychosomatic symptoms, and higher wellbeing
- Less likely to be unemployed as adults, either intermittently or over their entire life
- Psychological distress is less likely when their parents face reduced economic pressure. This in turn lessens the likelihood of withdrawal, anxiety and depression in the children, and reduces the likelihood of aggressive, delinquent behaviour and substance abuse.

A substantial position statement from the US also reports similar impacts on families and children from one or more parents having a job (American Psychological Association, 2014) including:

- Higher individual and family wellbeing
- Less punitive and arbitrary punishment of children
- Lower rates of distress and depressive symptoms in children, which leads to reduced risk of academic problems, substance abuse and risk of suicide.

The World Bank Development Report (2013) also concludes a lack of employment could lower the self-esteem and undermine the social status of other family members.

Community health benefits from employment

The health benefits for local communities from employment have not previously been studied for airport developments.

Only a small number of cohort studies have tackled the links between employment and community health effects. There are therefore insufficient relative risks or odds ratios from which to develop quantitative estimates.

The cohort studies considering the social gradient of health (whereby people less advantaged in terms of socioeconomic position have worse health and shorter lives than those more advantaged) substantially overlap with employment and mortality studies. This means further calculation here may substantially double-count the effect. Therefore, this health assessment adopts a similar qualitative approach (Arup and Partners Ltd, 2012) and considers if the employment effect is likely positive or negative, while making comment on the likelihood of the effect occurring. This is a practical approach for dealing with impacts that cannot easily be quantified.

The qualitative health effects likely from creation of 37,000 jobs in 2046 (comparing the Build versus No Build) include improvements in:

- Social contact and cohesion
- Sense of identity and contribution to society
- Placement on the social gradient of health and consequent improvement in physical and mental health.

Main job types created by M3R construction

During the construction process an additional 10,700 direct and indirect construction jobs are expected to be created, and are considered in the qualitative assessment.

These will be concentrated in the construction industry with associated benefits – largely in the construction industry – but with flow-on effects in wholesale trade, retail and manufacturing.

Many of the new jobs added in retail, manufacturing and wholesale are likely to be more diffused around Melbourne. Of the 10,700 direct and indirect construction jobs, 500+ direct construction jobs a year are expected to be created in the Melbourne Airport local area.

Main job types created by M3R operation

For Build versus No Build, the additional direct and indirect employment created in 2046 is ~37,000 jobs. When construction is complete and the airport is operational, approximately 500 additional jobs per year are expected to be created as a result of M3R. This will increase over time, to more than 2,000 jobs per year.

Historically, at least two-thirds of employees in direct airport jobs are drawn from the six LGAs closest to Melbourne Airport. Of these, Melbourne Airport provides direct employment for one in six in the City of Hume's workforce, and approximately one in 20 across the six LGAs in total. It is expected that the workforce required to support the additional direct jobs generated by M3R will continue to be sourced from these surrounding communities in coming decades.

The indirect jobs generated are expected to predominantly be in accommodation services, 'other construction', business services, wholesale trade and retail. These are more likely to be diffused throughout Victoria. Although some new retail and accommodation jobs will be located at the airport due to increased flights, boosts to the tourism industry attributable to M3R will result in more jobs in tourist areas around Melbourne and Victoria.

In terms of employment more generally, it is important to note that the infrastructure expansion provided at Melbourne Airport (in the Build scenario) will improve Victoria's infrastructure system. Together with the proposed Melbourne Metro, there will be a cumulative enhancement of the state's ability to connect to the global economy. This will help improve the long-term productivity outcomes for all employees and businesses.

Skill base, barriers and employment-support programs

To be able to take advantage of the jobs created by M3R, the workforce in the Melbourne region needs a skill set matching the job types created. Based on information from Jobs Victoria, there is expected to be a match as there are large existing retail, wholesale trade and construction sectors in the Melbourne region.

At the Commonwealth Government level, Jobactive would work closely with major subcontractors to place unemployed workers. Jobactive connects job seekers with employers and is delivered by a network of Jobactive providers in over 1,700 locations across Australia.

Employers can use a local Jobactive provider for tailored recruitment services, at no cost to their business. Jobactive providers can work closely with employers to understand their recruitment needs, and for job seekers, a Jobactive provider can help them get and keep a job. Jobactive providers have the flexibility to tailor their services to a job seeker's assessed needs. According to Jobs Victoria, most major subcontractors would already have a strategic relationship with Jobactive.

Jobs Victoria Employment Network is a Victorian Government agency to help disadvantaged Victorian jobseekers gain employment. Its services are delivered by specialist employment experts who work closely with employers to identify job opportunities and prepare job seekers for those roles.

The network engages with employers to identify job opportunities and assist industries to meet their workforce needs. The network also offers flexible services to disadvantaged jobseekers and is responsive to local and regional needs. It provides services that address gaps in, and complement, existing services including Commonwealth services. According to Jobs Victoria, most major subcontractors would already have a strategic relationship with Jobs Victoria Employment Network.

D3.6.3.2
Indirect employment: quantitative assessment of health effects Build v No Build

A quantitative assessment of deaths avoided can be calculated from the numbers of unemployed provided with jobs and the mortality hazard ratio for being unemployed.

The calculation provides a best-case scenario (based on the methodology described in Section D3.2.5.2). A similar calculation has been done only twice before for an airport HIA. These were for two airports in the UK: Stansted Airport's second runway (Environmental Resources Management, 2008) and Manston Airport (RiverOak Strategic Partners, 2018). Several caveats exist around the data:

- Estimates hold only if, as these new jobs are filled, the person taking that job creates an opportunity for a new employee at their old job and so on – until it provides an opportunity for a person not employed (i.e. a person entering or re-entering the workforce who is previously unemployed). This is a valid assumption for measurement of flow-on effects such as jobs created
- The hazard ratio is derived from adjusted data from multiple jurisdictions (including Australia)
- The hazard ratio is based on the negative health effects of unemployment rather than the positive effects of employment, and so may overestimate the effect
- Different types of employment are associated with different sets of health gains.

The assessment of mortality avoided for the 2046 Build versus No Build is presented in Table D3.19.

Thirty-eight indirect deaths are projected to be avoided due to employment (2046 Build versus No Build).

Table D3.19
Mortality avoided, indirect employment (regional employment)

Change in number of jobs created (in 2046 Build vs No Build)	Unemployed mean adjusted mortality hazard ratio	Premature mortality rate (per 10,000) for Greater Melbourne	Difference in indirect deaths
37,000	1.63 (difference of 0.63) (Roelfs et al, 2011)	161	-38

D3.7 MITIGATION AND ENHANCEMENT OF POTENTIAL HEALTH EFFECTS

Melbourne Airport recognises that it has to balance its role as a primary aviation gateway for passengers and freight in Victoria with the needs of local communities. Melbourne Airport therefore continues to implement the long-term planning decisions made regarding its Tullamarine site and the safeguarding policies of successive governments.

This assessment of M3R's health impacts has been described in terms of the severity of each type of impact. Regarding the assessment framework described in **Section D3.4**, when combined with the likelihood of the impact, medium risk ratings are assessed for communication interference, annoyance and sleep disturbance. APAM will continue to work proactively with governments, airlines, Airservices Australia, industry partners and local communities to manage and mitigate these impacts.

Chapter C4: Aircraft Noise and Vibration describes the noise mitigation and operational management measures that have flowed through into the data assessed in this chapter.

As part of developing the detailed airspace design (following this MDP), APAM will continue to work with stakeholders to develop a noise-monitoring and management plan based on the International Civil Aviation Organisation's Balanced Approach to managing aircraft noise.

This Balanced Approach includes principles such as reducing the noise at source (e.g. quieter aircraft engines), enhancing land use planning controls to prevent inappropriate development in noise-sensitive areas and operational procedures that can be designed to reduce noise impacts for local communities.

Mitigation measures to reduce NO_2 and PM are included in **Chapter B10: Air Quality** and, when implemented, will further reduce the PM and NO_2 emissions generated. It is also worth noting that, for the 2046 Build scenario assessment, the modelling assumed no future reductions in aircraft emissions technology. However, on the basis that emissions reduction has occurred over the past several decades – and is expected to continue into the future – the results of this chapter are likely to overestimate the actual level of risk. Therefore, no further mitigation or monitoring is recommended for these emission types.

Regarding enhancement of employment, Jobs Victoria places vulnerable people into roles and does not require any direct assistance from Melbourne Airport for this. Keeping Jobs Victoria up to date with M3R progress would assist their internal planning. No mitigation or monitoring is therefore recommended.

The ongoing Master Plan process will continue to develop and evolve monitoring and management strategies to ensure that health commitments are appropriately delivered.

D3.8 CONCLUSION

This chapter provides the assessment of the health effects caused by aircraft noise and emissions resulting from the M3R project.

The noise health assessment is based on data from chapters **C4: Aircraft Noise and Vibration** and **D4: Social Impact**; the air quality health assessment is based on data from **Chapter B10: Air Quality**; and the employment impact assessment based on data from **Chapter D2: Economic Impact Assement**. Data from **Chapter D4: Social Impact** is used to underpin the understanding of local communities impacted by the project.

The chapter assessment summary is presented in **Table D3.20**. Overall, when comparing the 2046 Build versus No Build scenarios, across air quality, noise and employment, the findings/assessments are:

- Adverse risk of impact from daytime aircraft noise is projected to occur for communication interference in community buildings and annoyance of people. The likelihood of these effects occurring is likely
- Arising from night night-time aircraft noise, a potential moderate effect on sleep disturbance is projected to occur. The likelihood of this effect is likely.
- For air quality, the risks of impact for PM_{10}, $PM_{2.5}$, NO_2, benzene and formaldehyde are negligible. CO and SO_2 concentration is forecast to be below the SEPP (AQM) at all modelled receptors in all scenarios, and therefore acceptable
- Beneficial impacts due to employment are projected in terms of avoided mortality - and on community, family and individual health
- M3R provides alternative modes of parallel runway operation that give significant opportunities for night-time noise abatement to minimise impacts of noise and disturbance – and to provide relief – for areas of the Greater Melbourne urban district
- It is not only extremely difficult to identify the underlying cause of migraines for the individual but also for this M3R health assessment. Therefore, no association between the 2046 Build and migraines can be made.

Overall, from a health outcome perspective, the beneficial health outcomes that affect mortality outweigh the less-serious negative health outcomes of sleep disturbance, annoyance and communication interference. However, it is important not to disregard the impact of these less-serious noise effects on those affected.

Table D3.20
Impact assessment summary

Environment aspect & baseline condition	Assessment of original impact						
	Original Impact	Mitigation inherent in design/practice	Duration	Significance			
				Severity	Likelihood	Impact
Operation						
Air quality – $PM_{2.5}$ in dust $PM_{2.5}$ exceeded the NEPM standard during baseline monitoring but were related to Melbourne-wide issues due to bushfire smoke	Negative effect, mortality and hospitalisation	See **Chapter B10: Air Quality**	Permanent	Negligible	Rare	Negligible
Air quality – PM_{10} As per $PM_{2.5}$ above	Mortality and hospitalisation	See **Chapter B10: Air Quality**	Permanent	Negligible	Rare	Negligible
Air quality – NO_2 Low. with no exceedances	Mortality and hospitalisation		Permanent	Minor	Rare	Negligible
Air quality – CO Very low, no exceedances	Exceedance of standard to protect health		Permanent	Negligible	Rare	Negligible
Air quality – SO_2 Very low, no exceedances	Exceedance of standard to protect health		Permanent	Negligible	Rare	Negligible
Air quality – benzene and formaldehyde Low, no exceedances	Lifetime risk of cancer		Permanent	Negligible	Unlikely	Negligible
Employment Substantial existing employment in related job types	Individual, family and community health benefits	See **Chapter D2: Economic Impact Assement**	Permanent	Beneficial	Almost certain	Beneficial
	Indirect effect on deaths avoided		Permanent	Beneficial	Likely	Beneficial

Mitigation and/or management measures	Assessment of residual impact				
	Residual Impact	Duration	Significance		
			Severity	Likelihood	Impact
See Chapter B10: Air Quality					
See Chapter B10: Air Quality					
N/A					

Environment aspect & baseline condition (cont.)	Assessment of original impact (cont.)					
	Original Impact	Mitigation inherent in design/practice	Duration	Significance		
				Severity	Likelihood	Impact
Operation						
Noise – day and night N70 (over a 24-hour period) extends north, south, east and west of the existing runways. N-above extends along the runway centrelines in each direction	Communication interference at community institutions	See **Chapter C4: Airspace Noise and Vibration**	Permanent	Moderate	Likely	Medium
	Reading comprehension in primary school children		Permanent	Negligible	Unlikely	Negligible
	High annoyance of people		Permanent	Moderate	Likely	Medium
	Noise induced awakenings		Permanent	Minor	Possible	Low
	Highly sleep disturbed people		Permanent	Moderate	Likely	Medium
	Myocardial infarction		Permanent	Negligible	Rare	Negligible

Mitigation and/or management measures (cont.)	Residual Impact	Duration	Severity	Likelihood	Impact
			Significance		
As part of the work to develop the detailed airspace design (post-MDP), APAM will continue to work proactively with stakeholders to develop a noise monitoring and management plan based on the International Civil Aviation Organisation (ICAO) 'Balanced Approach' to managing aircraft noise. There are several operating modes available for consideration that reduce the number of dwellings exposed to night noise (e.g. segregated modes Option 1 and 2). These options shall be included in community engagement initiatives. Melbourne Airport will encourage Airservices Australia to manage operations to extend the use of the noise abatement preferred modes procedures in the evening and early mornings as long as possible whilst operating conditions allow (based on safety, operational, efficiency and weather considerations).		Permanent	Moderate	Likely	Medium
		Permanent	Negligible	Unlikely	Negligible
		Permanent	Moderate	Likely	Medium
		Permanent	Minor	Possible	Low
		Permanent	Moderate	Likely	Medium
		Permanent	Negligible	Rare	Negligible

Assessment of residual impact (cont.)

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Chapter D4
Social Impact

Summary of key findings:

- Melbourne Airport is a key economic generator and social connector for the Greater Melbourne area, the state of Victoria, and Australia.
- Melbourne Airport is a major contributor to the Victorian – and Australian – economy, and forecast to provide a 4.6 billion dollar boost to Victoria's economy by 2046 with the commissioning of Melbourne Airport's Third Runway (M3R).
- Should M3R be built, 3,200 more jobs will be created on site and 37,000 more jobs will be created state-wide by 2046.
- The social impacts of M3R will vary for different people and communities and may change over time. Although the project will deliver significant economic and positive social benefits, these will not be directly or evenly shared by all individuals across all communities. Likewise, some of the negative impacts such as aircraft noise will decrease in some areas and increase in others. The degree of impact experienced, both positive and negative, will depend heavily on individual circumstances.
- Although the negative effects of M3R would not be shared evenly between communities, the parallel runways do provide greater flexibility by allowing the use of alternative flight paths that can distribute aircraft noise differently. Through community engagement, Melbourne Airport will give communities the opportunity to review and provide feedback on M3R. Significantly, modelling has identified not only a substantial number of homes that will be newly affected by aircraft noise but also a substantial (albeit smaller) number of homes that will experience less noise. It is also important to note that even without M3R there would still be a significant increase in aircraft noise as the airport approaches capacity – but with virtually no flexibility in how that noise could be managed.
- Night-time noise for those homes and community facilities which are currently impacted will likely be reduced by utilising the increased capacity for flexible operating modes that is provided by M3R. This has been noted as a benefit. Nevertheless, there will also be some homes that are newly affected by aircraft noise at night. The options available for alternative flight paths provide distinctly different possible noise outcomes. Melbourne Airport will therefore consider the input that is received through community consultation when determining the preferred option.
- Generally speaking, those to the east and west will see and hear reduced impacts from the airport while those to the north and south will experience increased impacts.
- On opening of the new runway, there will be no immediate increase in the number of aircraft using the airport. However, the shift in impacts from the east/west runway to the north/south runways will occur from M3R's opening. This will shift some 40 per cent of current traffic away from those affected by the current east/west runway and over those north and south of the airport. Those newly affected will be much more likely to notice the negative impacts than those likely to benefit from a decrease in aircraft noise. This change effect will be exacerbated by the increased volume of flights from the current low level as aviation recovers from the impact of COVID-19.
- The No Build scenario would also result in some negative social impacts caused by the growth in traffic reaching the capacity limits of the two current runways. There would be increased impacts from delays to incoming and departing aircraft, resulting in additional noise and emissions and significant economic costs.
- Additionally, the No Build scenario denies the opportunity to implement significantly beneficial noise-mitigation modes of operation such as Simultaneous Opposite Direction Parallel Runway Operations (SODPROPS). This mode seeks to direct all arriving and departure traffic to the north over the 'green wedge' at times of low traffic (between 11pm and 6am) and in amenable weather conditions.


Virgin
virgin australia

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D4.1 INTRODUCTION

Melbourne Airport is an economic generator and social connector for the people of Victoria. It does this by creating jobs and enabling people to travel anywhere in the world for business, leisure, or to reconnect with family and friends. Given that Melbourne's population is forecast to almost double by 2056 (DELWP, 2019), the city's infrastructure must also grow to support this future population.

Melbourne Airport's Third Runway (M3R) will deliver a parallel runway and taxiway network that increases the maximum capacity of the airport's runway system from between 48 and 60 aircraft movements per hour (depending on operational mode and weather conditions) to between 85 and 95 aircraft movements an hour in most weather conditions. Without M3R, by 2026, and assuming a resumption of air transport demand in line with pre-COVID forecasts, increasing delays would occur at Melbourne Airport as the runway capacity was exceeded. This would likely result in substantially increased travel costs, delays, aircraft holding (with consequent additional emissions and noise) and less flexibility for passengers and airlines (see **Section D2.7** of **Chapter D2: Economic Impact Assement**).

This chapter assesses the potential social impacts and benefits associated with the ground and airspace changes required for the construction and operation of the new runway. Dunera Consulting was engaged by Melbourne Airport to provide technical expertise and advice for this chapter.

The objectives of this Social Impact Assessment (SIA) are to:

- Identify potential positive and negative social impacts that may occur as a result of the airspace and ground-based changes that are required for the construction and operation of the new parallel runway
- Identify opportunities to enhance the positive social impacts; and measures to avoid, mitigate or manage the negative social impacts
- Provide an assessment of the potential net and ongoing social impacts associated with M3R.

The SIA is also part of Melbourne Airport's meeting of certain statutory and regulatory obligations (see **Chapter A8: Assessment and Approvals Process**).

D4.2
METHODOLOGY AND ASSUMPTIONS

The *International Principles for Social Impact Assessment* (Vanclay, 2003) are used widely by SIA practitioners when undertaking such assessments. The principles state that a SIA:

> *'… includes the processes of analysing, monitoring and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, and projects) and any social change processes invoked by those interventions. Its primary purpose is to bring about a more sustainable and equitable biophysical and human environment'*
> (Vanclay, 2003).

According to Vanclay, social impacts are associated with changes to one or more of the following:

- People's way of life: how they live, work, play and interact with one another on a day-to-day basis
- Their culture: their shared beliefs, customs, values and language or dialect
- Their community: its cohesion, stability, character, services and facilities
- Their political systems: the extent to which people can participate in decisions that affect their lives, the level of democratisation that is taking place, and the resources provided for this purpose
- Their environment: the quality of the air and water people use, the availability and quality of the food they eat, the level of hazard or risk/dust/noise they are exposed to, the adequacy of sanitation, their physical safety, their access to and control over resources
- Their health and wellbeing: health is a state of complete physical, mental, social, and spiritual wellbeing and not merely the absence of disease or infirmity
- Their personal and property rights: particularly whether people are economically affected, or experience personal disadvantage which may include a violation of their civil liberties
- Their fears and aspirations: their perceptions about their safety, their fears about the future of their community, and their aspirations for their future and the future of their children.

International principles and concepts have guided the development of this SIA. This section describes the methodology used, and pertinent assumptions and limitations that should be considered when reading this chapter of the MDP.

D4.2.1
Methodology

The assessment of social impacts associated with the construction and operation of a new runway has many variables and can become quite complex.

This chapter consolidates the findings from detailed assessments and analysis completed across many other chapters of this MDP. It provides a comprehensive assessment of the social impacts that may arise from the new runway compared to not building a new runway. References to other chapters where more detail can be sourced are included, with some replication of key data and information where appropriate for describing the potential social impacts.

A five-stage process was undertaken to complete the SIA. Each of these stages is defined and addressed in its own section, thereby forming the body of this chapter, as follows:

- Understanding the issues
- Predicting, analysing and assessing the likely social impacts in both the Build and No Build scenarios, and comparing these
- Developing mitigation and management strategies to minimise negative impacts
- Identifying benefits and opportunities to enhance social cohesion, and strategies for harnessing these
- Designing and implementing monitoring and continual improvement programs.

D4.2.2
Assumptions

The following assumptions and limitations should be considered when reading this chapter.

D4.2.2.1
Information sources

The SIA has been informed by a range of existing reports, studies, and information from the following sources:

Australian Bureau of Statistics (ABS) data – 2016 census data provided information about relevant populations, supplemented with the ABS's most recent statistical data

Existing reports and data – the SIA has drawn on information available in the relevant existing reports. These include government plans and policies, information from other planning projects conducted in the vicinity of the development footprint, media reports and community-based websites

Dwellings and community facilities data – The SIA relies on the dwellings dataset used throughout the MDP to identify those dwellings, and therefore residents, who are likely to experience aircraft noise. Likewise, the SIA relies on the community facilities dataset used throughout the MDP. These datasets are sourced from the Valuer-General Victoria and the Victorian Government Data Directory. (See Section C3.5.4.1 of Chapter C3: Aircraft Noise Modelling Methodology for a full description of how the dwellings datasets were determined.) The same approach was taken for the community facilities

Other MDP chapters – information used in this SIA has been drawn from other investigations undertaken for this MDP, and references to these are included throughout this SIA. Each of the referenced chapters includes its own methodology and assessment section, and these assumptions form part of the SIA's assumptions

Research – into social impacts in Australia, community responses to major infrastructure projects including lessons learned and best practice standards for community engagement and social impact analysis.

Relevant references are included as footnotes where appropriate.

D4.2.2.2 Aircraft noise modelling

The SIA relies on the modelling undertaken as described in Section C3.5 and Section C3.6 of Chapter C3: Aircraft Noise Modelling Methodology. Assumptions made in the noise modelling and assessment are set out in Section C3.7 of that chapter, with the sensitivities of the modelling described. In considering potential impacts, the SIA considers what the impacts might be should these assumptions differ, and therefore the aircraft noise picture varies from that modelled.

D4.2.2.3 Traditional aircraft noise metrics

Various ways of determining and describing aircraft noise are referenced in Australian legislation and policy, standards and guidelines. They have been used to describe social impacts in other aircraft-noise impact assessment processes in Australia. See Chapter C3: Aircraft Noise Modelling Methodology for an explanation of traditional aircraft noise metrics (Section C3.5.2) and the sensitivity of these to the assumptions used in the modelling calculations for these (Section C3.7.2).

This SIA applies the traditionally used metrics, as these are familiar ways of describing noise impacts and can tell part of the story. However, it is well established that people located outside these noise indicators also experience exposure to aircraft noise and many will still consider themselves to be adversely impacted by this situation. This SIA therefore goes beyond these traditional metrics to try to more fully capture the potential impacts (both negative and positive) that are likely to arise from M3R.

D4.2.2.4 Non-acoustic aircraft noise impacts

Research (e.g., Flindell, 1999) shows that non-acoustic impacts associated with aircraft noise may, in certain circumstances, be a greater driver of annoyance associated with aircraft operations than the noise level itself. A fair SIA must go further than the traditional metrics, which do not give due recognition to the non-acoustic factors that drive aircraft noise-related annoyance.

In overlooking these non-acoustic impacts – which go to how people perceive and respond to the sounds of aircraft – assessments tend to understate the potential impacts associated with aircraft operations. As a result, they may not effectively mitigate and manage the impacts. This SIA therefore considers non-acoustic factors associated with aircraft noise annoyance to better identify and assess potential impacts.

The limitations in this regard are that aircraft noise is a very personal and subjective experience. Any attempt to characterise the experience as being uniform across any community will be flawed. However, appropriate generalisations about likely impacts – and their potential scale – can be reasonably made and assist in guiding appropriate management strategies.

Aircraft noise annoyance and non-acoustic factors

Aircraft-noise management has generally been based on the balanced approach formulated by the International Civil Aviation Organisation (ICAO). This looks at managing/reducing the aircraft noise where possible, and using planning controls to minimise incompatible land use in areas of high noise.

Nevertheless, there has been discussion and some research on the issue of factors other than how much noise the aircraft make.

In a presentation to the ICAO Environmental Symposium 2019, one presenter (Gjestland, 2019) suggested that factors other than the level of noise might account for as much as two-thirds of the annoyance. It may be both difficult and unhelpful to quantify the contribution of the various contributors to annoyance, but it is important to recognise that other factors beyond how loud or frequent the noise will be are important components of the level of annoyance. These factors include perceptions about unfairness in sharing the noise, changes in the level of noise, unmet expectations about noise levels such as unexpected increases, individual sensitivity to noise, fear of what the noise represents (e.g. fear that aircraft operating overhead are a safety/crash risk) and personal lifestyle factors.

It is important not to interpret these other drivers of annoyance as invalidating or diminishing the legitimacy of aircraft-noise concerns. Indeed, the opposite is true: these are entirely valid drivers of annoyance and must be addressed. This can be done both through the management of the noise, and through addressing these other factors directly – usually through better community engagement, information provision and sincere efforts to deal with the concerns.

D4.2.2.5
COVID-19

COVID-19 has significantly changed the global aviation industry. This assessment assumes that Melbourne Airport traffic levels will have recovered before the new runway opens. Where appropriate, further discussion of potential impacts from this recovery is included to ensure appropriate strategies are considered. Ultimately, Melbourne Airport will continue to monitor and engage with its community and other stakeholders to ensure appropriate strategies are developed and implemented.

D4.3
STATUTORY AND POLICY REQUIREMENTS

Melbourne Airport is located on Commonwealth land, leased by Australia Pacific Airports (Melbourne) (APAM). The *Airports Act 1996* (Airports Act) and *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) are the key pieces of legislation that set the regulatory framework for M3R and this assessment. However, consideration has also been given to relevant Victorian and local legislation including environmental planning instruments, policies and guidelines. The following statutory and policy requirements are relevant to this chapter of the MDP.

D4.3.1
Airports Act 1996

This SIA has been prepared to address the relevant requirements for an MDP as set out in the Airports Act. See **Chapter A8: Assessment and Approvals Process** for more detail.

D4.3.2
Environment Protection and Biodiversity Conservation Act 1999

As discussed in **Chapter A8: Assessment and Approvals Process**, the MDP addresses the requirements of both the Airports Act and EPBC Act.

The EPBC Act requires that the MDP must consider impacts to the 'whole of the environment' which includes considerations of the social aspects of the environment. The MDP must also consider impacts on people and community as discussed in the *Significant Impact Guidelines 1.2*. Additionally, under section 136 of the EPBC Act, the Minister for the Environment and Water is required to consider economic and social matters when deciding conditions.

D4.3.3
National Airports Safeguarding Framework

The purpose of the National Airports Safeguarding Framework (NASF) is to enhance the current and future safety, viability and growth of aviation operations at Australian airports.

The NASF (NASAG, 2012) recognises the significant contribution of Australian airports to job creation, economic development, national productivity and social connectivity. It encourages approaches to planning that balance and protect airport/aviation operations and community safety and amenity expectations.

Topics discussed in the NASF relevant to this SIA include:

- Commonwealth, Victorian, territory and local governments and airport operators should support effective disclosure of aircraft noise to prospective residents
- ANEF should be supplemented with other noise metrics, such as N-contours to describe noise to the community and to support land-use planning decisions
- Commonwealth, state, territory and local governments recognise the roles that various airports play within their cities, regions and states/territories for economic, transport or social reasons
- Land-use planning processes should balance and protect both airport/aviation operations and community safety and amenity expectations.

D4.3.4
Melbourne Airport Master Plan

The *Melbourne Airport Master Plan 2022* (2022 Master Plan) outlines the vision and strategic intent for Melbourne Airport's future development over the next 20 years.

The Master Plan extends the long-term capacity of Melbourne Airport by proposing four runways and a fifth and sixth terminal. The Master Plan is based on the planning assumption that the terminal precinct would cater for up to 80 million passengers per annum.

The principal purpose of the 2022 Master Plan is to address the selection of the preferred third runway, being the north-south parallel (M3R project proposal) which differs from the 2013 and 2018 Master Plans that identified the east-west parallel as the preferred third runway development (as part of an ultimate four-runway system). This arrangement is detailed further in **Chapter A1: Introduction – The Project**.

This MDP will be assessed by the Minister for Infrastructure, Transport, Regional Development and Local Government following the approval of the 2022 Master Plan (refer to Chapter A8: Assessment and Approvals Process).

As required by the Airports Act, all airport master plans must provide an ANEF to determine likely noise exposure around the airport.

The 2022 Master Plan contains ANEF contours that represent Melbourne Airport's forecast long-range noise impacts to 2048 for the development stages of the four runways. The 2022 Master Plan includes a new ANEF based on updated forecasts (refer to **Chapter A8: Assessment and Approvals Process**).

D4.3.5
AS 2021:2015 Acoustics – aircraft noise intrusion – building siting and construction

This Australian Standard (AS, 2015) provides guidance on the siting and construction of buildings in the vicinity of airports to minimise aircraft-noise intrusion. The assessment of potential aircraft noise exposure at any given site is based on the ANEF system.

D4.3.6
Planning and Environment Act 1987

The *Planning and Environment Act 1987* (Vic) (PE Act) establishes a framework for planning and managing the use, development and protection of land in Victoria in the present and long-term interests of all Victorians. Planning schemes prepared under the provisions of the PE Act apply to each municipality in Victoria.

The Melbourne Airport Environs Area and Melbourne Airport Environs Overlay (MAEO) is established under the PE Act to provide requirements for land use, building and works and subdivision in noise-affected areas near the airport. The MAEO is applied to areas of forecast aircraft-noise exposure in excess of the 20 ANEF noise contour (with MAEO1 applying to areas within the ANEF 25 noise contour and MAEO2 applying to areas within the ANEF 20-25 noise contour). The MAEO is based on the 2018 ANEF.

D4.3.7
Plan Melbourne

Plan Melbourne is Melbourne's overarching Metropolitan Planning Strategy. An updated version of the plan was released by the Victorian Government in early 2017.

Plan Melbourne provides the strategic framework for Melbourne's future growth and development. It recognises the need to provide infrastructure – including airports – to support the city's growing demand for passenger travel and movement of goods. *Plan Melbourne* also highlights the intent to protect areas in the vicinity of airports from incompatible land uses and instead encourage complementary uses and employment-generating land uses.

D4.4
DESCRIPTION OF SIGNIFICANCE CRITERIA

To assist in evaluating the significance of social impacts, project-specific qualitative severity criteria have been developed (Table D4.1). More detail on the significance framework for the project as a whole is described in Chapter A8: Assessment and Approvals Process.

Table D4.1
Severity assessment criteria

Magnitude	Criteria
Major	The impact is considered critical to the decision-making process. Impacts tend to be permanent or irreversible or otherwise long-term and can occur over large-scale areas. People can no longer safely live/work/learn/recreate within an area because of impacts associated with operation of the airport. The social environment is irrevocably damaged because people no longer use the impacted area.
High	The impact is considered likely to be important to decision-making. Impacts tend to be permanent or irreversible or otherwise long to medium-term. Impacts can occur over large or medium-scale areas. People can continue to live/work/learn/recreate within the area, but many are severely impacted by the operation of the airport. The social environment is damaged because some people will choose to no longer use the impacted area.
Moderate	The effects of the impact are relevant to decision-making including the development of environmental mitigation measures. Impacts can range from long-term to short-term in duration. Impacts can occur over medium-scale areas or otherwise represents a significant impact at the local scale. People can continue to live/work/learn/recreate within the area, but some are severely or moderately impacted by the operation of the airport.
Minor	Impacts are recognisable/detectable but acceptable. These impacts are unlikely to be of importance in the decision-making process. Nevertheless, they are relevant in the consideration of standard mitigation measures. People can continue to live/work/learn/recreate within the area but are sometimes impacted by the operation of the airport.
Negligible	Minimal change to the existing situation. This could include for example impacts which are beneath levels of detection, that are within the normal bounds of variation or that are within the margin of forecasting error.
Beneficial	Effects of the impact are beneficial to the social environment.

D4.5 EXISTING CONDITIONS

D4.5.1 Understanding the issues

The nominal opening year for M3R is 2026. To understand the issues and potential impacts of the new runway, the SIA considers what the social conditions would be like if it was not built. The SIA compares forecast social conditions with the new runway built and operational against the forecast social conditions if the runway is not built. The operational comparison is made for 2026 and 2046 to enable consideration of both immediate and longer-term impacts.

Melbourne Airport has numerous 'touch points' on social conditions. Melbourne Airport provides:

- Access for people to go to or come from other destinations, connecting friends and families, as well as supporting tourism and other interstate and international trade involving people movement
- Access for goods to go to or come from other destinations, providing access to goods for individuals as well as supporting businesses engaged in interstate and international trade of goods
- Support for the provision of medical and emergency services
- Employment both direct and indirect, as a consequence of the efficient transport of goods and people, and so supporting a stronger economy
- Viability for a range of infrastructure and services in the surrounding areas
- Community-initiative investments.

However, it also means the surrounding areas are affected by:

- Aircraft noise
- Ground-based noise and sometimes vibration
- Landscape and visual impacts
- Road traffic and sometimes congestion
- Pollution such as emissions from ground and air traffic.

These are all features of the airport that are already experienced within the community. As appropriate, more detail on the existing conditions (quantitative and qualitative) is explored in **Section D4.6** which provides an assessment of the potential impacts of M3R relative to existing conditions and the No Build scenario into the future.

As the airport grows, positive and negative associations tend to also increase, and are unevenly shared by members of the community. The airport's activity is forecast to continue growing even if the new runway is not built. Consequently, the benefits and negatives will continue to increase even in the No Build scenario.

Without a new runway, Melbourne Airport will ultimately reach a point where it does not have the capacity to meet air traffic demands. Reaching this constraint will mean a cap on the benefits; a continuation or increase of negative impacts; and some new or significantly increased negative impacts such as:

- Flight delays leading to delayed access for people and goods to and from Melbourne and the region, with flow-on effects e.g. from trade and tourism being diverted to other Australian centres
- More aircraft arrivals and departures scheduled through the evening, night and early morning, with associated impacts on communities (e.g. increased sleep disturbance) until ultimate capacity is reached – at which point, noise, vibration and visual amenity impacts of aircraft will plateau
- Less flexibility in the use of low-impact landing and departure procedures and flight paths would mean increased aircraft-noise impacts over more areas and, for some, fewer opportunities for respite periods
- A levelling of associated employment (direct and indirect) and potential flow-on effects (such as from trade and tourism) being diverted to other Australian centres
- Disproportionate increases in noise and pollution (carbon emissions in particular) due to more aircraft in holding patterns in the air, and holding aircraft on the ground with engines running.

Infrastructure Australia has included M3R on its Infrastructure Priority List on the basis that the capacity constraints of the current two-runway configuration will be evident by 2022 and have significant impacts by 2033 (see **Section D2.4.1** in **Chapter D2: Economic Impact Assement**). These impacts are additional pertinent considerations when evaluating the social conditions of the 2046 No Build scenario. Indeed, some of the increased negative impacts identified above were already being experienced in peak times in 2019. These would increase significantly without M3R as capacity constraints were reached over more of the day.

D4.5.2
Existing factors that may increase M3R impact sensitivities

D4.5.2.1
COVID-19 social impacts

COVID-19 has created significant, unprecedented social impacts. Some of them are likely to continue to affect existing social conditions over the next two to three years at least.

For example, it is widely accepted that the impacts of COVID-19 included a sharp increase in unemployment and great uncertainty about prospects for people across a broad range of personal circumstances. This has been associated with mental-health challenges for an increased number of Australians. The resilience of the Australian economy in the wake of the pandemic's impacts has not necessarily been reflected in the capacity of some individuals to cope with the psychological and economic impacts of COVID-19.

The first of a series of surveys being conducted by Monash University (2020) found:

> *'… a widespread increase in psychological symptoms, including anxiety, depression, and irritability that people attributed to the COVID-19 restrictions. People experiencing the worst symptoms were more likely to have lost their jobs, be caring for children or other dependent family members, or to be living alone or in an area with fewer resources. Nevertheless, on average people were more optimistic than pessimistic about the future and many described good things that had happened to them because of the restrictions.'*

Although this survey was conducted early in the COVID period (in April and May 2020) and before the lockdowns and subsequent reopening in Victoria, it is appropriate to consider that the social impacts of COVID-19 are likely to include increased anxiety and depression related to personal safety and personal job security. Further, studies suggest that the pandemic has exacerbated existing social inequalities (O'Sullivan, et al, 2020).

It will be important that the direct and indirect impacts associated with M3R are regularly considered in the wider context of social impacts – with particular sensitivity around COVID-19 specific impacts – to minimise cumulative negative impacts while leveraging opportunities to create community connections and deliver better social outcomes.

In addition, the COVID-19 pandemic has led to a dramatic decline in aviation activity in Australia and worldwide. The International Civil Aviation Organisation (ICAO, 2020) summarises the global impacts in 2020 as follows:

- Air passenger traffic: An overall reduction of air passengers (international and domestic) ranging from 59 per cent to 60 per cent in 2020 compared to 2019
- Airports: An estimated loss of approximately 64.2 per cent of passenger traffic and 65 per cent (or over US$111.8 billion) airport revenues in 2020 compared to business as usual (Airports Council International)
- Airlines: 66.3 per cent decline of revenue passenger kilometres (RPKs, international and domestic) in 2020 compared to 2019 (International Air Transport Association)
- Tourism: A decline in international tourism receipts of between US$910 billion and US$1170 billion in 2020 compared to the US$1.5 trillion generated in 2019 with 100 per cent of worldwide destinations having travel restrictions (UN World Trade Organisation)
- Trade: A fall of global merchandise trade volume by 9.2 per cent in 2020 compared to 2019 UN World Trade Organisation)
- Global economy: A projected 4.4 to 5.2 per cent contraction in world GDP in 2020 – far worse than the 2008–09 financial crisis (International Monetary Fund and World Bank).

This has meant a significant decrease in the impacts (both positive and negative) associated with aviation.

During the lockdowns, there was effectively almost no activity at Melbourne Airport. While domestic air travel is returning, no-one can confidently predict how and when the aviation sector in Australia – and Melbourne Airport specifically – will recover. However, most analysts predict that it will recover in time and then continue to grow on a similar trajectory as before COVID. Melbourne Airport is confident demand will recover and grow, and therefore that the capacity drivers for a third runway remain valid. In a post-COVID recovery phase, M3R can play a positive stimulus role.

A further potential impact of COVID may appear in the form of a trend to increased working-from-home arrangements. If these persist, even in a reduced form post-COVID, the impact of a given level of daytime aircraft noise may increase.

D4.5.2.2
Existing aircraft noise sensitivities

Complaints data

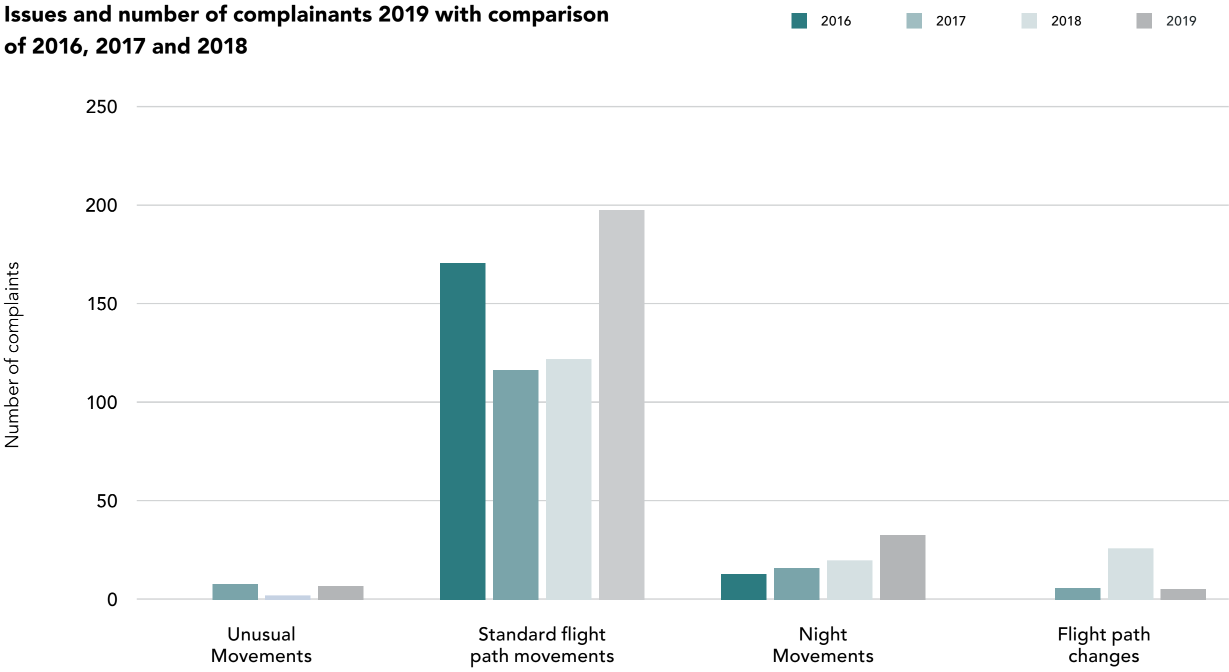
Airservices Australia manages enquiries and complaints about aircraft noise and operations through the Noise Complaints and Information Service (NCIS). This provides insight into some of the current community concerns about aircraft noise.

In 2019, a total of 245 individuals made complaints to the NCIS about Melbourne Airport operations. This is an increase from 171 complainants in 2018, continuing an upward trend since 2017. During 2019, there were 90 suburbs across the greater Melbourne basin that recorded complainants, with the predominant issue of concern being (as in previous years) current standard flight paths – see Figure D4.1. This was followed by night movements as the next most-reported issue in 2019.

Across all issues reported, the runway movements of greatest concern were arrivals to runway 34 (i.e. aircraft landing onto the main north-south runway over suburbs to the south (see **Figure D4.2**), followed by departures from runway 16, which also impact residents to the south of the airport, suggesting that these residents are already significantly concerned about aircraft operations over their homes at the levels experienced in 2019.

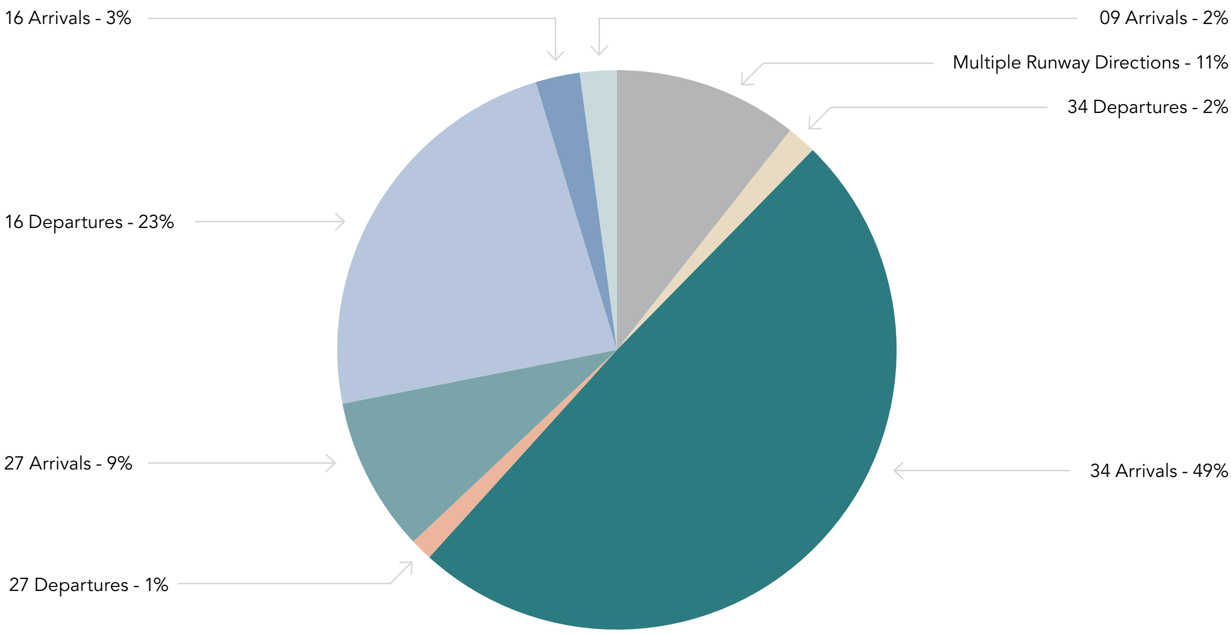
Given the sensitivity to aircraft noise impacts already in communities to the south, it is likely that any increased noise and/or overflights resulting from operation of the new runway will be experienced as highly negative. Areas that have not experienced much aircraft noise previously are likely to find new impacts highly invasive.

Figure D4.1
Issues and number of complainants 2019 with comparison of 2016, 2017 and 2018



Source: Airservices Australia, 2020

Figure D4.2
Runway directions and percentage of complainants affected by each in 2019



Source: Airservices Australia, 2020

D4.5.2.3
Community Aviation Consultation Group insights

Melbourne Airport's Community Aviation Consultation Group (CACG) is an advisory group that supports Melbourne Airport to carry out appropriate consultation in all areas of its planning and operations. The group is one of several engagement forums facilitated by Melbourne Airport that enables residents to raise issues for a response.

The CACG meets on a quarterly basis. Its role is to:

- Enable the airport operator, residents affected by airport operations, local authorities, airport users and other interested parties to exchange information on issues relating to airport operations and impacts
- Allow matters to be raised and taken into account by Melbourne Airport, who shall genuinely endeavour to resolve issues that emerge
- Discuss and share information between the airport and the communities affected by its operations and plans
- Complement and support the consultative requirements already established for Master Plans and Major Development Plans.

Melbourne Airport's CACG is facilitated by an independent chair and comprises membership from the Australian Mayoral Aviation Council (AMAC), Trades Hall Council, Local Government, the Department of Environment, Land, Water and Planning (DELWP), local Council representatives, local business representatives, and local resident and community representatives (including education).

Meetings are attended by the Department of Infrastructure, Transport, Regional Development, Communications and the Arts, Airservices Australia and Melbourne Airport. Minutes show this forum's continued interest in the potential health and social impacts (especially aircraft noise) associated with M3R. This indicates that there is not just potential community sensitivity to these impacts, but also interest in engaging on the issue. Melbourne Airport will continue to use its ongoing engagement activities to work with the CACG and more broadly with interested communities on ways to mitigate, manage and monitor the social impacts of M3R.

D4.5.2.4
Change to runway orientation

MDP Part A: The Project addresses the progression of Melbourne Airport's third runway program. This process meant that, for an extended period (more than five years), stakeholders and communities expected that the third runway would be in an east-west orientation with associated impacts affecting communities in particular ways.

The decision to change to a north-south orientation for M3R brought about different community impacts. Sensitivity to these impacts may be increased where people who are now relatively worse off feel aggrieved at a sense of being unfairly impacted because the original plan was changed. Melbourne Airport undertook a comprehensive community and stakeholder engagement process to inform its final decision on the third runway orientation which helps to mitigate this potential sense of unfairness, but it is likely to remain with at least some of those who previously expected to be better off and who now will be worse off.

In particular, residents in the south who already experience high levels of aircraft noise impact understood that a parallel-runway system in an east-west orientation increased the potential for a shift in some aircraft noise impacts away from homes in the south. At the time of the decision on M3R orientation, community groups opposed to the north-south orientation began campaigning for the runway construction to be put on hold (ABC, 2019) and are expected to continue to engage actively on this issue.

D4.5.3
Demographic profile

This section provides relevant demographic details for areas within 15 kilometres of Melbourne Airport. The 15 kilometre radius reflects not only those communities more likely to be affected by ready access to employment opportunities and direct economic stimulus from the airport, but also the area more susceptible to traffic congestion and other ground-based impacts. While it is also likely to encompass the areas of louder aircraft noise impacts, complaint data shows that this does not necessarily equate to the area most likely to generate noise complaints.

D4.5.3.1
Population

The estimated resident population of Greater Melbourne at 30 June 2019 was just over five million people (ABS, 2020). Population density generally increases towards the CBD while the outer local government areas, including Hume and Melton, have lower populations and density. Much of the population surrounding the airport live to the south and east of the site. Approximately one million people live within 15 kilometres of Melbourne Airport.

D4.5.3.2
Cultural and ethnic characteristics

Melbourne has a culturally diverse population, with 58 per cent of the population having one or more of their parents born overseas (Invest Victoria, 2017).

The proportion of the population born overseas is higher in the CBD and the western and north-eastern suburbs (particularly around Broadmeadows, Campbellfield, Keilor East, Westmeadows, Tullamarine and St Albans). Near Melbourne Airport, Essendon, Strathmore, Altona, Aberfeldie and Albion have lower proportions of people born overseas.

Approximately one-third of households in Melbourne speak two or more languages, with the most common languages (other than English) being Mandarin, Greek, Italian, Vietnamese and Cantonese (ABS, 2016).

Areas around Sunshine West, Campbellfield, Meadow Heights, Braybrook, St Albans and Cairnlea have a higher proportion of people who speak languages other than English at home. It was evident that areas which used another language at home, particularly around Broadmeadows, Meadow Heights and St Albans, generally also had lower levels of English (i.e. reported/indicated that they did not speak English or did not speak English well). In contrast, members of households in Tullamarine, Keilor Park and Keilor East, Attwood and Greenvale generally speak English at home.

D4.5.3.3 Employment

In 2018, at least two-thirds of employees in the 20,600 jobs at Melbourne Airport were drawn from the seven municipalities within the 15 kilometres radius of the airport. Of these municipalities, Melbourne Airport provides direct employment for one in six in the workforce of the City of Hume and approximately one in 20 across the seven municipalities (APAM, 2018). Melbourne Airport is a significant local employer.

Employment participation rates have been assessed by identifying the proportion of the population in the workforce. The participation rate is a measure of the active part of an economy's workforce. Those not involved in the paid workforce may include the retired, students, home workers and/or those with long-term health conditions or disabilities. A high employment participation rate is generally illustrative of lower unemployment and improved economic opportunities and conditions for households.

ABS data shows that some areas close to the airport – including Campbellfield, Dallas, St Albans, Broadmeadows and Somerton – have a lower proportion of their population in the workforce; other areas close to the airport – including Tullamarine, Keilor Park, Keilor North, Attwood, Oaklands Junction and Wildwood – have a higher proportion of people in the workforce (ABS, 2016).

D4.5.3.4 Socio-economic status

The Socio-Economic Indexes for Areas (SEIFA) is a dataset provided by the Australian Bureau of Statistics (ABS) that describes the socio-economic environment of an area based on census data. This includes income, educational attainment, unemployment and dwellings without motor vehicles. It gives a more general measure of socio-economic status than using indicators on their own.

SEIFA has a number of indexes; this SIA uses the Index of Relative Socio-economic Advantage and Disadvantage (IRSAD). The IRSAD summarises the economic and social conditions of people and households within an area, including both relative advantage and disadvantage measures (ABS, 2018).

A low IRSAD score indicates relatively greater disadvantage and a lack of advantage in general. For example, an area could have a low score if there are (among other things) many households with low incomes or many people in unskilled occupations; and few households with high incomes or few people in skilled occupations. A high score indicates a relative lack of disadvantage and greater advantage in general.

As shown in **Figure D4.3**, many areas close to the airport have low IRSAD scores indicating relative disadvantage.

In general, areas nearer the Melbourne CBD show higher IRSAD scores, indicating relative advantage. Close to the airport, areas to the east (including Coolaroo, Broadmeadows, Meadow Heights, Campbellfield and Fawkner) and areas to the south (including St Albans, Kings Park, Albanvale, Deer Park, Sunshine West, Sunshine as well as Plumpton and pockets of Sunbury) are within the lowest decile. On the other hand, Sunshine North, pockets of Keilor, Taylors Lakes, Hillside and eastern Greenvale have relatively high scores, indicating greater advantage. Areas shown in white on the map in **Figure D4.3** either have no residents or not have enough people to generate a SEIFA score.

Understanding this uneven distribution of social disadvantage is important, given the proximity of the most disadvantaged areas to the airport and existing flight paths. This uneven distribution will result in a greater social impact on those disadvantaged areas from M3R due to geographical circumstances, not as a result of any targeting of particular communities.

D4.6 ASSESSMENT OF POTENTIAL IMPACTS

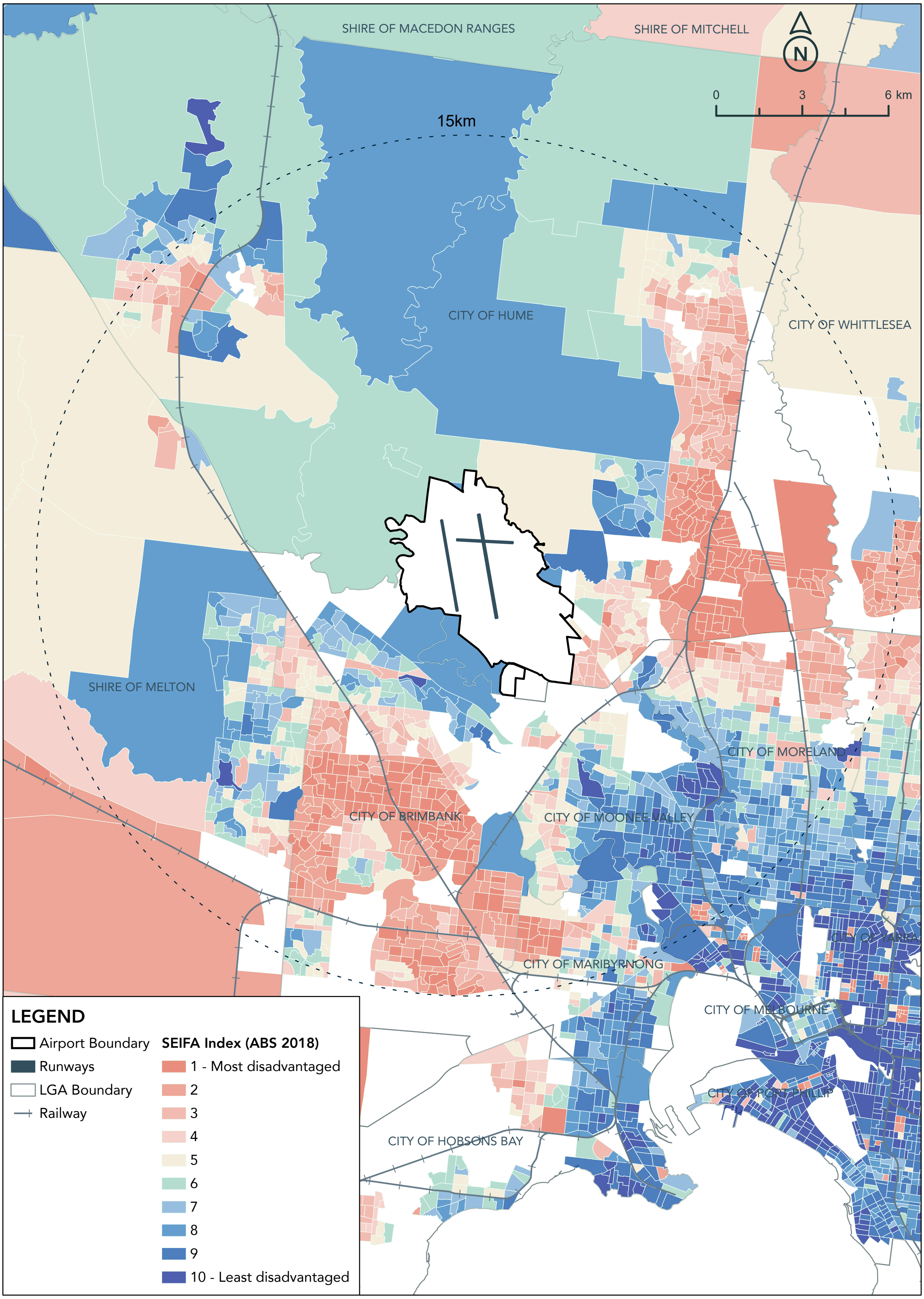
This section describes the potential impacts of a parallel north-south runway at Melbourne Airport. This includes the impacts associated directly and indirectly with both construction activities and the ongoing operations of the new runway.

D4.6.1 Construction impacts

A variety of social impacts will be directly associated with the M3R construction works. They will be both positive and negative, none of which would arise in the No Build scenario. Most negative impacts will be temporary or short term in nature, a majority lasting for only some portions of the construction period (four to five years, total). Once the project has approval to proceed, these will be the first noticeable social impacts experienced by the community.

The approach to construction of the new runway is described in **Chapter A5: Project Construction**.

Figure D4.3
Index of Relative Socio-economic Advantage and Disadvantage



Source: ABS, 2018

D4.6.1.1
Access for people and goods

During the construction period, there will be some relatively short periods (ranging from part of a day to several weeks) when access to the existing north-south or east-west runways and/or taxiways will be restricted. This may be, for example, during concrete pours or when heavy equipment is being positioned. Consequently, the airport's current capacity will be reduced, which may lead to delays for aircraft arrivals and departures.

Where practicable, efforts will be made to schedule these essential construction activities for low-traffic periods in order to minimise potential delays for passengers and freight. In general, these impacts will be minimal. They can be largely mitigated by clear and timely communication about the impacts so people can make arrangements to accommodate them.

D4.6.1.2
Employment

The economic assessment conducted in **Chapter D2: Economic Impact Assement** identified a range of positive impacts – or economic benefits – to Victoria from the Build scenario.

There are no significant negative economic impacts.

The economic assessment estimates a significant economic boost for Victoria. It includes a $2.26 billion economic contribution and an additional 10,700 direct and indirect jobs over the construction period. Of these, more than 650 construction-related jobs are expected to be created in Melbourne Airport's local area.

There will also be significant flow-on impacts to other industries in the area including accommodation and food services, retail trade and transport, postal and warehousing. In addition, opportunities to work on this major project can flow to strong references and recognition for businesses, potentially leading to future work opportunities and business expansion, and contributing further to downstream job creation and economic stimulus. **Chapter D2: Economic Impact Assement** identifies how agglomeration-driven benefits, although difficult to quantify, are expected to result from M3R.

The health impact assessment prepared for this MDP identifies that a person's economic status has a significant bearing on their health and wellbeing, and that having a job – or not – is a key socio-economic indicator. Therefore, the delivery of a significant number of jobs would have a beneficial impact on health and wellbeing outcomes.

These health and wellbeing outcomes arise from individual, family and community health gains; and from the avoidance of indirect mortality associated with improved economic outcomes for individuals and their families. For more information about the positive impact of employment on health and wellbeing, see **Chapter D3: Health Impact**.

D4.6.1.3
Infrastructure and services

There will be positive and negative impacts on infrastructure and services from M3R.

There will be increased pressure on some existing infrastructure during construction, in particular roads and flow-on effects to public transport services. However, with mitigation the construction impact will be minor. There will be only a minimal overall increase in truck traffic, and a small increase from construction-worker traffic (see **Chapter A5: Project Construction** and **Chapter B8: Surface Transport**).

There will be beneficial impacts on local services. Increased demand from construction workers for services such as take-away food and other incidental services will support local businesses including on-airport outlets.

D4.6.1.4
Community initiatives

Melbourne Airport recognises the need to balance its role as the primary aviation gateway for passengers and freight in Victoria with the needs of its neighbours and city and regional interests. Melbourne Airport would continue its community initiatives in either the No Build or Build scenarios.

M3R construction provides an opportunity for Melbourne Airport to potentially expand its community initiatives and foster new connections with communities, businesses and passengers. Melbourne Airport is therefore committed to exploring these opportunities to enhance its social connections with surrounding communities.

D4.6.1.5
Aircraft noise and overflights

During construction of the new runway, changes to aircraft noise around Melbourne Airport can be expected.

As mentioned, there will be some relatively short periods (part of a day through to several weeks) when access to the existing runways and/or taxiways will be restricted due to essential construction activities. In addition to causing possible delays for passengers and freight, they may also disrupt the usual overflight patterns. Aircraft noise impacts are then likely to be experienced as unusual in some areas around the airport.

Where practical, efforts will be made to schedule these necessary construction activities for low-traffic periods to minimise the extent of unusual overflight patterns and their aircraft noise impacts. However, there will need to be a careful balance: to minimise the disruption to operations, some works will be scheduled for the evening and night-time; but this may mean that, to the extent that changes in usual patterns of overflight and aircraft noise are disruptive to individuals' sleep, they may be more intrusive at these times.

During construction of M3R, changes to aircraft noise around Melbourne Airport can be expected. Melbourne Airport is investigating construction staging and aircraft noise impacts separate to this MDP. The construction staging and associated aircraft noise will be communicated fully once they are established. Public communication of any disruptions to standard flight-path operations will be a key focus, including advice on the extent and timeframe of any disruptions.

D4.6.1.6
Ground-based noise and vibration

Ground-based noise and vibration impacts will occur during the significant earthwork phases and subsequent stages of the runway construction process. The impacts of ground-based noise, together with potential vibration impacts, during construction are considered in Chapter B9: Ground-Based Noise and Vibration.

Construction noise will be generated by construction plant and machinery. Haulage noise will be generated by heavy vehicles delivering construction materials to the site and during the removal/redistribution of excess construction waste (spoil).

Vibration from construction activities will typically occur from high-energy works such as piling, dynamic compaction and blasting. These will generate a combination of ground-borne vibration and airborne noise that can, in some cases, generate vibration effects within buildings.

Many activities during construction will produce noise of similar levels to existing airport noise during operational hours. At certain stages of the construction program, and principally during the night-time period, construction noise will result in a minor to moderate adverse effect at one location (95-105 McNabs Road). Construction vibration was assessed as negligible even should blasting occur.

Mitigation measures for the construction phase will be incorporated into the Construction Environmental Management Plan (CEMP) to minimise ground-based noise and vibration impacts.

D4.6.1.7
Landscape and visual amenity

Construction of the new runway would result in changes to the landscape at Melbourne Airport. This includes the removal of vegetation and landform changes due to the construction of the new runway. These impacts are expected to be more obvious during vegetation clearing and the early stages of construction.

Impacts are likely to reduce when impacted areas adjacent to the new runway construction are reinstated and landscape-mitigation measures are implemented. However, the restrictions on planting in the vicinity of runways will limit the extent to which original landscapes can be restored. The removal of a portion of the Grey Box Woodland will be permanent.

During construction, works would be visible from viewpoints on and around the airport. This impact is mitigated by the fact that views from these viewpoints are already impacted by the airport and its associated infrastructure. See Chapter B12: Landscape and Visual for details.

D4.6.1.8
Traffic and transport

The main traffic and transport impact of the construction period will be from the truck movements travelling to and from the site while delivering materials and equipment. Their impact on daily traffic operations will be moderated by spreading traffic through each day and over the entire construction period. There will be little or no interface between the construction activity and active transport modes because construction-vehicle access routes are separated from the most active transport corridors.

With reasonable mitigation measures to be developed in the planned Construction Traffic Management Plan, there will be a temporary minor adverse impact on road transport in the local vicinity of the airport, and on arterial roads elsewhere on the road network, due to the construction activity. The minor extent of this impact is illustrated by the estimate that truck traffic on Sunbury Road could increase by only up to two per cent. See Chapter B8: Surface Transport for more detail.

D4.6.1.9
Air quality

During the construction period, dust emissions from bulk earthwork activities are expected to affect ambient air quality in the immediate vicinity of these works. Construction activities that could contribute to dust emissions include:

- Clearing of land and topsoil scraping
- Haulage of materials (e.g. imported fill, stone aggregate, sand, and cement to the site – with some haulage on unpaved roads)
- Materials handling by construction equipment such as excavators, bulldozers, and front-end loaders
- Grading and compaction
- Wind erosion from exposed areas and active stockpiles.

The potential for air quality impacts has been assessed in Chapter B10: Air Quality. The calculated dust emission estimates show that the key dust emissions data in the modelling are for wheel-generated dust caused by material haulage on unpaved roads, bulldozer activities, and wind erosion from stockpiles and open areas.

Modelling for the construction period shows most air quality impacts would be contained within the airport site, with some exceedances of the air quality standard outside the airport boundaries. These exceedances were either expected based on existing air quality data, or considered able to be appropriately managed through construction management practices and so would not impact any sensitive receivers. Despite this, residents downwind of construction areas may have a perception of being affected by reduced air quality.

This may represent a minor social impact, although it is noted that **Chapter D3: Health Impact** determined the potential health effect is projected to be negligible.

D4.6.1.10
Culture and heritage

Chapter B6: Indigenous Cultural Heritage and **Chapter B7: European Heritage** provide assessments of the potential impacts on local cultural and heritage values associated with M3R. The assessment detailed in Chapter B6 has identified Aboriginal cultural heritage places within the study area. They consist of artefact scatters, low-density artefact distributions and scarred trees. An additional 131 surface artefacts were identified that require further investigation. Melbourne Airport is committed to working with Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation to ensure careful management of this heritage.

The assessment in **Chapter B7** has identified 14 European heritage sites, one being of notable significance. Melbourne Airport has worked with historical societies, experts and Heritage Victoria in assessing these sites and will continue to work with these partners in the management of construction impacts on them.

D4.6.2
Operational impacts: aircraft noise and overflight

This section assesses the potential impacts on the social environment from the ongoing operation of the new runway following opening, specifically those due to aircraft noise and overflight. This is detailed separately from other operational impacts because of the complexity of the issues. It describes the assessed differences between the Build and No Build scenarios at opening (in 2026) and longer term (in 2046).

D4.6.2.1
Context

Capacity at an airport suddenly increases with the operational commissioning of a new runway. Even though there would be a steady and gradual growth in the air traffic demand, a new pattern of runway usage is implemented immediately. Aircraft movement distribution is immediately different: new areas are affected, and previously overflown areas are likely to experience changed patterns of overflight and noise. This will affect people who live, work and enjoy recreational activities in these areas.

However, even without the new runway, it is anticipated that movement distribution will change over time because the growth in air traffic demand would need to be accommodated on the existing two runways; and higher capacity runway modes would be required more often and for longer, thereby reducing the availability of noise- abatement modes that are only available during lower demand periods. See **Section C2.2.14** in **Chapter C2: Airspace Architecture and Capacity** for a description of existing noise abatement procedures.

Residents currently affected by the higher-capacity runway modes will experience increasing overflights and associated aircraft noise, with increasingly fewer periods of respite.

Residents currently affected only by those noise abatement modes solely available during lower-demand periods may experience reduced impact. While this is positive for those individuals, people usually don't tend to notice or value a relatively small reduction in a negative and intermittent impact. In contrast, those who experience the increased impacts of higher-capacity runway mode usage will likely notice the negative impacts – especially when the increased overflights and aircraft noise occur during the more highly-sensitive night and early morning periods. **Chapter D3: Health Impact** undertakes a detailed assessment of the health impacts associated with sleep disturbance.

Gradual change experienced by communities is generally much less noticeable, and there is therefore less of an impact on social conditions than with a sudden change. However, with an otherwise growing airport, the addition of increased capacity through the third runway can mitigate some negative impacts that would otherwise be associated with reaching capacity without it.

During periods when demand is lower, the runway infrastructure, facilities and airspace architecture proposed with M3R will allow a wider range of practical operating modes. This will give greater flexibility when managing negative impacts. The available modes are described in detail in **Section C2.5.2** in **Chapter C2: Airspace Architecture and Capacity**. Their impacts are considered below.

D4.6.2.2
Runway usage

To understand why a third runway will have such a substantial impact on the management of air traffic around the airport, is it necessary to understand how the airport's runway layout will change.

Melbourne Airport currently has two runways and is proposing to build M3R parallel to the current north-south runway, situated 1,311 metres to its west. The M3R scope also includes shortening runway 09/27 by approximately 346 metres at the western end so that the Runway End Safety Area is clear of the graded runway strip for 16R/34L (see **Figure D4.5**).

The numbers at the end of each runway in **Figure D4.5** are used to describe or label the runways. They are derived from compass bearings rounded off to the nearest 10 degrees.

Figure D4.4
Current runway configuration of Melbourne Airport

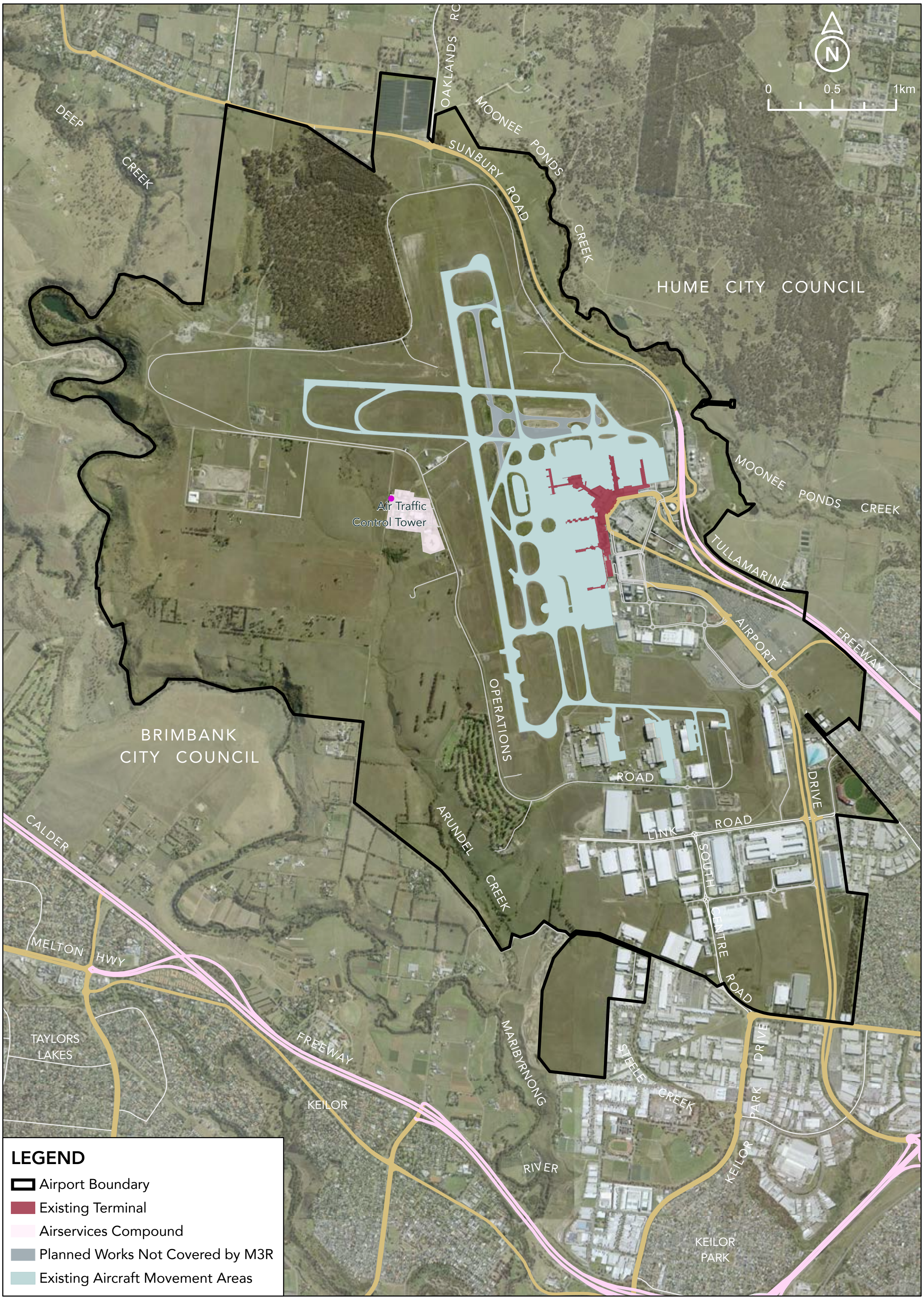
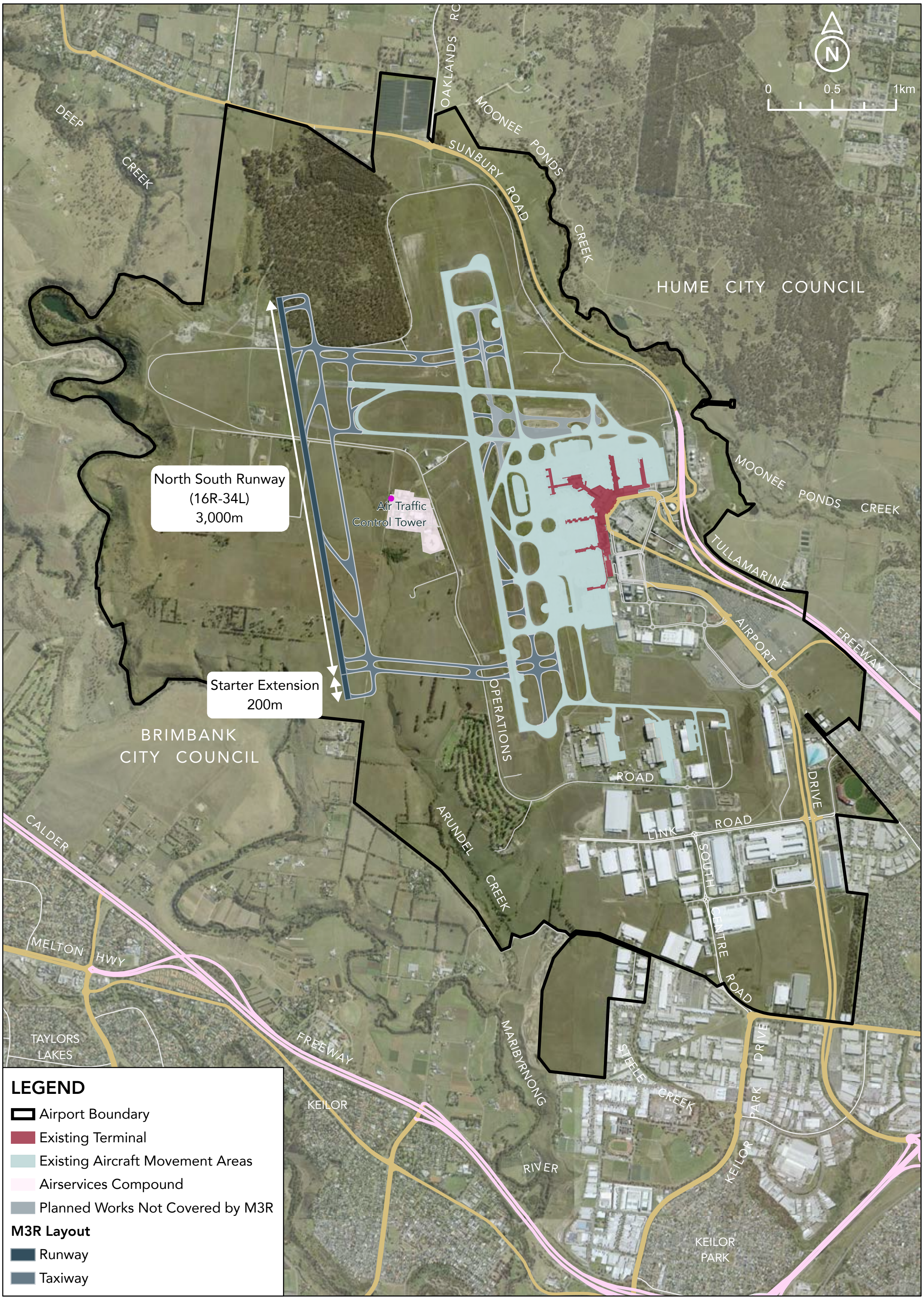


Figure D4.5
Runway configuration with M3R, Melbourne Airport



For example, 34 refers to the direction of 340 degrees on a compass. It labels the long runway when aircraft using it are pointing to 340 degrees, i.e. while landing or taking off towards the north (or more precisely 340 degrees, 20 degrees short of due north).

When used in the opposite direction (160 degrees, or 20 degrees off south) the same strip of paving goes by a different label, 'Runway 16'. The strip of pavement itself is referred to as runway 16/34.

However, with M3R the new runway will be designated runway 16R/34L (because it is on the right when heading at 160 degrees and the left when heading 340 degrees). The existing runway will be redesignated as runway 16L/34R to differentiate between the two. The existing cross runway labelled 09/27 will be shortened in the M3R Build scenario.

Air Traffic Control's selection of runways for operations is heavily influenced by weather conditions. Even within the same day, different runway configurations may be required. Historically, runways 27 and 34 are more frequently used in the winter months and runway 16 during the summer months.

Melbourne Airport is reaching the practical capacity of its current intersecting runway system and will exceed it by 2026 or soon after (depending on the pace of recovery post-COVID) with cancellations and delays impacting passengers and airlines. Delays in the morning peak have already occurred.

Domestic and international travel demand is forecast to continue growing, which will create unacceptable delays and cause severe disruption to passengers – while triggering consequential disruption to the Australian aviation network. For more detail see **Chapter A2: Need for the Project**.

With M3R, the parallel-runway configuration would enable Melbourne Airport to increase its capacity to accommodate the 449,000 annual aircraft movements forecast for 2046, rather than remain restricted to 312,500 annual movements. Hourly maximums for the three-runway configuration would increase to between 85 and 95 aircraft movements an hour in most weather conditions, up from the existing 48 to 60 range.

With a parallel runway system available, its use becomes the most efficient operating mode. Noise modelling presented by M3R to date has not included use of Runway 09/27. This strategy was adopted to avoid understating the potential impacts of the primary parallel north-south operating modes.

Runway 09/27 remains an important element of Melbourne Airport's operation following M3R. Feedback during the public exhibition clearly demonstrated community desire for its ongoing use for sharing noise, especially at night.

Melbourne Airport acknowledges that there is significant opportunity to introduce operating modes that promote use of Runway 09/27 with the objective of noise sharing. The process of detailed airspace design (pending approval of the M3R MDP) shall incorporate this objective and include updated noise modelling.

Conversely, residents currently affected by the existing north-south runway (which will become 16L/34R once M3R is operational) would experience an increase in arrivals and departures during the day/evening, gradually increasing as air traffic demand grew over time.

Chapter C4: Aircraft Noise and Vibration discusses the available modes in which the parallel runways can be used; and demonstrates how a parallel runway system gives the flexibility to manage noise impacts while also increasing airport capacity.

In particular, there are noticeable benefits for all areas impacted by the existing runway system in the M3R Build scenario compared to the No Build scenario. M3R will shift the burden of this noise increasingly onto those living north and south of the airport, and away from those to the east and west. This shifting of the burden is a major impact regardless of any calculation about the balance of costs and benefits from the construction of M3R.

Large numbers of homes will benefit from the shift but there will be newly affected areas to the north (with minimal dwellings/residents) and south (with significant dwellings/residents), and areas already affected that will get new/more noise.

The parallel runway system does, however, enable distribution of overflights and associated noise between those to the north and south of the existing and new runways. Community preferences for how this is done will be gauged through public exhibition engagement.

Table D4.2
Total predicted aircraft movements by scenario and year

Assessment year	Annual Movements* (Regular Public Transport)	
	No Build (constrained)	Build (unconstrained)
2026	276,800	276,800
2031	302,200	320,700
2046	312,500	449,000

**excludes rotary wing movements*

Benefits are achieved through using high-capacity operating modes during the day and evening, when demand is high, and applying Noise Abatement Procedures (NAPs) that preference the lowest-impact operating modes when traffic demand allows during the day/evening period – with further constraints at night to minimise impacts in the most noise-sensitive period of 11pm to 6am.

See **Chapter C4: Aircraft Noise and Vibration** for details about the different operating modes and preferences that incorporated into NAPs in the Build scenario. **Chapter C3: Aircraft Noise Modelling Methodology** and **Chapter C2: Airspace Architecture and Capacity** describe how the runway operating plan (see **Chapter E4: Draft Runway Operating Plan**) has been prepared, taking into consideration the impacts of aircraft noise.

Sections 2.5.3 (Mixed Mode parallel operations), **2.5.5** (single runway operations) and **2.5.7** (other modes) in **Chapter C2: Airspace Architecture and Capacity** provide a description and map of each of the operating modes proposed with M3R.

D4.6.2.3
Aircraft noise impacts on homes

Chapter C4: Aircraft Noise and Vibration presents the existing and predicted future noise exposure with and without M3R (i.e. under the Build and No Build scenarios). It presents several operating mode options with the varying impacts of the different options evident. It also includes an appendix showing suburb-level analysis which shows each suburb that has forecast aircraft noise at a level in the Build and/or No Build scenario that is at or above defined noise thresholds. This shows clearly where the differences in aircraft noise impacts lie between the Build and No Build options.

This approach (referred to as N-above contours/counts) is a commonly accepted standard (AS, 2016) for identifying and comparing potential aircraft noise impacts. It is useful when assessing and comparing alternatives. However, the subjective and personal way in which each individual responds to aircraft noise means it is at best a generalisation. It by no means attempts to predict the actual or likely experience of individuals living in homes that fall either inside or outside the contours presented in **Chapter C4: Aircraft Noise and Vibration**. It is important that individuals considering this information understand what it represents and do not make assumptions about how they will (or will not) be affected by aircraft noise.

It is also important to be mindful of how aircraft operate at an airport, and the significant difference in experience between an average day and a high noise day. Because airports operate certain runway modes at different times, it means that those areas affected by each mode experience the impacts whenever that runway mode is operational. Certain modes can be in place for several hours, all day, or for several days in a row, meaning a home that is highly affected by the noise of a particular mode will be impacted with minimal respite for an extended period. Likewise, when a different mode is used for an extended period the home might experience zero aircraft noise events. The average may therefore be outside a N-above contour line, but those experiencing the impacts of some periods of extended overflights may consider their home affected by intrusive aircraft noise. For this reason, and to evaluate the social impacts of the proposed M3R and No Build scenarios, it is important to also look at the impacts of a high noise day. **Chapter C4: Aircraft Noise and Vibration** presents an additional contour line to represent a 'Typical Busy Day' – this concept enables a more realistic identification of the areas where aircraft noise impacts are likely to be intrusive for at least some of the time.

Finally, it is important to recognise that, particularly at the edges of each contour line, there will be no noticeable difference in the aircraft noise situation for someone whether they are on one side or the other. In other words, people will generally not be able to discern the difference between being overflown by an average of five events at 70 decibels (just inside the contour line) and an average number of flights just below five events at 70 decibels (just outside the contour line). It is tempting to interpret the contour maps as showing a line where the noise stops, when it is merely a line that represents where a certain arbitrary level of noise impact stops. Nonetheless, the contour maps do enable a comparison of impacts and were used for this purpose as part of the SIA.

This MDP does not determine the way in which the various modes will be prioritised, and therefore how the flexibility in operating parallel runways will be used to spread or concentrate the aircraft noise is not defined. Instead, it offers two options.

Of key concern for assessing the social impact of the noise from M3R will be the outcome of the two options put forward for daytime operations in 2026; the two options put forward for night-time operation in 2026; and the two options for night-time operation in 2046. These are the options available during times when traffic levels and weather conditions give the greatest potential to use alternative modes. The options also have very different impacts on affected communities.

The two options that are available as set out in the previous paragraph are described in detail in **Chapter C4: Aircraft Noise and Vibration**. In short Option 1 would put all arrivals on the new runway and all departures on the existing runway. Option 2 would alternate between using the pattern in Option 1 on one day, and on the other day putting all arrivals on the existing runway and almost all departures on the new runway (with only the biggest and heaviest aircraft needing to use the existing runway for departures). These options differ from 'mixed mode' where both runways are used for arrivals and departures. Mixed mode results in more homes affected by noise but achieves the highest capacity. In 2046, traffic levels will require this mode for much of the time during the day. For this reason, Options 1 and 2 are considered for night-time only in 2046.

Figure D4.6 to **Figure D4.12** provide a visual comparison of the different noise impacts between the No Build scenario and each of the Build scenarios (Mixed Mode, Option 1 and Option 2). The 'Typical Busy Day' N70 contour for 5 events or more is also included, showing the extended reach of noise impacts likely for some of the time.

Table D4.3 and **Table D4.4** summarise the impacts of these scenarios in terms of the number of homes within N60 and N70 contours. They show that Option 1 achieves the best outcome in purely numerical terms - in that the fewest homes (referred to as dwellings in other parts of this MDP) are affected. Option 2 spreads the noise more (which could be considered more equitable) and provides residents with some predictable respite from noise impacts on the alternate days, but in total numbers affects more homes.

The following tables merge the 'day' and 'evening' division used in some other parts of this MDP under the heading 'day' (which therefore covers 6am to 11pm). It is important to acknowledge that, while these hourly ranges are commonly used (reflective of the most noise-sensitive night period being when a majority of people are most commonly sleeping), for many people night-time might commence before 11pm or the day may begin later than 6am. The value of these divisions is not to predict the particular impact of noise on certain individuals or households, but rather to allow for an overall generalised comparison between scenarios. Equally important is that the 60 and 70 decibel cut-offs will not be relevant to many, and certainly not to those just outside the contours, but are used to allow comparisons (not to predict individual responses to noise).

Table D4.3
Impact of M3R – 2026 number of homes within N70 and N60 contours

	M3R Build	No Build	Increased Noise	Decreased Noise	Newly Affected
N70 Day & Evening (6am to 11pm)					
Option 1	18,068	14,202	12,825	5,046	5,039
Option 2	25,790	14,202	21,268	4,450	8,557
Mixed Mode	22,473	14,202	19,894	6,884	7,785
N70 24hrs					
Option 1	18,792	15,632	13,185	5,370	5,444
Option 2	26,360	15,632	21,238	4,494	8,544
N60 Night (11pm to 6am)					
Option 1	19,799	44,592	13,339	35,702	6,149
Option 2	29,044	44,592	9,727	26,269	3,813

Table D4.4
Impact of M3R – 2046 number of homes within N70 and N60 contours

	M3R Build	No Build	Increased Noise	Decreased Noise	Newly Affected
N70 Day & Evening (6am to 11pm)					
Option 1	13,871	9,408	11,514	5,735	8,571
Option 2	15,670	9,408	12,939	5,389	9,677
Mixed Mode	14,311	9,408	11,678	5,966	8,750
N70 24hrs					
Option 1	15,612	11,790	12,351	5,969	9,135
Option 2	18,104	11,790	13,601	5,669	9,905
N60 Night (11pm to 6am)					
Option 1	23,298	47,628	15,869	39,307	5,045
Option 2	33,815	47,628	14,656	27,836	4,605
N60 24hrs					
Option 1	126,938	199,134	106,369	113,081	17,560
Option 2	140,045	199,134	109,592	104,476	17,712

Figure D4.6
No Build 2026 N70 day & evening (6am to 11pm)

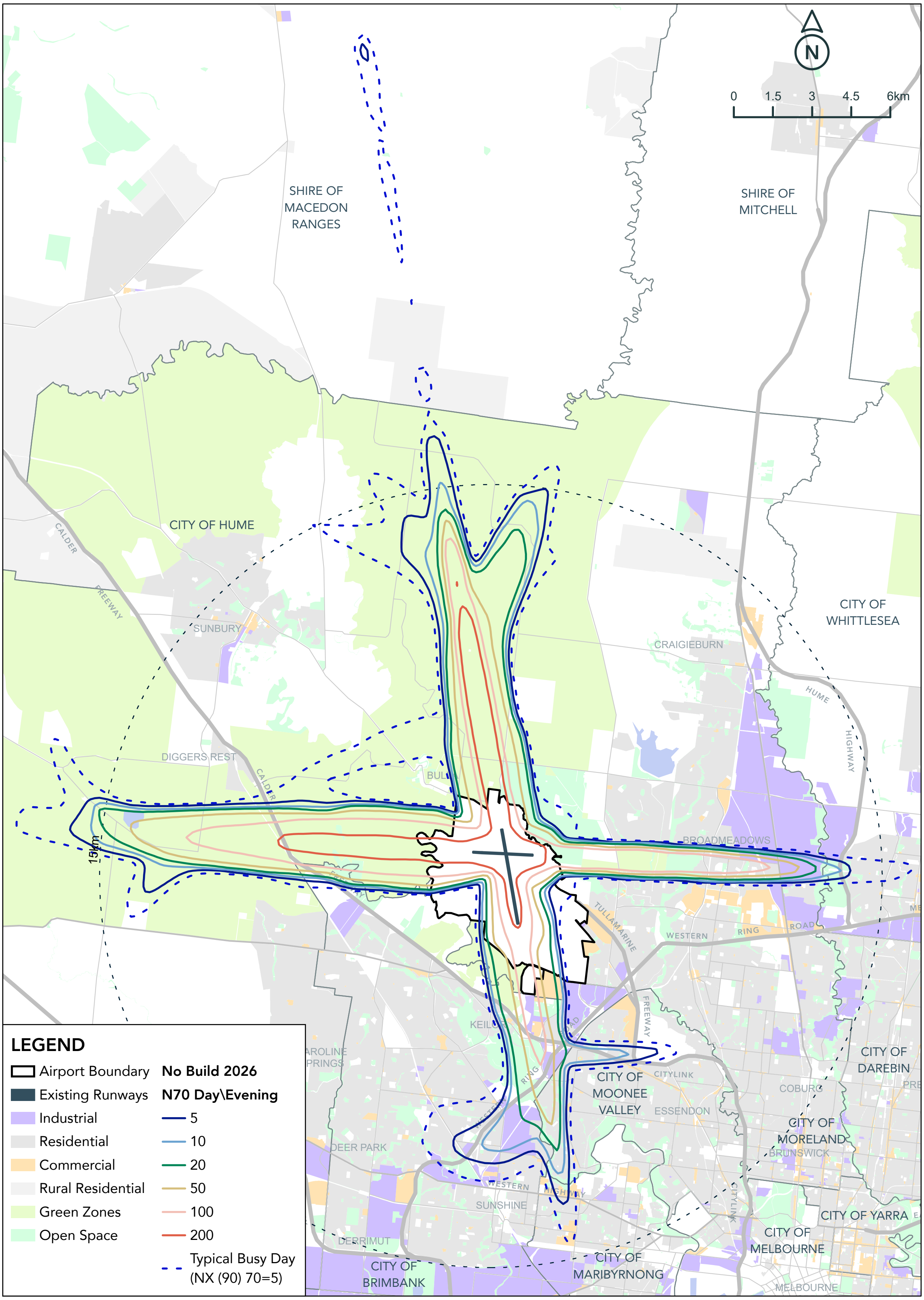


Figure D4.7
M3R Mixed Mode 2026 N70 day & evening (6am to 11pm)

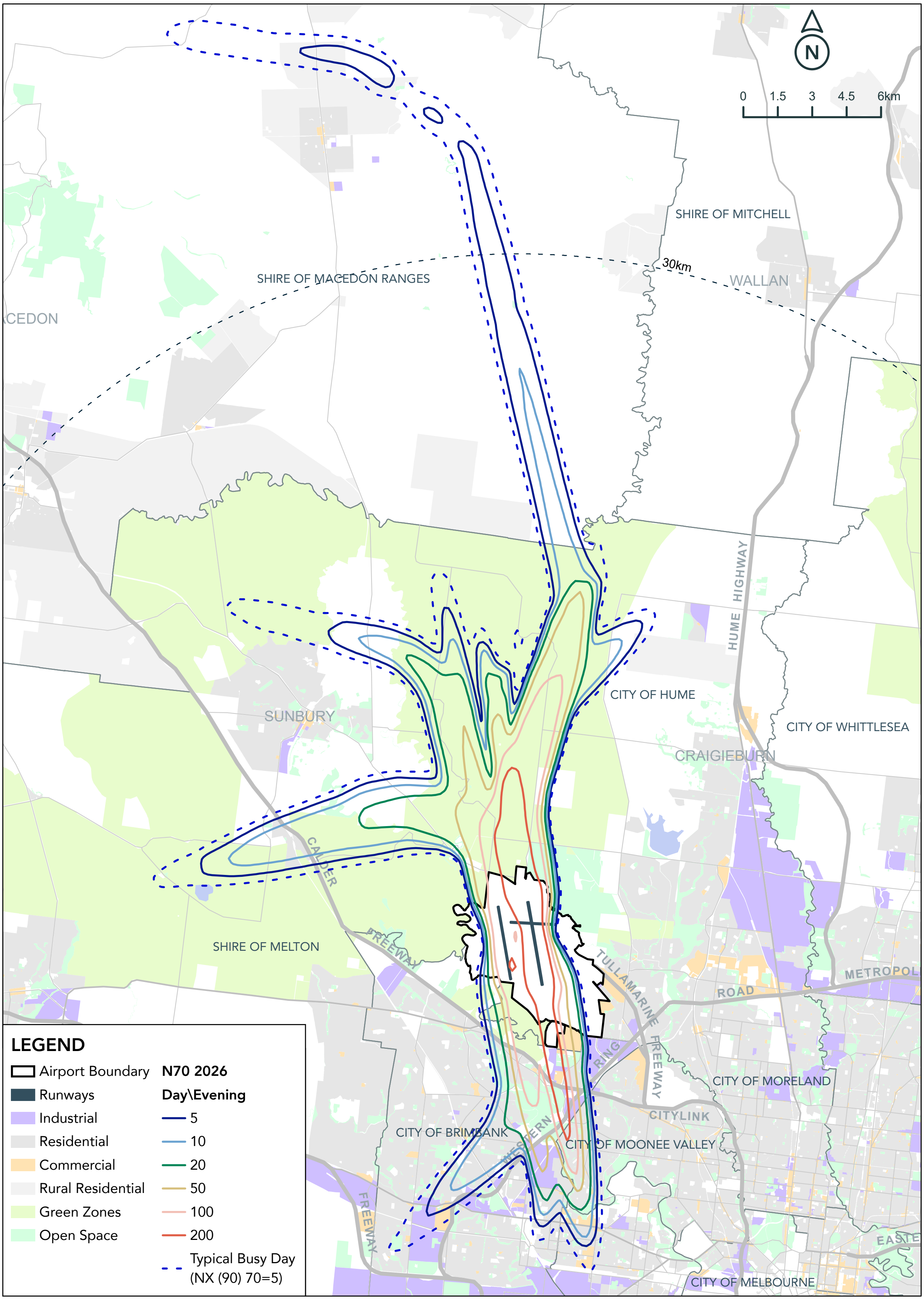


Figure D4.8
M3R Option 1 2026 N70 day & evening (6am to 11pm)

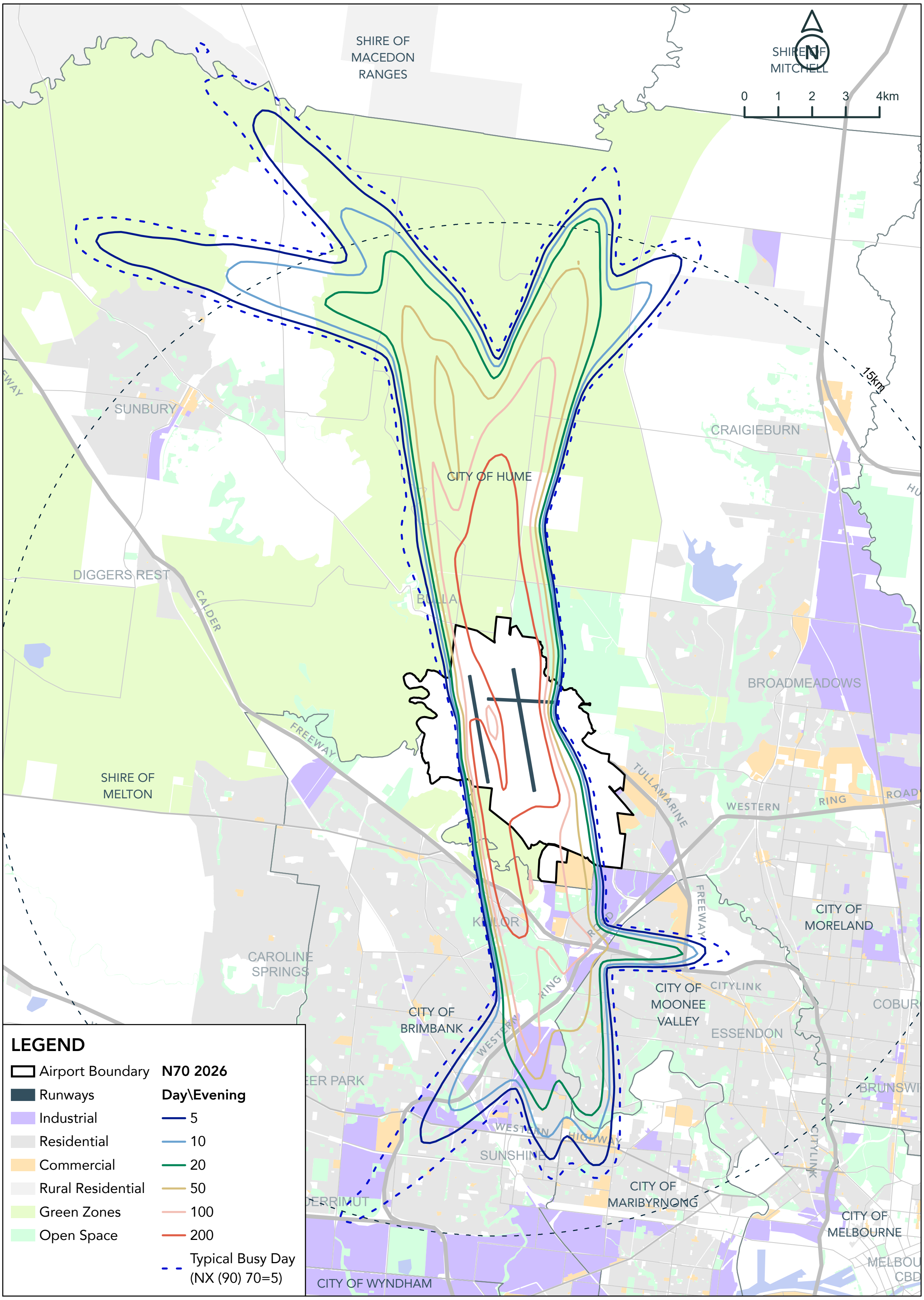


Figure D4.9
M3R Option 2 2026 N70 day & evening (6am to 11pm)

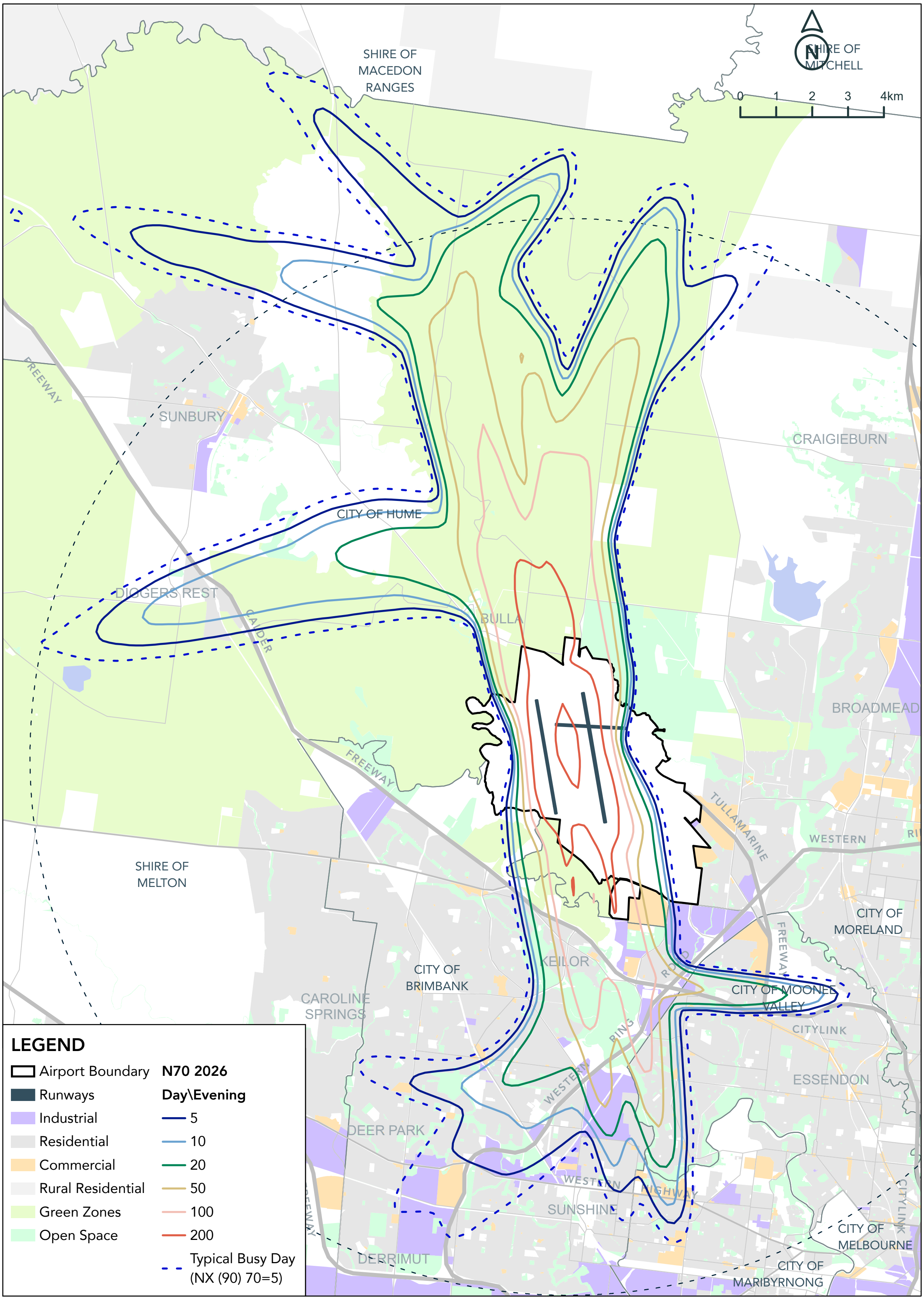


Figure D4.10
No Build 2026 N60 night (11pm to 6am)

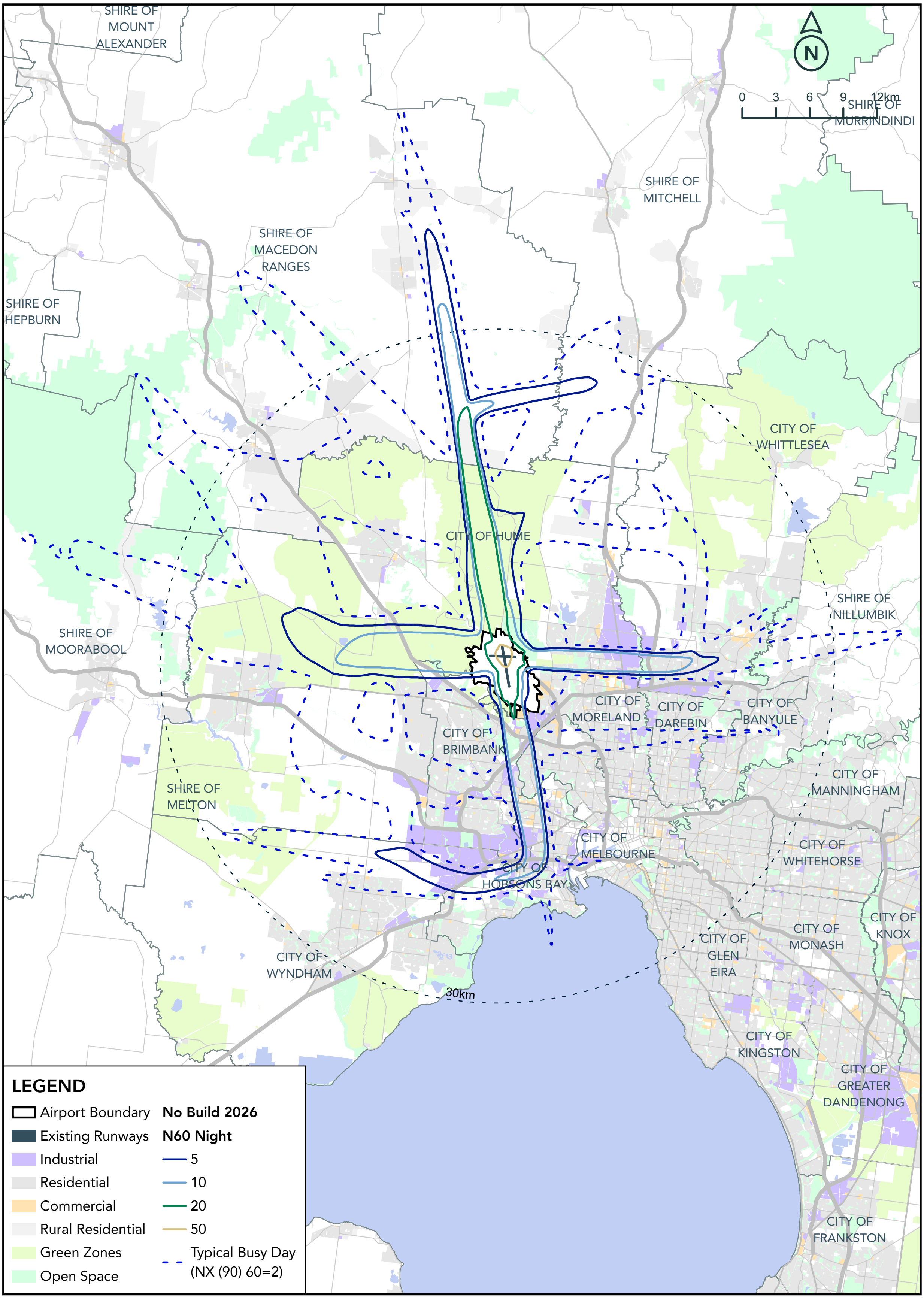


Figure D4.11
M3R Option 1 2026 N60 night (11pm to 6am)

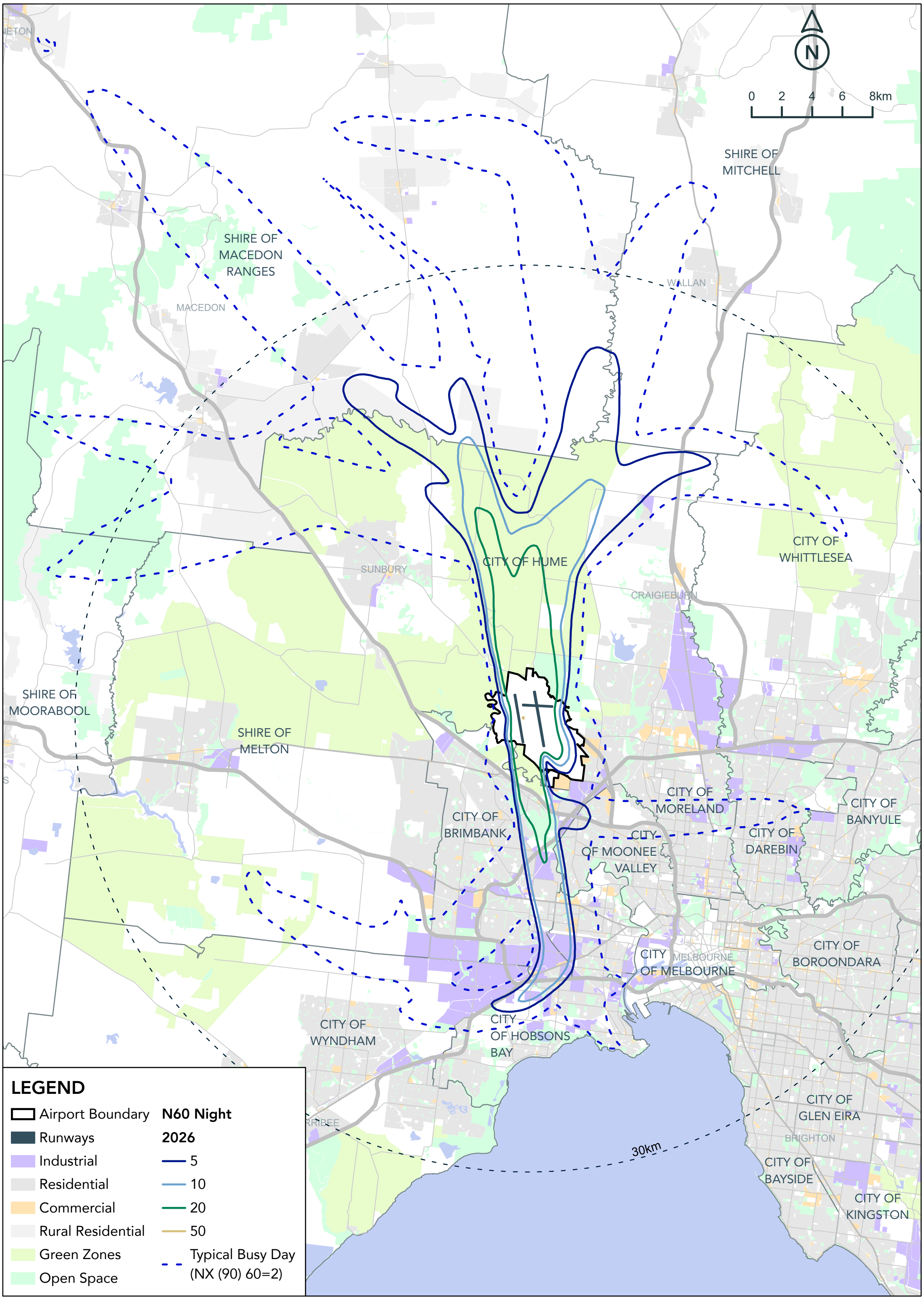
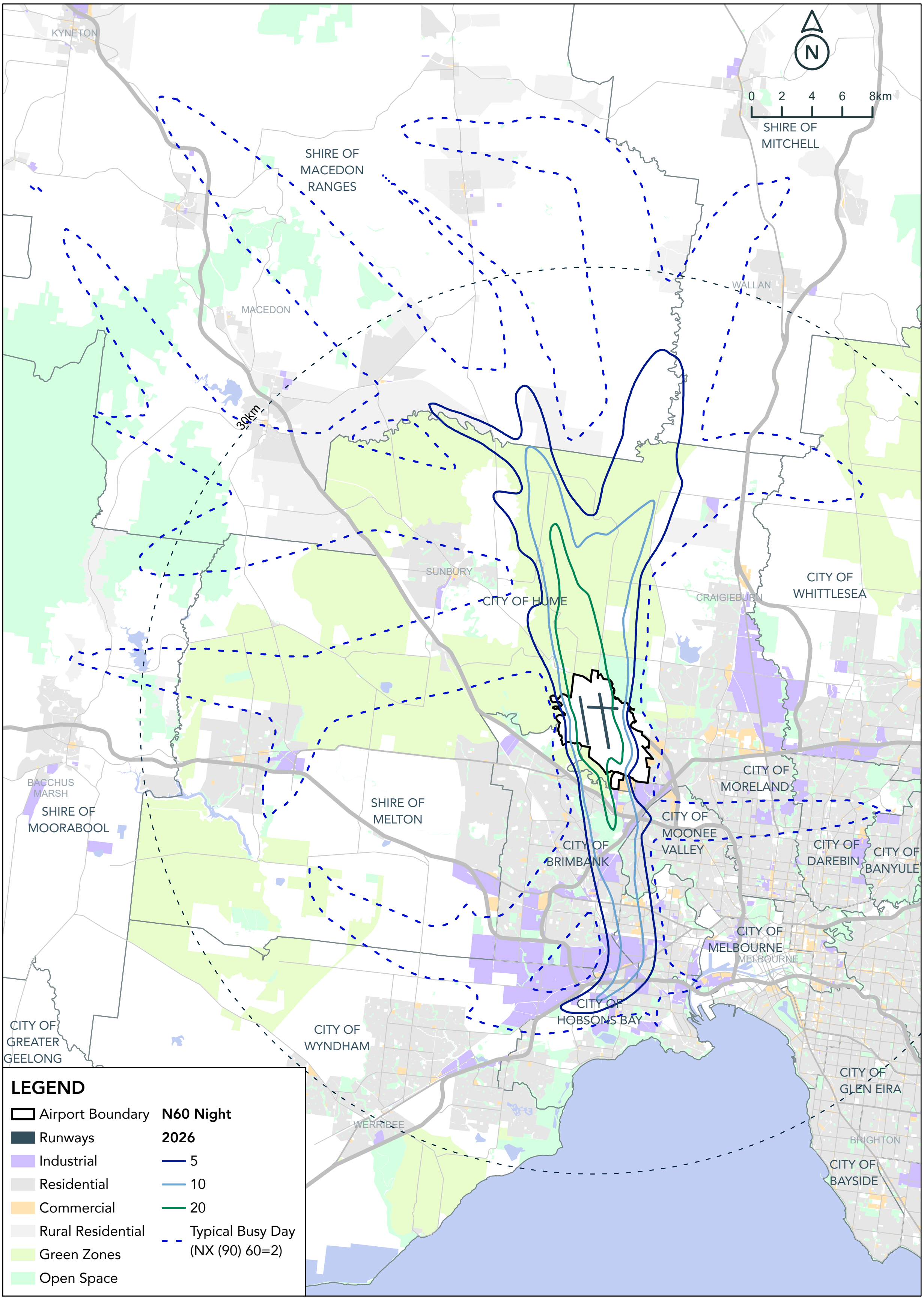


Figure D4.12
M3R Option 2 2026 N60 night (11pm to 6am)



D4.6.2.4
Day-time impacts on homes

Whatever the option, more homes will be affected by aircraft noise during the day (6am to 11pm) with M3R than under the No Build scenario.

Table D4.3 shows the differences between the options at runway opening in 2026 as the number of homes within the N70 contours that represent five or more events of 70 decibels or greater during the day:

- Mixed Mode operations will be required during peak traffic periods in the day, which tend to be in the morning and afternoon. Operations in this mode will affect more homes than Option 1 and fewer than Option 2 (when comparing operating each for a full day)
- Option 1 would have the smallest increase of the Build scenarios in the total number of homes within the N70 contours (an estimated 3,866 more homes with M3R compared to No Build). However, this option would be feasible only during lower demand periods of the day (busier periods would be in Mixed Mode). However, it does offer the lowest impact in terms of the number of homes experiencing aircraft noise at five or more events of 70 decibels or greater
- Option 2 would have a larger increase in the total number of homes within the N70 contours. This is because it reflects a deliberate strategy of spreading noise impacts between more homes. The concept alternates the parallel runway used for arrivals and departures, allowing periods of predictable respite for those whose homes are impacted by each runway. As with Option 1, this option would be feasible only during lower demand periods of the day while the busier periods will need to operate in Mixed Mode.

By 2046, the opportunities for selecting between Option 1 or Option 2 will have been reduced by growing traffic levels that increasingly require Mixed Mode throughout the day. Therefore, only the Mixed Mode scenario is considered in comparison to the No Build scenario. Note that both the Build and No Build scenarios reduce the forecast number of homes within the N70 contours. This reflects the model's changed aircraft types representing the expected transition to a more advanced and quieter aircraft fleet using the airport.

D4.6.2.5
Night-time impacts on homes

In marked contrast to day-time impacts, night-time results show dramatic declines in the total number of homes impacted by aircraft noise with M3R (compared to the No Build scenario). Night-time impacts are particularly relevant given this is generally a more sensitive time for those affected by noise, as it can be most intrusive if it disrupts sleep (see Chapter D3: Health Impact, which considers the health impacts of sleep disturbance from M3R).

At runway opening in 2026, even under Option 2 (the less effective option in avoiding homes but the better option for sharing the noise and providing respite) an estimated 15,548 fewer homes are in the N60 equals five or more events contour at night compared to the No Build scenario. Under Option 1, the difference in the number of homes in this N60 contour in 2026 with M3R is estimated to be 24,793 less than the No Build scenario. These impacts are illustrated inFigure D4.10 to Figure D4.12.

By 2046, the difference in night-time impacts under M3R compared to No Build continues to be positive. Under Option 1, an estimated 23,330 (or 51 per cent) fewer homes are expected to be in the N60 contour and an estimated 13,813 fewer homes under Option 2. Option 2 would again give a greater sharing of the noise impacts and the opportunity for predictable respite for many on alternate nights.

Reducing the total number of people exposed to detrimental levels of aircraft noise is an important element of the effort to find appropriate balance between the need for M3R and the health and broader social impacts associated with aircraft noise exposure (see also Chapter D3: Health Impact). In particular, the issue of night impacts (where sleep disturbance or noise-induced awakenings is more likely occur) is especially relevant to managing health impacts.

It is important to note that, although this assessment refers both to homes that are worse off and those that are better off, the two groups do not directly correlate. This is discussed further in Section D4.6.2.8.

SODPROPS

The impact of night-time noise discussed above is focused on options 1 or 2, with the preferred solution to be sought through consultation with affected communities. Importantly however, there will be another opportunity to reduce noise over homes during the night – the operating mode known as SODPROPS (Simultaneous Opposite Direction Parallel Runway Operations). Section 2.5.9.9 in Chapter C2: Airspace Architecture and Capacity explains this concept, including a graphical representation in Figure C2.47.

SODPROPS involves sending all departing aircraft over the green wedge areas to the north of the airport and bringing all arriving aircraft into the airport in the opposite direction (also over the green wedge). This mode will provide respite for almost all homes in the vicinity of the airport and is clearly the preferential during low traffic night-time hours. SODPROPS requires lower traffic demand as all traffic is being managed within a relatively small segment of airspace. There are specific weather requirements that apply to this mode in terms of cloud base, visibility and wind strength and direction. Departures must turn a minimum of 15 degrees away from the arrival path. These strict weather requirements mean that this mode is available for less than 30 per cent of the time at night, for limited periods and with limited predictability.

Accordingly, SODPROPS has not been factored into this assessment. Even if it does operate for a period during the night, once it is no longer usable the disruption that night-time traffic can cause to those affected will resume. Any period of respite while residents were sleeping will not register as strongly if they are subsequently awakened.

D4.6.2.6
Newly affected homes

Identification of newly affected homes is relevant when considering impacts because people notice change. New noise impacts, even at relatively low levels of frequency, can be highly intrusive and annoying. Many people who currently reside in homes exposed to some aircraft noise will have somewhat adjusted to the associated impacts. As a consequence, an increase in the number of noise events, unless it is a significant change, will not be as impactful to many of these people. There is unfortunately no perfect formula for determining which Option will be the least impactful. As noted above, when considering aircraft noise impacts, it is certainly not just a matter of adding up the number of homes (or individuals) potentially affected and seeking to minimise this number. Seeking to avoid the exposure of new homes (or individuals) is equally worthy.

To consider the specific impacts of new noise on homes when the new runway becomes operational, **Table D4.3** and **Table D4.4** defined a home as 'newly affected' if the home is projected to be within one of the contours (N70 equals five or more events or more for day or N60 equals five or more events for night) under the Build scenario and in the No Build scenario would experience fewer than one threshold event. For example, a home is newly affected in the day period if it experiences an average of five or more noise events at 70 decibels or greater in the Build scenario and in the No Build scenario, it had fewer than one event at 70 decibels.

Table D4.3 shows that of the 22,473 homes estimated to be experiencing day-time noise impacts with M3R Mixed Mode, 7,785 are newly affected in the first year of operations (2026). Similarly, of the 18,068 and 25,790 homes estimated to be experiencing day-time noise impacts under Options 1 and 2 respectively, 5,039 and 8,557 of these are newly affected. Of the homes impacted at night under Options 1 and 2, 6,149 and 3,813 respectively are estimated to be newly affected in 2026. Though these numbers are not large in the context of Melbourne's population, or even just the estimated 19,799 who will be affected by at least five events at over 60 decibels during the night in 2026 (Option 1), this will be irrelevant for those people included in the group who are newly affected and who experience the impacts as highly annoying. Melbourne Airport will engage with those who experience new impacts that are highly annoying through broad consultation. This engagement will provide information on the times and levels of that noise, the seasonal patterns of that noise, and on reducing noise intrusion into homes. Melbourne Airport will also ensure that any community suggestions for improvement are thoroughly considered and responded to in detail.

D4.6.2.7
Where will the noise impacts be?

Different scenarios result in the noise impacts affecting different areas - significant impacts of M3R will be experienced in 2026, when the existing noise impacts are shifted from a four-way spread off the existing runways to a more concentrated spread from the parallel north-south orientated system.

Figure D4.6 to **Figure D4.9** show the modelled N70 contours for the No Build, M3R Mixed Mode, M3R Option 1 and M3R Option 2 in 2026 (during day hours 6am to 11pm). These images show the shift in noise impacts away from areas to the east and west of the airport and increased impacts north and south, under the different M3R operating alternatives. More detailed information on the comparative impacts of the mixed mode and also of Options 1 and 2 against the No Build baseline are discussed above. **Chapter C4: Aircraft Noise and Vibration** provides full listings of suburb by suburb counts of homes affected under each scenario in **Appendix D4.A**.

Figure D4.13 to **Figure D4.16** present the same contours overlaid on the SEIFA Index of Relative Socio-economic Advantage and Disadvantage, showing that the impacts fall across a range of more and less disadvantaged areas in either scenario. Importantly these figures demonstrate that the greater impact of M3R on disadvantaged communities to the south-east of the airport is a consequence of proximity to the airport rather than any targeting of air routes over particular socio-economic group.

Another way of thinking about the change in impacts is presented in **Section C4.6.5** of **Chapter C4: Aircraft Noise and Vibration**, which presents N-contour difference charts, representing the areas of increased and decreased noise impacts (using N-contours as the metric). N-above difference charts for 2046 are very similar to those presented for 2026 and similar trends are evident in the N60 night difference charts.

Figure D4.13
SEIFA IRSAD overlaid with No Build 2026 No N70 day & evening (6am to 11pm)

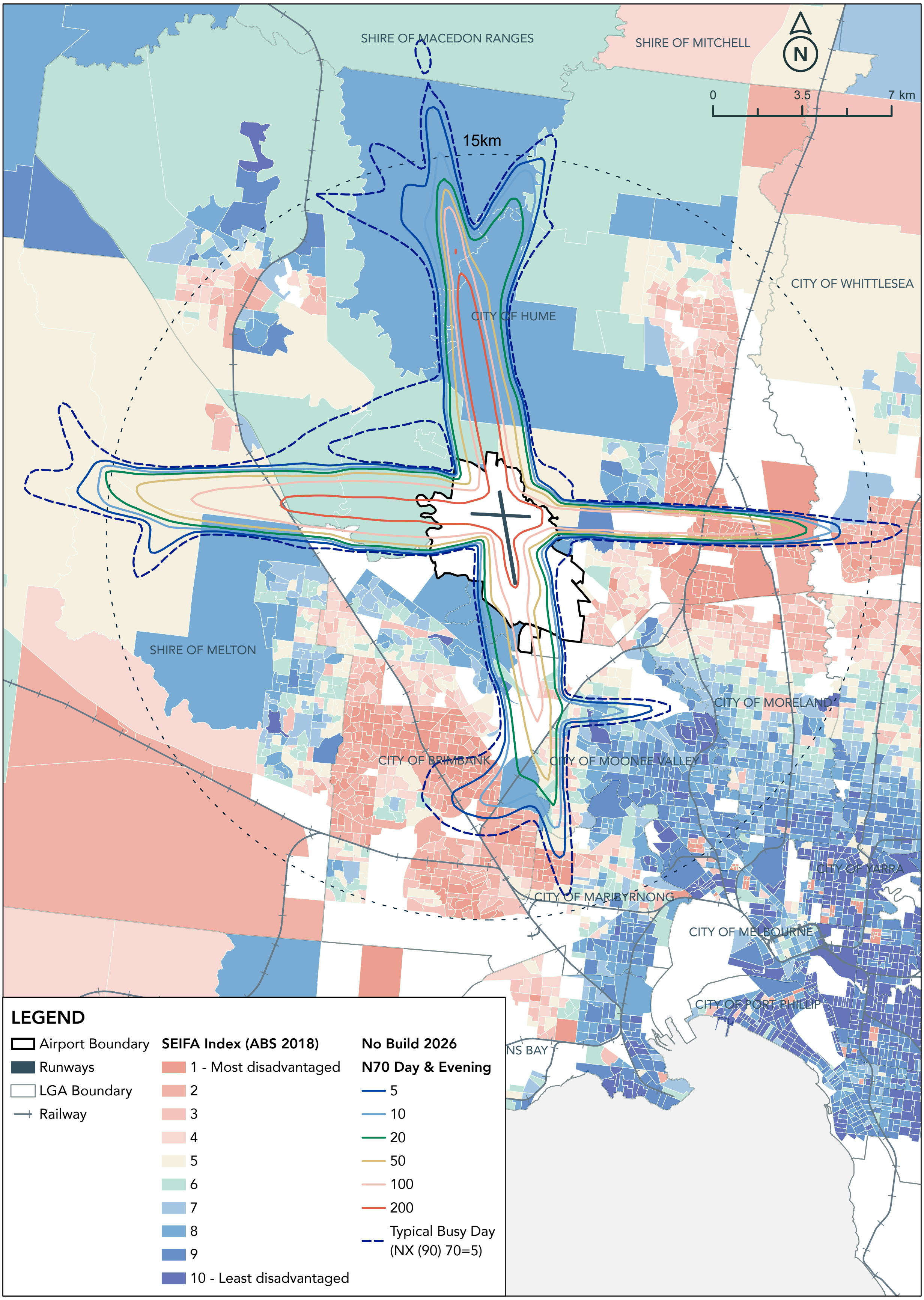


Figure D4.14
SEIFA IRSAD overlaid with M3R Mixed Mode 2026 N70 day & evening (6am to 11pm)

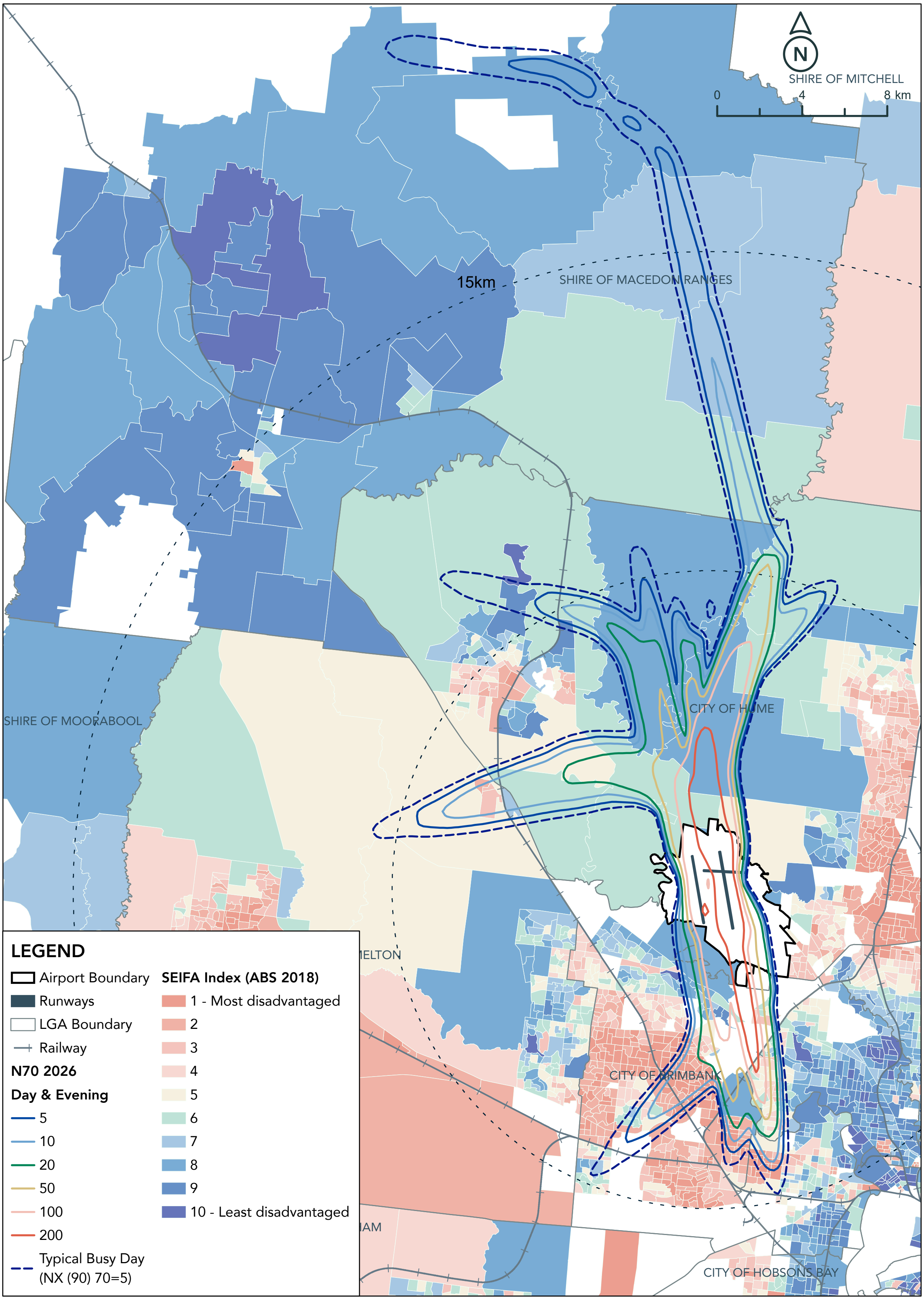


Figure D4.15
SEIFA IRSAD overlaid with M3R Option 1 2026 N70 day & evening (6am to 11pm)

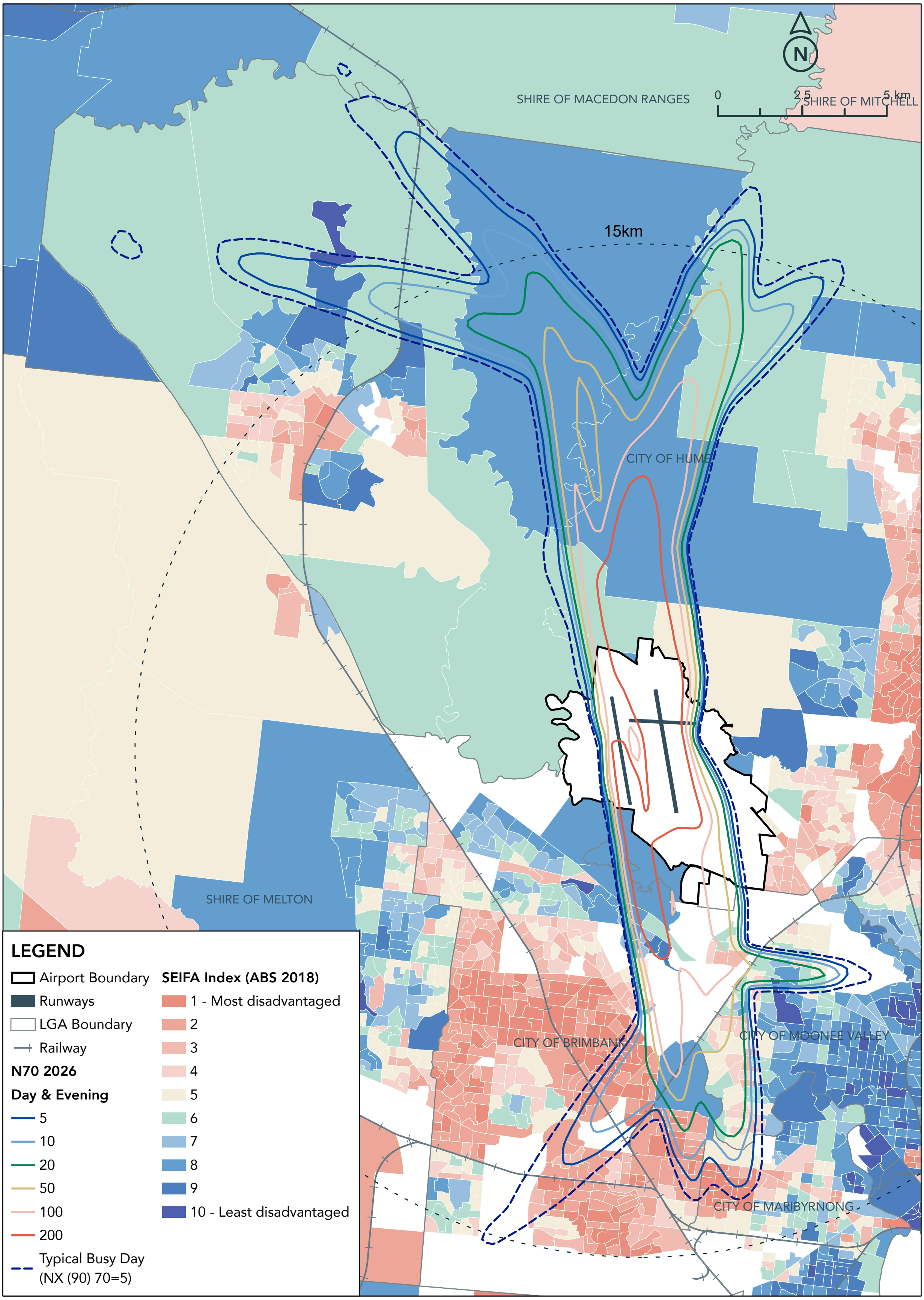
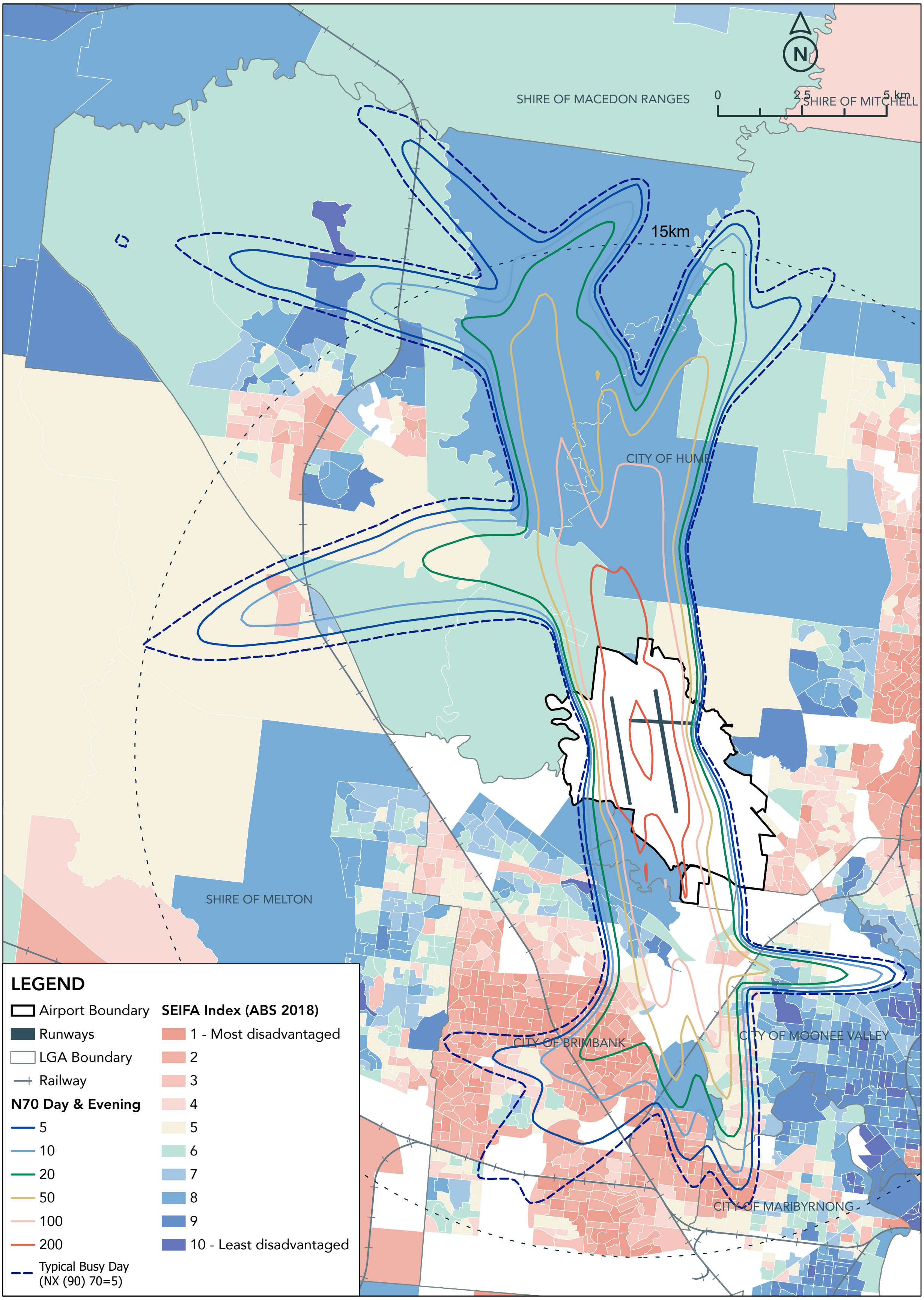


Figure D4.16
SEIFA IRSAD overlaid with M3R Option 2 2026 N70 day & evening (6am to 11pm)



D4.6.2.8
What the noise impacts on homes will mean?

Overall, with M3R there will be many residents who will receive less noise that is potentially detrimental or annoying. This is particularly so for those disturbed by night noise and those living to the east and west of the airport. On the other hand, there will also be many people worse off, particularly in populations to the south of the airport and the smaller number of residents to the north of the airport. Even with the opportunity to use SODPROPS for some periods at night, moving more night noise to the green wedge north of the airport, there will be some people who receive disruptive night-time noise for the first time.

Perhaps the most significant social impact of the new runway will be the annoyance and disruption to lifestyle of those receiving disruptive aircraft noise for the first time. In an overall community sense this may be balanced out by those who have improved noise outcomes and by the substantial economic and consequential social benefits (such as employment, access to travel, etc) that flow from M3R. However, this overall social balance is of little comfort to those who experience the negative impacts. Accordingly, Melbourne Airport is committed to working with affected communities to minimise the detrimental effects of aircraft noise.

D4.6.2.9
Impacts on real estate values

Section D2.7.1.13 of Chapter D2: Economic Impact Assement outlines the studies undertaken to examine the impact of aircraft noise on property values. This included an assessment of historical and potential property impact due to airport operations undertaken by Queensland University of Technology (QUT) in 2016, with a follow up study in 2020.

The 2016 assessment found that the location of residential properties under a Melbourne Airport flight path had no significant long-term impact on annual movements in house prices. It was found that house price growth in a number of flight path affected suburbs had outpaced that of other Melbourne suburbs with similar socio-economic profiles (not under a flight path). The 2020 study found that suburbs with exposure to aircraft noise (defined as being within designated noise contours or subject to significant levels of aircraft noise complaints) had the same sales trends as comparable suburbs that had low or no aircraft noise complaints. Investment performance was very similar, regardless of exposure to aircraft noise.

D4.6.2.10
Aircraft noise impacts on community facilities

A range of facilities service communities in the vicinity of Melbourne Airport. Figure D4.17 highlights these facilities within the study area. Facility information (including location) was obtained from a data request from Spatial Datamart (DELWP) in 2021. To ensure consistency with Local Government Agency (LGA) data, a request was made to LGAs near the airport to review this information. Where additional data was provided, this was merged with the Spatial Datamart data and removing duplicates where identified. Whilst Melbourne Airport has endeavoured to collate complete data, some community facilities may have been missed. This section focuses on community facilities considered to be sensitive to aircraft noise exposure.

Table D4.5 to Table D4.8 provide a summary of the number of facilities within the N70 day (6am to 7pm) and N60 night (11pm to 6am) noise contours. The number of facilities in the No Build scenario is compared to the number of those facilities within the equivalent 2026 and 2046 contours for the Build scenarios (Mixed Mode, Option 1 and Option 2). These represent the predominant operational modes that will be applied for M3R, informed by the outcomes of ongoing community engagement.

The data in Table D4.5 to Table D4.8 are represented in Figure D4.18 to Figure D4.24.

It must be recognised that these tables present the overall impacts under each scenario. However, the impacts will potentially fall to different facilities, depending on their location with respect to the contours. Section D4.6.2.7 describes where the impacts now fall and will fall under the various M3R alternative operating modes. Further, Chapter C4: Aircraft Noise and Vibration Appendix C4.A provides full listings of suburb by suburb counts of homes affected under each scenario – community facilities in the suburbs of increased or decreased numbers of dwellings within the threshold contours are likely to be similarly affected.

Community facilities that inform the analysis within Table D4.5 to Table D4.8 are listed in Appendix D4.A.

Figure D4.17
Community facilities within the study area

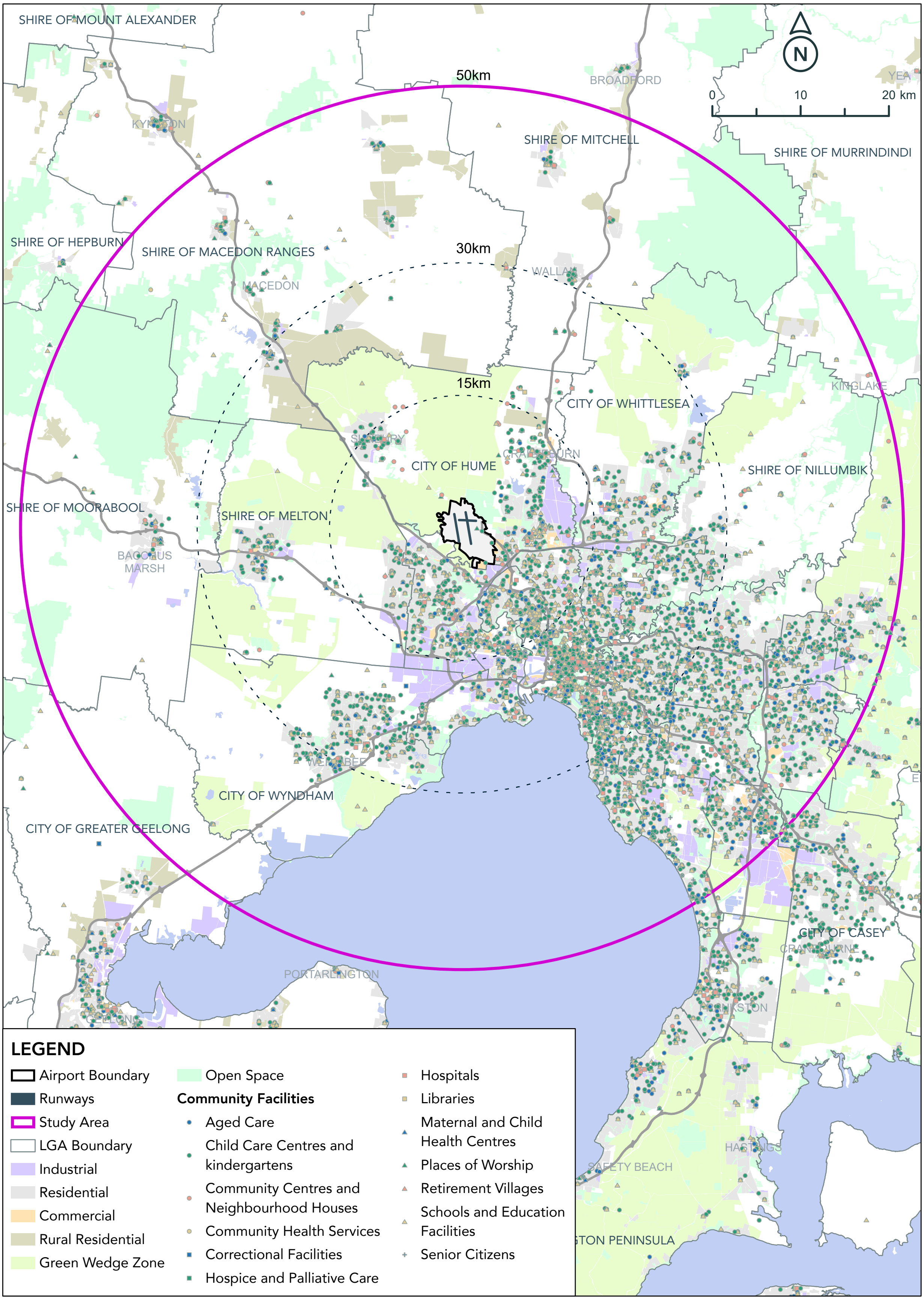


Table D4.5

Number of community facilities within N70 day (6am to 11pm) – 2026 No Build compared to Build scenarios

N70 Contour 6am to 11pm	2026 No Build						2026 Build																	
							Mixed mode						Option 1						Option 2					
Facility Type	**5-9**	**10-19**	**20-49**	**50-100**	**100-199**	**200+**	**5-9**	**10-19**	**20-49**	**50-100**	**100-199**	**200+**	**5-9**	**10-19**	**20-49**	**50-100**	**100-199**	**200+**	**5-9**	**10-19**	**20-49**	**50-100**	**100-199**	**200+**
Schools (9am-3pm)	3	2	2	0	0	0	4	3	1	0	0	0	5	1	0	1	0	0	10	1	0	1	0	0
College (9am-3pm)	1	0	2	0	0	0	1	2	0	0	0	0	1	2	0	0	0	0	1	1	2	0	0	0
Education Facility (9am-3pm)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Places of worship	3	5	2	1	3	0	2	4	7	0	2	2	3	0	5	3	2	2	4	4	6	1	4	0
Retirement village	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Library	0	2	0	0	0	0	0	0	1	0	2	0	0	1	0	0	0	2	0	1	0	0	2	0
Hospital, Hospice, Respite Care	3	1	0	0	0	0	1	0	0	0	1	0	0	3	0	0	0	1	0	3	0	0	1	0
Maternal and Child Health Centres	0	1	0	0	1	0	1	0	0	1	0	0	0	0	1	0	0	0	1	0	1	0	0	0
Correctional facility	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Community centre / neighbourhood house	3	5	0	0	0	0	10	3	4	1	2	0	3	6	2	0	0	2	3	8	5	2	2	0
Senior Citizens centres	0	1	0	0	2	0	1	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0	0	0
Childcare and kindergarten	5	6	7	2	5	0	13	15	12	2	4	0	8	5	9	3	0	3	9	14	14	4	3	0
Aged care	3	1	4	2	0	0	2	1	3	3	3	0	1	3	6	3	0	0	4	2	5	3	0	0
Subtotals	21	24	18	5	11	0	35	28	28	7	14	2	21	22	23	10	2	10	35	34	33	11	12	0
Totals	**79**						**114**						**88**						**125**					

Table D4.6
Number of community facilities within N70 day (6am to 11pm) – 2046 No Build compared to Build scenarios

N70 Contour 6am to 11pm	2046 No Build						2046 Build																	
							Mixed mode						Option 1						Option 2					
Facility Type	5-9	10-19	20-49	50-100	100-199	200+	5-9	10-19	20-49	50-100	100-199	200+	5-9	10-19	20-49	50-100	100-199	200+	5-9	10-19	20-49	50-100	100-199	200+
Schools (9am-3pm)	2	2	1	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
College (9am-3pm)	0	0	2	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0
Education Facility (9am-3pm)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Places of worship	2	1	0	0	3	0	5	2	0	2	2	2	5	2	0	2	0	4	5	1	2	1	2	2
Retirement village	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Library	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	2
Hospital, Hospice, Respite Care	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1
Maternal and Child Health Centres	1	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0
Correctional facility	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Community centre / neighbourhood house	0	1	0	0	0	0	6	4	2	0	0	2	6	5	1	0	0	2	6	4	3	0	0	2
Senior Citizens centres	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Childcare and kindergarten	4	1	6	2	3	0	16	6	4	2	2	2	17	1	4	3	1	2	13	8	4	2	2	2
Aged care	2	1	2	1	0	0	4	0	3	1	2	0	3	0	3	2	1	0	2	2	3	1	2	0
Subtotals	11	6	12	3	9	0	32	12	12	6	6	9	32	8	11	8	2	11	27	15	15	5	6	9
Totals	**41**						**77**						**72**						**77**					

Table D4.7
Number of community facilities within N60 night (11pm to 6am) – 2026 No Build compared to Build scenarios

N60 Contour 11pm to 6am	2026 No Build						Option 1						Option 2					
Facility Type	5-9	10-19	20-49	50-100	100-199	200+	5-9	10-19	20-49	50-100	100-199	200+	5-9	10-19	20-49	50-100	100-199	200+
Retirement village	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hospital, Hospice, Respite Care	1	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0	0	0
Correctional facility	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aged care	9	10	0	0	0	0	3	3	0	0	0	0	7	7	0	0	0	0
Subtotals	11	10	0	0	0	0	3	4	1	0	0	0	8	8	0	0	0	0
Totals	**21**						**8**						**16**					

Table D4.8
Number of community facilities within N60 night (11pm to 6am) – 2046 No Build compared to Build scenarios

N60 Contour 11pm to 6am	2046 No Build						Option 1						Option 2					
Facility Type	5-9	10-19	20-49	50-100	100-199	200+	5-9	10-19	20-49	50-100	100-199	200+	5-9	10-19	20-49	50-100	100-199	200+
Retirement village	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hospital, Hospice, Respite Care	1	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0	0	0
Correctional facility	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aged care	9	12	0	0	0	0	7	2	1	0	0	0	2	11	2	0	0	0
Subtotals	10	13	0	0	0	0	7	3	2	0	0	0	3	12	2	0	0	0
Totals	**23**						**12**						**17**					

Figure D4.18
No Build 2026 N70 day & evening overlaid with community facilities

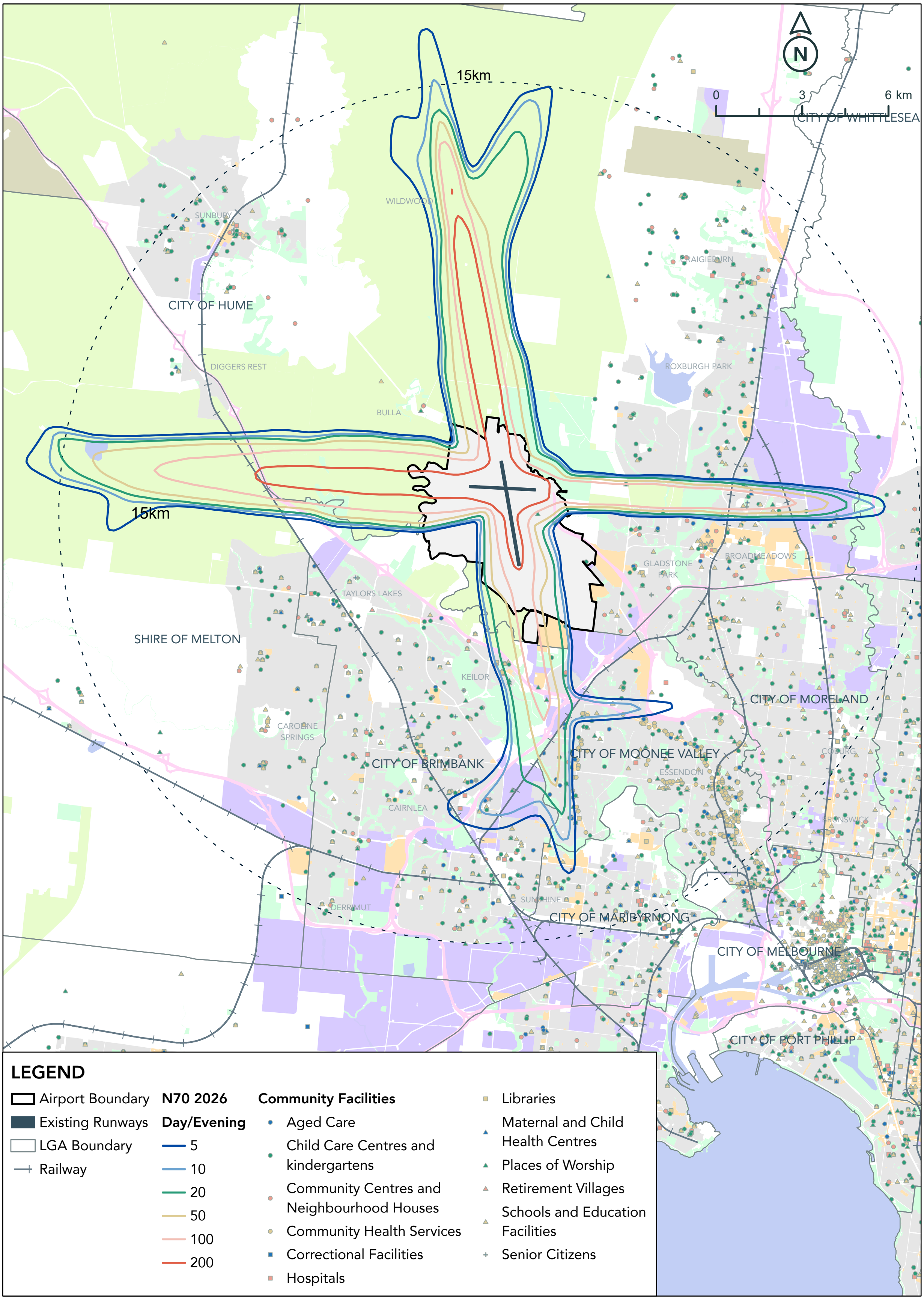


Figure D4.19
M3R Mixed Mode 2026 N70 day & evening overlaid with community facilities

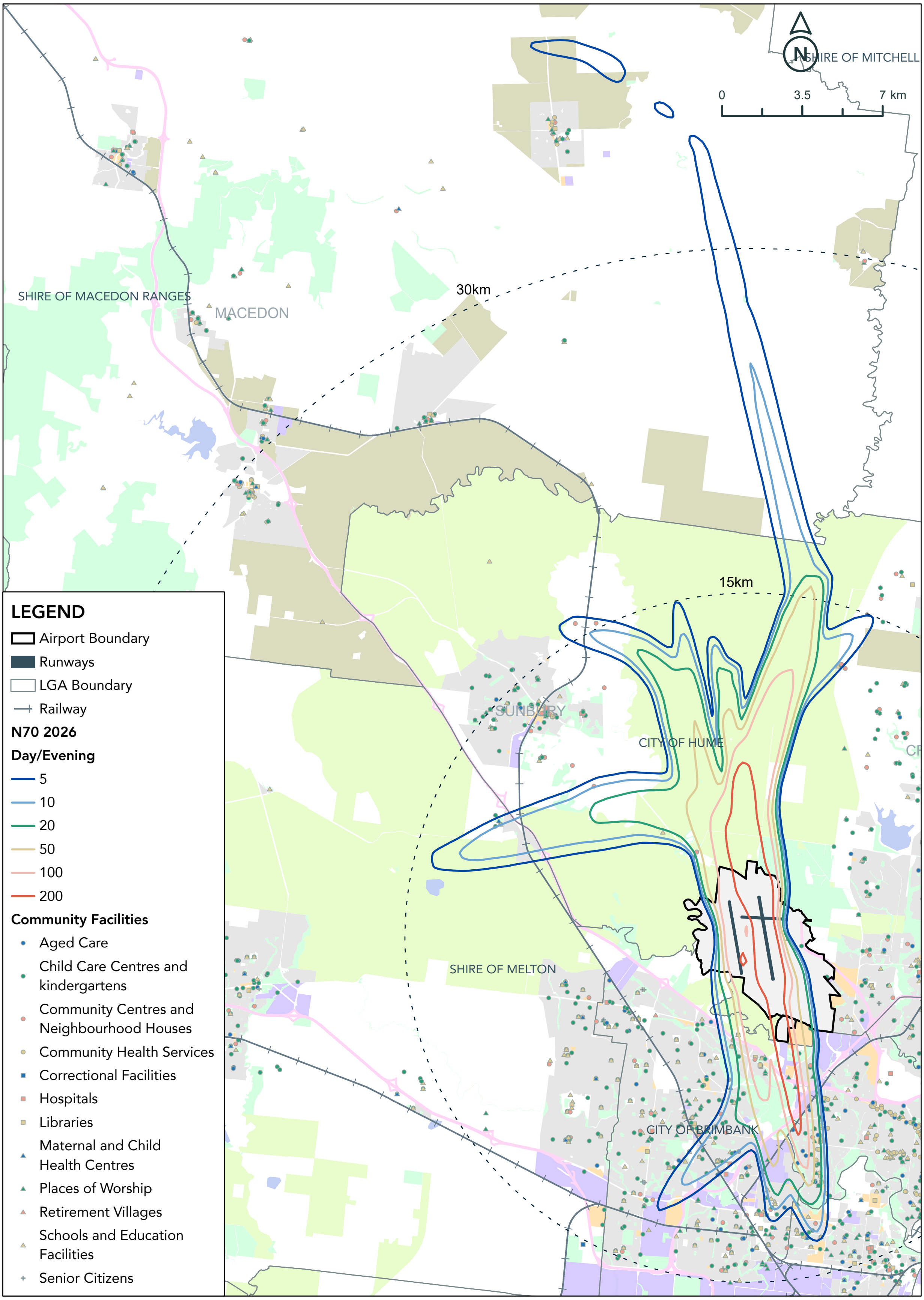


Figure D4.20
M3R Option 1 2026 N70 day & evening overlaid with community facilities

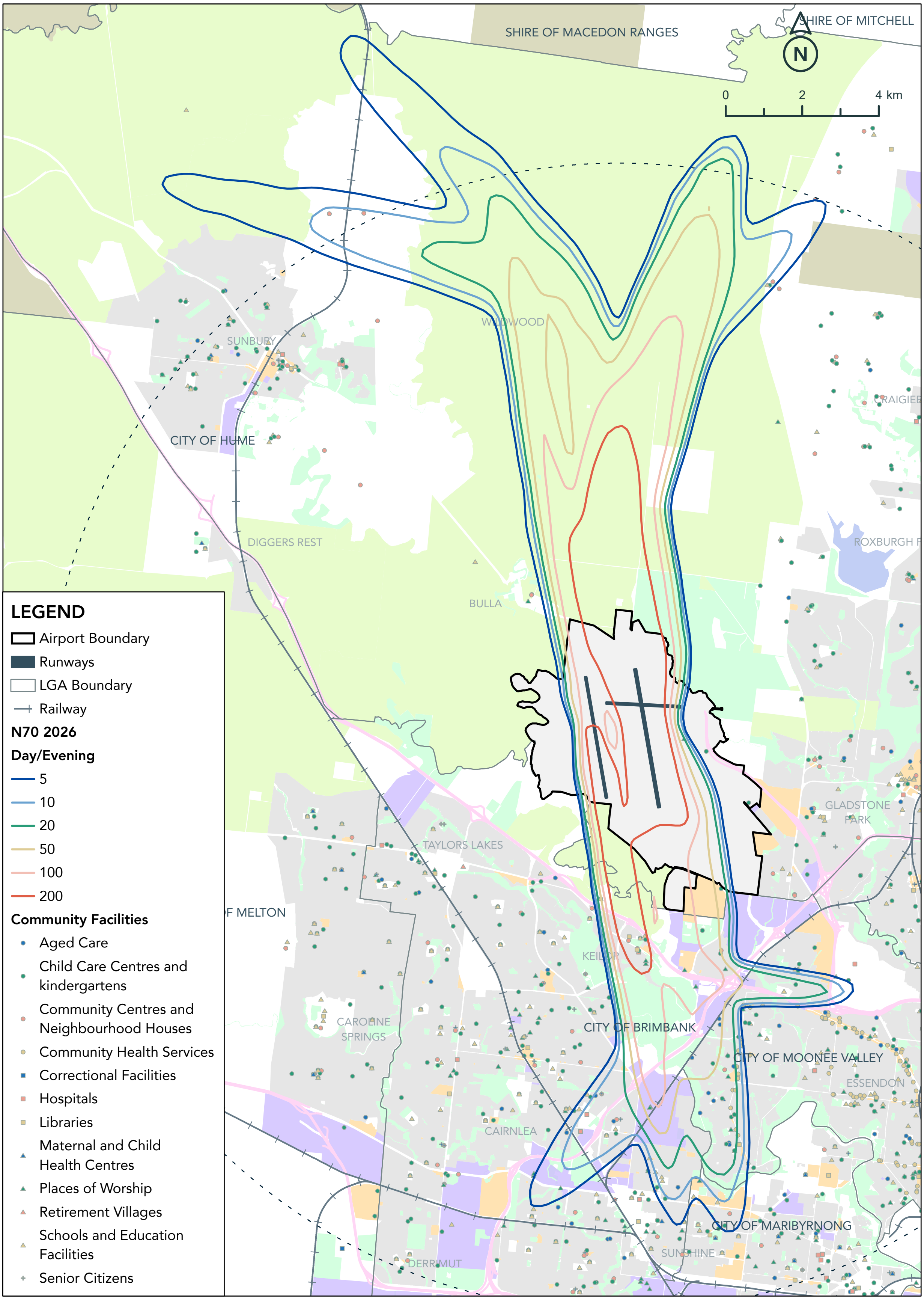


Figure D4.21
M3R Option 2 2026 N70 day & evening overlaid with community facilities

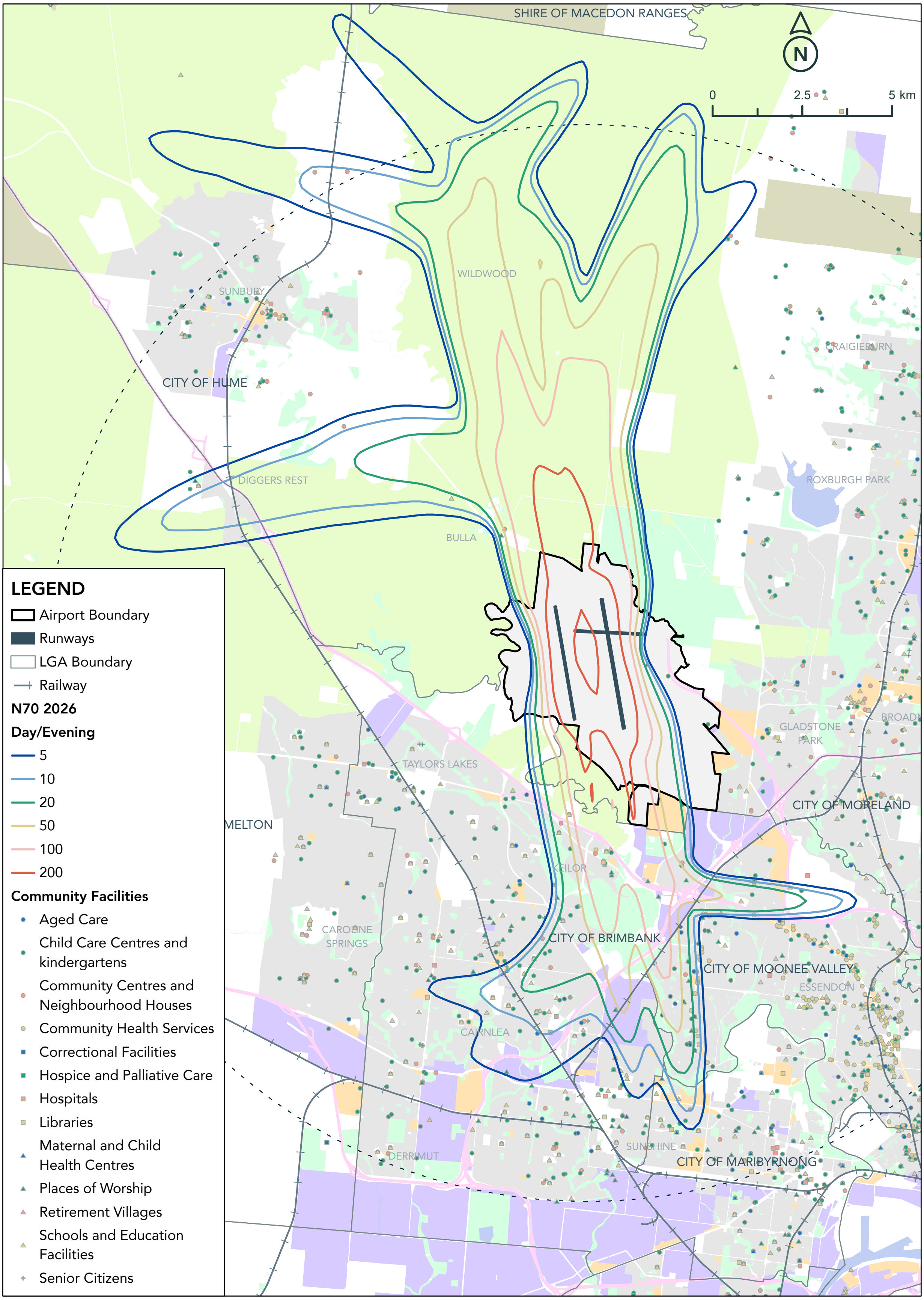


Figure D4.22
No Build 2026 N60 night overlaid with community facilities

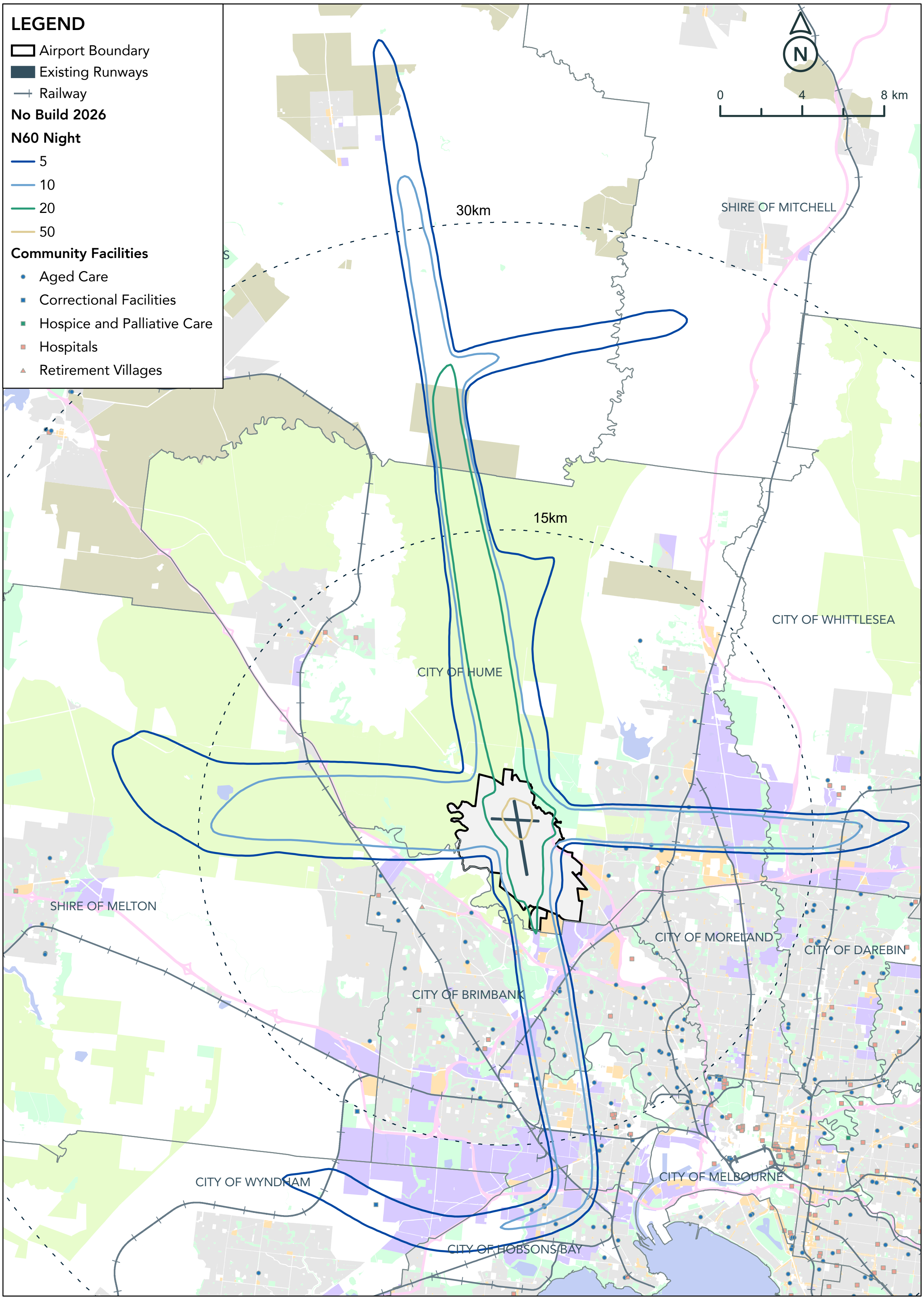


Figure D4.23
M3R Option 1 2026 N60 night overlaid with community facilities

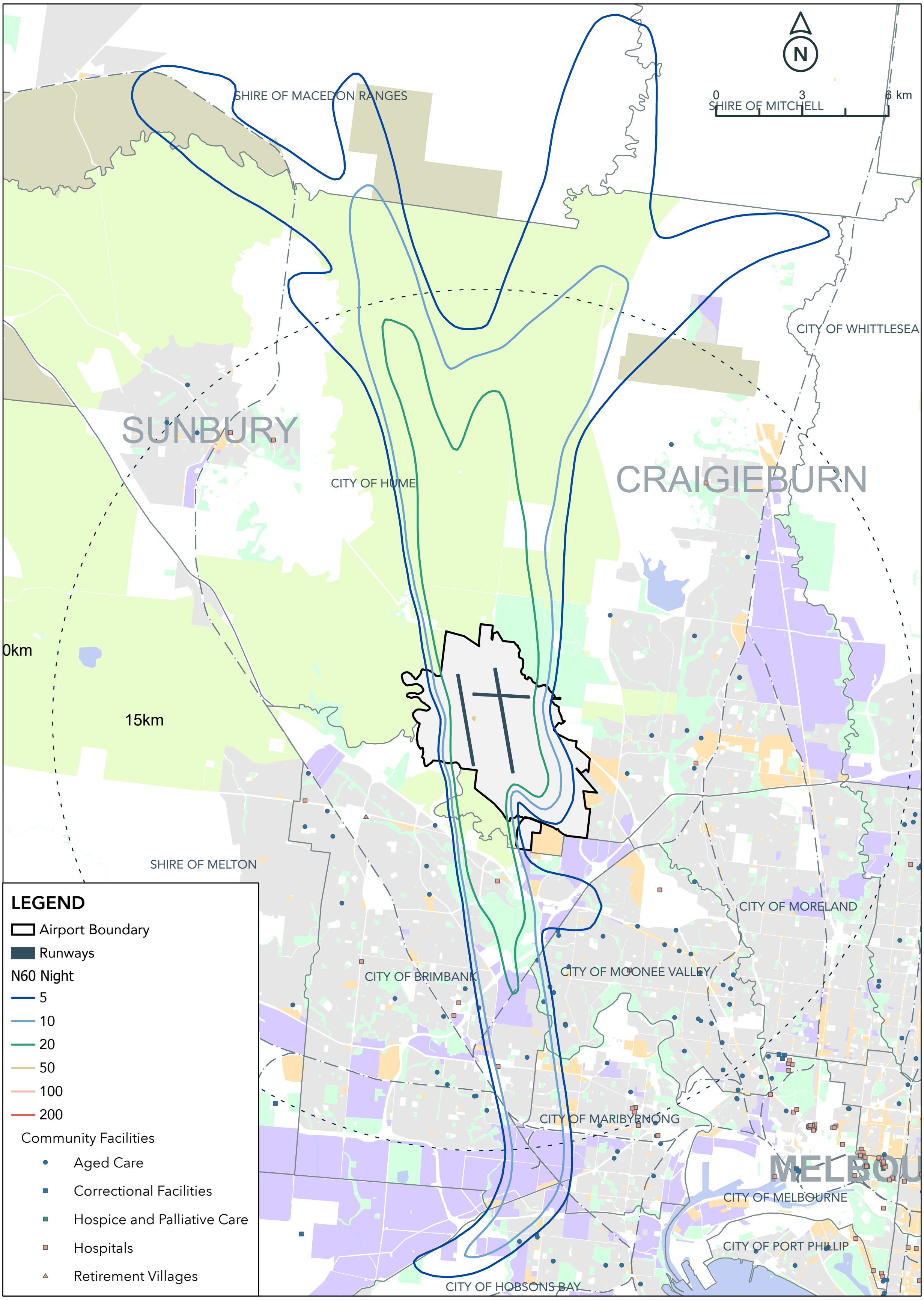
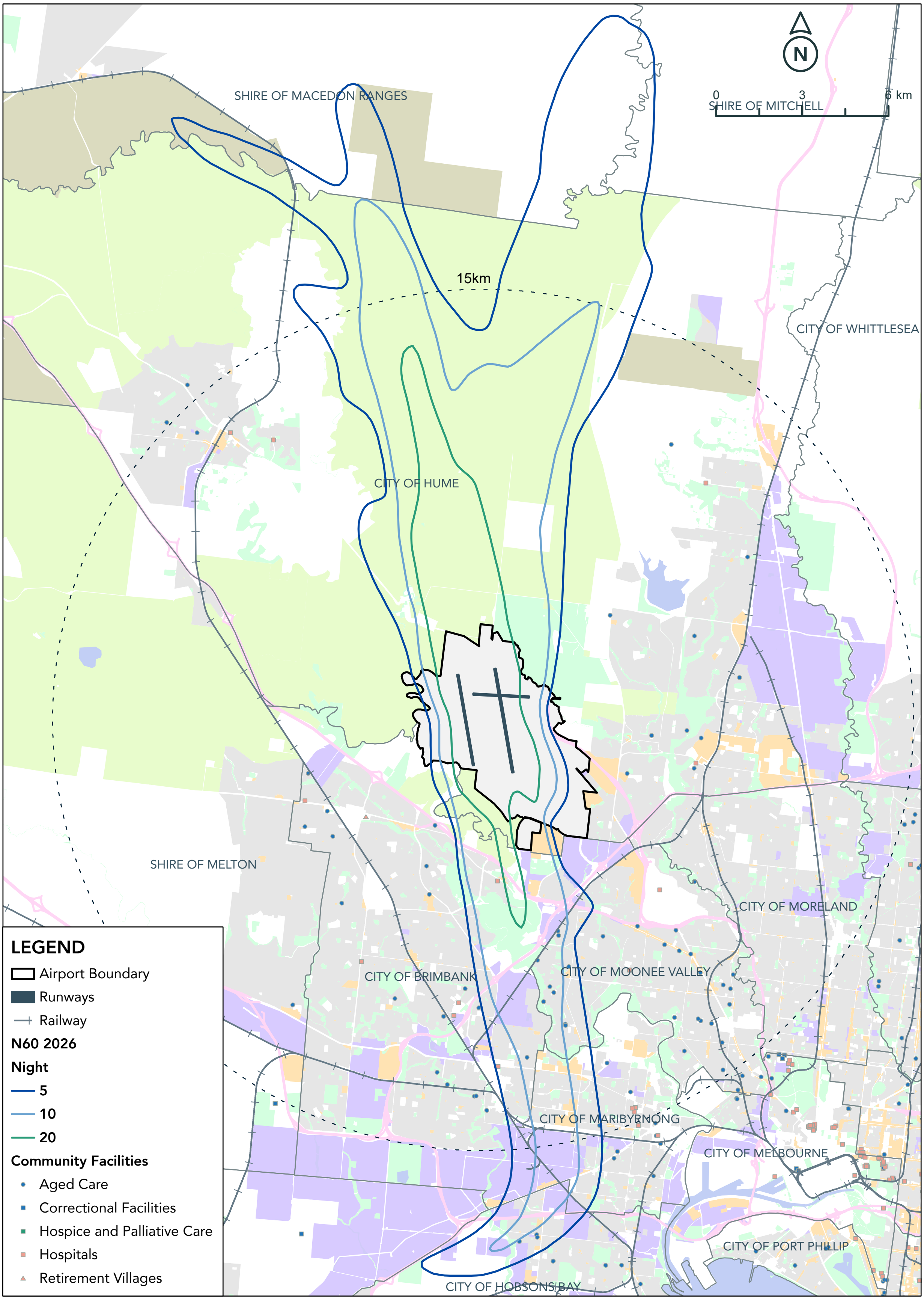


Figure D4.24
M3R Option 2 2026 N60 night overlaid with community facilities



D4.6.2.11
Schools

For schools, the N70 contours have been produced for the period from 9am to 3pm to reflect noise events at schools during their core operating hours. The tables above show that, compared to the No Build scenario:

- Mixed Mode shows an additional school within the 5-9 events contour and a shift of one school from the 20-49 events contour into the 50-99 events contour
- Option 1 shows more schools within the 5-9 events contour with one school in the 50-100 events contour
- Option 2 is similar to Option 1 for schools in event contours above 10, however have double the number of schools within the 5-9 contour. This reflects the deliberate strategy of sharing noise impacts.

In 2046 regardless of mode, the number of schools in N70 contours reduces by to one school but that school is in the higher 50-100 events contour. Overall, the impact is negligible but the impact on the school concerned will have to be carefully considered to identify any options for managing the change.

Impacts on children's reading comprehension

Section D3.6.2.6 of Chapter D3: Health Impact considers the potential effect of aircraft noise exposure on reading comprehension when the Build scenario is compared to the No Build scenario. It concludes that the projected effect on reading comprehension is negligible.

D4.6.2.12
Hospital, hospice, respite care facilities

In the No Build scenario, four hospital facilities are estimated to be within the 2026 N70 contour with one within the 10-19 events contour. In both Option 1 and Option 2, it is estimated that three hospitals will be within the 10-19 events contour and one each within the 200+ and 100-199 contours. Melbourne Airport will engage directly with these facilities in advance of the change to ensure they are fully aware of likely impact.

It is estimated that there is one facility located within the N60 night 5-9 events contours for the No Build scenario in 2026 and 2046. An additional facility in the 10-19 events contours is predicted for Option 2 (both 2026 and 2046). Estimates for Option 1 (both 2026 and 2046) includes a facility within the N60 night 10-19 events contours and one within the 20-49 events contour.

It is also a matter that will inform consideration in the community consultations on the preferred Option (1 or 2) for both 2026 (day and night) and 2046 (night).

D4.6.2.13
Childcare and kindergarten

For these facilities there are some mixed consequences depending on the outcome of community consideration of options 1 and 2. In particular, in 2026, Option 1 would impact a lower number of facilities overall compared to Option 2. In contrast, under Option 2 more facilities in total are within the N70 day contours in 2026, seven of which are estimated to fall into the higher 50-100 and 100-199 events contours. There are estimated to be three facilities within the 200+ events contour for Option 1. This reflects the different objectives of the options: Option 1 aims to minimising the total areas impacted (but also concentrating noise over one area) while Option 2 seeks to share the impacts.

As can be expected with the growth of traffic, the position worsens by 2046. Community consideration of options 1 and 2 for daytime use in 2026 will have to weigh up that although Option 2 has an increased aircraft-noise effect on these facilities than Option 1, it does offer the potential for periods of predictable respite (that is, alternating days with minimal noise impacts). This is also a matter on which Melbourne Airport would engage directly with the affected facilities in advance of the change.

D4.6.2.14
Aged care facilities

In 2026, the mixed mode will see an increase in the number of aged-care facilities affected by aircraft noise in the daytime and more facilities experiencing a higher number of noise events per day. Option 1 provides a relatively better outcome in 2026 and Option 2 a comparable outcome with Mixed Mode. All of the Build scenarios will involve a shift in impact to different facilities and changing levels for others, which will mean some will see a detriment.

By 2046, the three Build scenarios offer the same modest overall increase in both the number of institutions in the N70 contours and an increase in the number of events they will receive compared to the No Build scenario.

The total number of facilities within the N60 night contours is reduced in the Build scenario compared to No Build for both 2026 and 2046. The situation for the N60 night-time contours is that the overall noise impact under all Build scenarios in both 2026 and 2046 will not be substantially different in an overall sense, but with Option 2 impacting more facilities, consistent with its design to share the noise.

In both day and night scenarios, there will be noticeable changes for individual locations in 2026 compared to the No Build scenario.

While overall for the sector the impacts are minor, there will be major impacts for the worst affected facilities. As with all community facilities potentially affected, Melbourne Airport will engage early with affected facilities in advance of the change.

D4.6.2.15
Community centres and neighbourhood houses

Overall, the number of community centres within the N70 day contours are predicted to increase with all M3R scenarios compared to the No Build scenario in 2026 and 2046. In addition to the increase in number, there are more facilities estimated to be within the higher-range event contours (50 and above). It will be important to engage actively with those facilities that are worse off. While the impact is forecast to be minor, it is likely to occur and so deserves attention.

D4.6.2.16
Libraries

The number of libraries within the N70 contours are estimated to increase by one for all M3R scenarios compared to No Build. The increase is within the 10-19 events contour, with the facilities estimated to be within the No Build 10-19 events contour are to estimated to increase to over 100 events. This is expected, due to the facilities being located in line with the new runway.

Melbourne Airport will engage further with the libraries in advance of the change.

D4.6.2.17
Correctional facilities

No correctional facilities are estimated to be located within the day and evening N70 contours in both the Build and the No Build scenarios. At night, the single facility that is estimated to be within the No Build contour but not within any of the M3R build scenarios.

D4.6.2.18
Places of worship

The number of places of worship that would receive at least five events a day on average (more on a busy day) increases from 14 to 17 under the Mixed Mode in 2026 with M3R. Under Option 1 there is an overall increase in the number of places of worship within the N70 day-time noise contours. Under Option 2 more facilities are affected (19). In addition to the total number of affected facilities increasing, the facilities are affected more severely by being in higher-event contour ranges compared to No Build. The 2046 estimates show a similar outcome.

The impact of this change depends on the circumstances of the individual facilities; their construction, external environment, manner and time of use; and even their internal building configuration. Accordingly, it is not possible to assign an overall assessment of the severity of this impact although it is clear that for some individual places of worship a high level of impact is almost certain to occur. It will therefore be a priority for Melbourne Airport to engage with each organisation concerned in advance of the change.

A further complication is that, like some of the other categories of community facilities, places of worship fare better under Option 1 than Option 2, in 2026, and in this case the difference is quite marked. As with those other categories, this is an issue that will be included in the community engagement on the choice of options.

As these facilities generally operate during the daytime, night-time counts have not been prepared.

D4.6.2.19
Summary of community facilities impacts

The data shows that there are more facilities affected during the day in both 2026 and 2046 under all the operating modes (including both Option 1 and Option 2) for the Build scenarios compared to the No Build scenario.

The night-time benefits that, at least in overall terms accrue to homes, are not reflected in the same substantial overall gains for community facilities. On the other hand, the total number of facilities is small enough that Melbourne Airport will be able to engage with those that will be affected by more noise, with the intention of sharing relevant information. This will allow those facilities to consider the specific impacts of the changes in the context of how they operate; the nature of the physical premises and surrounds; and options for those facilities to manage some aspects of how they are affected.

Overall, the impact on community facilities will be moderate.

D4.6.2.20
Sport and recreation venues

No detailed count has been made for sporting and recreation venues. The range and definition of such venues is highly variable, and the impacts are also highly diverse. Outdoor sporting fields used for team sports such as football, for instance, would not be significantly affected by other than very high levels of noise – given the noisy environment that they themselves create. Equally, squash courts, with a mix of the windowless construction providing more sound insulation than many other structures, and the noise of the sport, would be less affected by noise – at, say, 70 decibels – than many other facilities.

In contrast, quieter recreation spaces such as golf courses and tennis courts would certainly notice the impact of loud noises. Nevertheless, the impact of aircraft noise, while real, would be markedly less than that of many other loud noises. This is because the noise arises and lessens relatively slowly compared to abrupt noises such as car horns, people yelling and sirens sounding. This makes aircraft noise more manageable in such environments.

There is no doubt that aircraft noise will have a detrimental effect on some sport and recreation venues, but that the effect is assessed as generally minor albeit likely to occur. The noise will be significantly more manageable with good information about its nature, level, timing and duration. Accordingly, Melbourne Airport is committed to include these organisations in M3R engagement.

D4.6.2.21
Indicative noise impact of M3R on Essendon Fields Airport operations

As a result of M3R and the associated change to airspace operations for Melbourne Airport (that is, an increase in the use of north-south parallel runway operations at Melbourne Airport) there will be some effects on the operations associated with Essendon Fields Airport as described in Section C2.5.11 in Chapter C2: Airspace Architecture and Capacity. However, it is difficult to identify exactly what these impacts might be, as they will depend on the particular mix of aircraft operations which Essendon Fields Airport is forecasting. In some ways this is dependent on which decisions are made about M3R and the final airspace designs for both airports.

Changes to the way Essendon Fields Airport operates may result in some increase in aircraft noise impacts to the north and south of the airport, and may also result in a decrease of aircraft noise impacts to the east and west.

D4.6.2.22
Overflight

The noise experienced on the ground by an overflying aircraft varies depending on where the aircraft flies in relation to the receptor on the ground (that is, both its altitude and lateral displacement). In addition, the type of aircraft, its size, the amount of weight it is carrying (passengers, cargo, fuel etc) and the way in which the aircraft is being flown by the pilot will also have an influence. So too will the meteorological conditions (wind speed and direction, temperature, cloud cover).

In general, the noise from an arriving aircraft is quieter overall for a given altitude, but is experienced for a longer duration as the arriving aircraft slows for landing. In contrast, noise from a departing aircraft is generally louder overall for a given altitude, but is shorter in duration as the departing aircraft climbs quickly to gain altitude and reach cruising speed. For people under an arrival and/or departure path, it depends on where they are in relation to each flight path as to whether they experience the arrivals or departures as being noisier. Whether the noise is disruptive or annoying will depend on many personal and subjective influences, including non-acoustical factors (see Section D4.2.2.4 above).

While the previous section focused on areas contained within the various noise contours, people in areas outside these contours will still hear and see aircraft operating in the skies above Melbourne. In particular, those living, working or engaging in recreation under or near the main flight paths are likely to notice the impacts, especially from a change in the usage of a flight path and/or its location.

A set of flight path and movement charts have been prepared to show where aircraft are likely to fly when approaching and departing Melbourne Airport. They are presented in Section C4.6.7 of Chapter C4: Aircraft Noise and Vibration.

It is important to note that aircraft will not always fly narrowly within the designated flight paths. These charts therefore show indicative flight paths as 'swooshes' with fading edges. Section C2.3.1 in Chapter C2: Airspace Architecture and Capacity shows the 2019 actual flight tracks against the published flight paths to illustrate this point. Consequently, at some stage in any year, most areas around Melbourne Airport will experience some aircraft overflight, with these areas under the main flight paths receiving a high concentration of overflight. See Figure C2.5 in Chapter C2: Airspace Architecture and Capacity.

It is evident from these charts that aircraft overflights are widespread in their impacts, with the noise impacts reducing further from the airport due to the aircraft altitudes. However, it is also apparent that most areas experience some periods during which the impact of aircraft noise is either absent or very significantly reduced. See Section C4.6.4 of Chapter C4: Aircraft Noise and Vibration for more about 'respite' and the respite charts produced to demonstrate the percentage of days when little or no aircraft noise events are expected during the nominated time. These periods will occur for varying percentages of each day/evening/night.

D4.6.3
Other operational impacts

This section assesses the potential impacts on the social environment from the ongoing operation of the new runway following opening, in addition to the aircraft noise and overflight impacts. It describes the assessed differences between the Build and No Build scenarios at opening (in 2026) and longer term (in 2046).

D4.6.3.1
Access for people and goods

Air traffic demand at Melbourne Airport is forecast to grow, with predictions being that the current two-runway capacity will be reached in the next five to 10 years should M3R not proceed.

From this time onwards in the No Build scenario, people and businesses of Greater Melbourne and regional Victoria will be limited in their access to air transport as a means of moving people and goods. This constraint would have direct and indirect economic costs as alternative, less efficient means of access might need to be sought or access forgone. When demand outstrips supply, prices increase, with additional cost burdens flowing through to individuals and businesses, indirectly impacting economic wellbeing.

In the No Build scenario, delays would regularly occur when runway capacity is exceeded. In response, airlines may adapt by:

- Moving flights away from peak times of day
- Increasing the price of peak-period flights
- 'Up-gauging' the fleet (that is, increasing the size of the aircraft or the number of seats on the aircraft) as far as is physically, commercially and safely possible
- Increasing the load factors on flights – reducing the number of empty seats.

Collectively, although these solutions would partially mitigate the capacity constraints in the short term they would still result in unmet demand from passengers and freight in the long term. And as capacity was reached for certain times of the day/year, pricing strategies would favour high-revenue traffic. It is therefore expected that low-cost carriers would more likely be shifted to the remaining off-peak times or elect to operate at alternative airports.

Chapter D2: Economic Impact Assement estimates the ultimate total costs of delay without M3R would start at 178 million dollars per year in 2026 and grow to 3.595 billion dollars by 2046, based on unconstrained demand. With a third runway built, these delays would reduce and range from 114 million dollars in 2026 to 502 million dollars in 2046.

However with M3R these negative economic impacts would be avoided, and access for people and goods to go to or come from other destinations free to grow in support of demand. **Chapter D2: Economic Impact Assement** concludes that, when M3R is operational, a number of benefits are expected to be achieved (compared to the No Build scenario of Melbourne Airport remaining a two-runway airport). These benefits include:

- Greater reliability for air travellers
- Induced additional air travel and therefore reduced fare prices
- Reduced cost of delays in airside operations
- Greater tourism exports in Victoria
- Agglomeration-driven productivity gains
- Productivity gains through greater connectivity.
- These benefits would all have positive social impacts.

D4.6.3.2 Employment

In its first year of operational use, M3R is forecast to create 500 additional jobs compared to the No Build scenario, most of which will be directly associated with on-airport operations and support functions. As use of the additional runway capacity increases over time, 2000-plus new jobs will be created annually.

These jobs are expected to predominantly be in accommodation services, other construction, business services, wholesale trade and retail trade; and will be diffused throughout Victoria. Some new retail and accommodation jobs will be located at the airport due to increased flights; and boosts to the tourism industry will result in further jobs at the airport and in tourist areas around Melbourne and Victoria. See **Chapter D2: Economic Impact Assement** for detailed analysis of the employment impacts of M3R compared to the No Build scenario.

As noted in **Section D4.6.1.2, Chapter D3: Health Impact** identifies that a person's economic status has a significant bearing on their health and wellbeing; and that the significant number of new jobs would have a beneficial social impact on health and wellbeing outcomes. These health and wellbeing outcomes arise from both individual, family and community health gains; and the avoidance of indirect mortality associated with improved economic outcomes for individuals and their families.

D4.6.3.3 Infrastructure and services

The infrastructure expansion provided at Melbourne Airport (in the Build scenario) constitutes an improvement in the infrastructure systems of Victoria. In concert with the planned rail link from Melbourne Airport to the CBD and the completion of the Melbourne Metro, there will be a cumulative enhancement of the state's ability to connect with the global economy. This will help to improve productivity outcomes for all employees and businesses in the long term.

With M3R operational, Melbourne Airport would have the opportunity to grow and deliver additional economic and social outcomes to Victoria. In 2046, the project is expected to provide an increase in gross state product of 16.8 billion dollars, compared to the No Build scenario.

As discussed in *Plan Melbourne*, aviation and non-aviation businesses are expected to grow significantly on land within the airport boundary and surrounding areas. This may create opportunities to develop tailored business developments that benefit from proximity to airport facilities. *Plan Melbourne* recognises the importance of airports for economic development and social connection (Victorian Government, 2017).

The airport is recognised in *Plan Melbourne* as a key transport gateway for Victoria. Transport gateways are economic and employment centres, playing a significant economic and employment generating role for the region, state and country. These transport gateways are intended to be protected from incompatible land uses by encouraging complementary land uses and employment-generating activity (Victorian Government, 2017).

D4.6.3.4
Community initiatives

Melbourne Airport recognises the need to balance its role as a primary aviation gateway for passengers and freight in Victoria with the needs of its neighbours and city and regional interests. Melbourne Airport will continue its community initiatives in either the No Build or Build scenarios. These presently include:

- Neighbourhood House Grants Program
- Western Chances
- Cross Cultural Volunteering
- Scholarships
- Banksia Garden Community Services
- Conversation Volunteers
- Salvation Army
- Rural China Grouped Small Hydro Project.

Details of Melbourne Airport's community initiatives can be found via Melbourne Airport's website.

New initiatives will be developed in response to ongoing community engagement.

D4.6.3.5
Ground-based noise and vibration

In addition to the noise of aircraft operating in the sky, aircraft noise is also emitted on ground at the airport (i.e. taxiing, engine testing). Other ground-based noise sources on airports include the use of Auxiliary Power Units (APU) and aircraft maintenance activities. Noise from vehicles operating on the airport (including private vehicles, buses and delivery trucks) are also considered in the airport noise environment. The impacts of ground-based noise, together with potential vibration impacts, are considered in Chapter B9: Ground-Based Noise and Vibration.

As described in Chapter B9: Ground-Based Noise and Vibration, ground-based noise such as taxiing of aircraft or ground running of aircraft engines is not expected to significantly impact sensitive receivers off-airport in either the Build or No Build scenarios, and will not increase substantially with the operation of the new runway.

D4.6.3.6
Landscape and visual

Melbourne Airport is a dominant visual feature within the study area. Runways, taxiways, terminal buildings, the air traffic control tower, car parks and other on-airport developments are visible from a range of off-airport viewpoints. Aircraft can also be seen operating in the vicinity of the airport day and night. See Chapter B12: Landscape and Visual for more detail.

Once operational, during the day the visual impact of the new runway would be generally minor. The main sources of impact would be partial removal of the Grey Box Woodland, and increased air traffic seen overhead and travelling north-south across views. At night, the visual impact of the new runway operations would have a moderately higher level of visual impact due to lighting associated with the runways, and increased air traffic seen overhead and across these views.

On the basis of the assessment contained in Chapter B12: Landscape and Visual the social impact of these landscape and visual changes is not considered significant.

D4.6.3.7
Traffic and transport

The efficient functioning of roads on and around Melbourne Airport is fundamental to its successful operation.

As described in Chapter B8: Surface Transport, road networks provide access to and from the airport for public transport, shuttles, taxis/ride shares, freight, aviation support vehicles, emergency services and private vehicles. Passenger activity accounts for the majority of traffic demand at Melbourne Airport. Taxis carry a significant number (just under 20 per cent) of passengers to and from Melbourne Airport. The SkyBus express bus service transports around 10 per cent of passengers to and from the airport.

From 2026, the increased capacity of the new runway will enable more passengers to travel through Melbourne Airport. This will in turn, generate a greater demand for road transport to and from the airport. There will therefore be additional traffic on the road network surrounding the airport, and the existing external and internal road networks will require improvements to meet the increased demand and service requirements. As assessed in Chapter B8: Surface Transport, if left unmitigated, this has the potential to lead to significant traffic delays on the internal road network and surrounding arterial network. However, even with mitigation, the Build scenario compared to the No Build scenario will create a significant impact on the operations of the transport network, mainly on the external road network.

From a social perspective, these external road traffic impacts are most likely to negatively impact people's way of life in the area surrounding the airport by causing delays and increasing travel time. Further, the SkyBus, taxis/ride shares and other bus services connecting Melbourne Airport to the CBD and other locations will be affected – but may be able to use bus/express lanes to reduce the effects.

Construction of Melbourne Airport Rail (MAR) will enhance public transport connections and reduce road traffic impacts. Construction of MAR on airport land is planned to begin in 2023 with a target completion date of 2029 subject to relevant Victorian and Federal planning, environmental and other government approvals (Rail Projects Victoria, 2021).

Within the airport boundary, a road network provides access for passengers, employees, visitors, freight and local traffic. The internal road system provides access to a range of land uses that generate passenger, employee and commercial trips. Passenger trips are generally concentrated in the terminal precinct and car parking areas, and there is currently congestion in these areas during peak and shoulder periods. These trips are estimated to represent about two-thirds of all traffic entering the airport precinct. Employee trips and commercial trips are usually concentrated in the business and industrial precincts.

The difference between the Build and No Build scenarios for internal road transport operations is expected to be negligible or, at worst, a minor adverse impact in the Build scenario.

D4.6.3.8
Air quality

Melbourne Airport has an Air Quality Monitoring Program (AQMP) (July 2019). that defines air quality monitoring regimes for air pollutants (nitrogen oxides (for NO_2), sulphur dioxide (SO_2), ozone (O_3), carbon monoxide (CO), and particles as PM_{10} and $PM_{2.5}$). It also defines 'air toxics', which in this context are hydrocarbons identified by the Australian Government (2020) as the most important hydrocarbons for monitoring and reporting (benzene, toluene, ethylbenzene, xylene and formaldehyde).

Melbourne Airport has two ambient Air Quality Monitoring Stations (AQMS) for monitoring criteria pollutants, located to the south and east of the airport. Melbourne Airport also specifies a periodic monitoring program in its AQMP (2019) to assess compliance with air quality standards for Volatile Organic Compounds (VOCs). The most recent round of this monitoring (from December 2014 to July 2017) focused on the key VOCs including benzene, toluene, xylenes and formaldehyde.

The AQMP has been reviewed periodically by independent experts (Jacobs in 2017 and Point Advisory in 2019). As a result, Melbourne Airport updated its risk register and AQMP in July 2019.

As with potential construction impacts on air quality, residents may perceive that there are operational air quality issues. To alleviate this, Melbourne Airport will ensure the impacts on air quality are appropriately communicated. Air quality impacts have been carefully considered and avoided where possible; and mitigated to ensure these impacts will be acceptable on the sensitive receptors surrounding the airport (see **Chapter B10: Air Quality** for details). **Chapter D3: Health Impact** determined that the potential health effect is projected to be negligible.

D4.6.4
Other social implications

Other social implications of the new runway are discussed in the context of the parameters defined in **Section D4.2**, specifically vulnerable populations, people's way of life, people's environment, and their interaction within the community.

An assessment of the health and wellbeing impacts is contained in **Chapter D3: Health Impact**; **Chapter D2: Economic Impact Assessment** considers the impacts on property values; **Chapter B2: Land Use and Planning** describes the development implications of M3R.

D4.6.4.1
Vulnerable populations

As discussed in **Section D4.2.2.4**, individuals respond to sound and noise differently and there can be large variation in their response. It is also the case that certain groups within the population are particularly noise-sensitive, or vulnerable to new or increased aircraft-noise exposure levels. A review by the Dutch Institute for Public Health (van Kamp, et al, 2013) of relevant studies from 2008 to 2011 identified the following as populations which are potentially more vulnerable to noise impacts:

- Infants and children
- Older adults
- People with mental or physical medical conditions
- People with hearing or speech challenges
- Shift workers.

These people may be more vulnerable to noise exposure depending on the nature of their condition or circumstance. For example, people with hearing impairments may be most vulnerable to speech interference. People with depression or anxiety issues may experience increased effects due to fear of accidents from overflying planes. Shift workers may be more sensitive to daytime and evening noise events because they may need to sleep during times of more aircraft noise, and so may experience greater sleep disturbance impacts as a result.

Surveys conducted around the world have supported the development of generalised conclusions about the community response to specified levels of noise (known as dose/response surveys). These surveys have been the basis of tools such as the ANEF contours. Although they have been used to create generalised assessments of community response, they have also demonstrated the high variability in responses to noise at any specific level. Accordingly, they also highlight that is it not only individuals with an identifiable 'vulnerability' who may be more significantly affected by aircraft noise, some individuals are more sensitive to noise than others.

To accommodate both vulnerable groups and those more sensitive to noise, this social impact assessment has not regarded any particular noise contour as a 'cut-off' for impacts. Instead, it uses the noise metrics to identify the likely scale of impact while noting that many outside the contours will also be affected.

A key concern for vulnerable groups is the potential impact on cognitive development in young children. This has been considered above in the discussion about schools in Section D4.6.2.11, which notes that Chapter D3: Health Impact considers the potential for impacts on reading comprehension to be negligible and unlikely.

Consideration of the impact on other vulnerable groups also appears in Sections D4.6.2.10 to D4.6.2.20 as part of the assessment of noise on community facilities such as aged care homes.

D4.6.4.2 People's way of life and environment

Exposure to aircraft noise has the potential to adversely impact people's way of life including 'how they live, work, play and interact with one another on a day-to-day basis' (Vanclay, et al., 2015).

The direct impacts associated with new or additional exposure to aircraft noise are considered in Section D4.6.2 of this assessment. These impacts on people's way of life might include annoyance, interference with watching television or listening to the radio, sleep disturbance, interference with conversation, and interference with learning. However, there are also indirect consequences of noise and of overflight more generally. These include:

- Use of dwellings/buildings – people who experience frequent aircraft noise events may change the way they use their dwelling (e.g. keep windows closed or not using outdoor living spaces). This may result in loss of amenity, higher use of air conditioning, and less frequent interactions with neighbours and their community.
- Speech disturbance – conversations may be interrupted by noise events. People may have to talk louder or stop talking/listening until the aircraft has passed overhead. The World Health Organisation (WHO) Guidelines for Community Noise (WHO, 1999) state that sectors of the community who are particularly vulnerable to impacts created by speech disturbance are the hearing impaired, the elderly, children in the process of language and reading acquisition, and individuals who are not familiar with the spoken language.

Measures to address aircraft-noise issues will also be relevant to addressing these issues. Of particular value will be measures that include the provision of information – both about the noise itself; and about ways to respond to that noise, such as indoor and outdoor modifications that residents can make to their homes to manage these impacts. Equally, better understanding of the aircraft noise and available mitigation measures can help schools and managers of community facilities to take an active role alongside the airport in mitigating these detrimental effects.

D4.6.4.3 Community interactions

Exposure to aircraft noise has the potential to impact people's community including 'its cohesion, stability, character, services and facilities' (Vanclay, et al., 2015). As discussed in Section D4.6.2, operation of M3R would increase the number of homes and community facilities impacted by exposure to aircraft noise during the daytime and evening periods.

People's connection to their community stems from their interaction with neighbours and other people in their local environment, and their participation in community events such as church services, Scout groups and school fetes. Interactions occur at home through socialising with neighbours; or at local facilities such as shopping areas, schools, places of worship or other community facilities.

The impact of excessive noise on certain sections of the community has the potential to change the way people use their living spaces, reducing incidental interactions with neighbours, for example because people might not be outside as frequently. It may also impact their use of community facilities in their local area. This may result in some people being, or feeling, less connected to their local community.

The direct noise impacts of these changes are discussed in the noise impacts section of this assessment (Section D4.6.2). Specifically, Sections D4.6.2.10 to D4.6.2.20 show there will be varying impacts on the community facilities affected by noise under the alternative operating scenarios for M3R.

It is important to be conscious of the broader social impact that such changes can have to ensure they are managed to achieve the least disruption to patterns of social interaction and community support. Melbourne Airport will engage with the management of affected facilities in advance of any changes.

As with the direct noise impacts there will be some areas that benefit under the new flight routes while others will be more affected by overflights and noise.

Once operational, M3R has been assessed as having a medium-level impact on community interactions.

D4.6.4.4 Other aviation uses

Due to the proximity of Melbourne Airport to Essendon Fields Airport, the changes to airspace architecture required as part of M3R will change the interaction between the two airports' operations. This raises the question of what the impact of M3R will be on operations at Essendon Fields Airport. Analysis based on 13 years of wind and weather data has shown that, with M3R, the two airports would be able to operate in complementary modes, runways 16/34 and 17/35, for 95.6 per cent of the time.

For one per cent of the time, due to the wind, aircraft at Essendon Fields would require the use of its east/west runway 26 when Melbourne is using the north/south parallel runways. These periods of non-complementary runway operations would be typically 30-60 minutes in length. For 3.4 per cent of the time, during periods of strong westerly winds, Melbourne and Essendon Fields would be operating on runways 27 and 26 respectively.

The existing arrangements require use of a slot scheme and Essendon Fields during periods of poor weather, when non-complementary runway modes are in operation. This scheme permits only two approaches per hour to Essendon Fields Airport. These poor weather conditions exist approximately eight per cent of the year but the scheme is only implemented about four per cent of the year (~15 days).

D4.7 AVOIDANCE, MANAGEMENT AND MITIGATION MEASURES

This analysis has shown that some communities and homes will be better off in terms of social impact, while others will be worse off with M3R. Melbourne Airport will work with its communities and other stakeholders to maximise the benefits of the new runway while minimising the disadvantages. This includes a broad range of measures to try to avoid negative impacts and, where unavoidable, mitigate those impacts through careful management. It also includes measures to ensure that identified opportunities and benefits are fully harnessed.

This section discusses measures that will be undertaken, in consultation with affected communities and stakeholders, to achieve the best possible outcomes. It concludes with a defined monitoring and reporting framework, with allocated resources and frequency, that is pertinent to the identified impacts and proposed measures.

D4.7.1 Community engagement

Key to the development and implementation of effective and meaningful strategies for managing the impacts of the new runway will be an ongoing and evolving program of community engagement. This MDP has drawn on the input and insights of community members and representative bodies, and will continue to be shaped by feedback received during the public consultation period. Beyond this MDP, Melbourne Airport is committed to maintaining constructive engagement with the community. This includes:

- Regular engagement activities (online and in person)
- Regular updates via its website
- Dedicated surveys and invitations for feedback on emerging issues and opportunities
- 'M3R impacts management' will be a standing agenda item for Community Aviation Consultation Group (CACG) meetings. Melbourne Airport will be responsive to that group's feedback on community engagement plans.

Importantly, community engagement should not await the operation of the new runway as there is much benefit from community input at a much earlier stage.

Melbourne Airport will continue to engage with stakeholders and the community, including landowners and tenants/lessees, about the growth of Melbourne Airport and the impacts and benefits this growth brings. This engagement will take place via the standing consultative forums including the Planning Coordination Forum (PCF), CACG, and the online discussion forum https://my.melbourneairport.com/. In addition, the Airport is developing several forums and special events specifically for M3R, including project briefings, public displays, listening posts, community forums, and conversations with the community via its my.melbourneairport.com website and in person through community events. Melbourne Airport will also engage with stakeholders in the following ways:

- Melbourne Airport will continue to work with state and local government to implement appropriate planning provisions to protect airport operations from incompatible land uses and encourage complementary uses
- Melbourne Airport will engage specifically with the owners and tenants of relevant public buildings regarding the impacts (such as new daytime noise) associated with operation of M3R
- Melbourne Airport will continue to work with state and local government to identify improvements for off-airport road networks that provide access to Melbourne Airport so that adverse impacts on local and regional community connectivity are reduced
- Melbourne Airport will work with relevant partners to communicate the benefits of M3R, including the significant economic benefits of the construction phase (e.g. jobs) and the opportunities that an unconstrained Melbourne Airport brings to the metropolitan region and state (i.e. travel and freight benefits)
- Both in the lead-up to, and during construction of, M3R, as well as after it is operational, Melbourne Airport will provide information on its impacts in the short, medium and long term.

To ensure that community engagement is both effective and meaningful it is important that stakeholders should have access to accurate, reliable and up-to-date information. Information sharing is already underway and will continue through construction and after M3R is operational.

Melbourne Airport has developed a range of information resources (see Chapter A6: Stakeholder Engagement). Since determining that the alignment of the new runway is to be north-south, the constraints of COVID-19 have limited the options for community engagement. Nevertheless, Melbourne Airport conducted several online community engagement sessions. Given the early stage of the project with conceptual planning only, the sessions have been developed as information-sharing and awareness-raising opportunities.

This program of community engagement and information sharing will continue as the planning and design elements of the project proceed, as well as through construction and ultimately operation of M3R. It is important to acknowledge that many design aspects will necessarily be constrained by safety and operational requirements that are often not apparent to observers. Melbourne Airport is committed to ensuring that these requirements are explained so that affected communities can understand when the community's input will genuinely influence decisions and what aspects are non-negotiable due to safety and operational requirements.

Chapter A6: Stakeholder Engagement of this MDP sets out in detail the proposed program of community and project consultation.

D4.7.2
Impact specific strategies: construction impacts

During construction, Melbourne Airport will work with all contractors to consider impacts so that the timing of works, the manner in which they are carried out, and overall management of construction activities is undertaken at industry best-practice standards. Key elements of the mitigation strategies for construction impacts are discussed further in the following paragraphs.

D4.7.2.1
Proactive information provision

Melbourne Airport will proactively inform communities and other stakeholders about the construction program and provide specific timely updates in the lead-up to, and during, periods of potentially negative impact. A mix of engagement channels will facilitate monitoring and responsive management to ensure the least-negative impacts are experienced, particularly at homes, schools and community facilities.

D4.7.2.2
Targeted management plans

Management plans will be prepared in advance of the construction works by experts to mitigate and manage the particular impacts associated with the construction activities, including:

- Construction Traffic Management Plan (CTMP) – to provide greater clarity on the form and scale of the construction traffic, including the truck fleet that will bring plant and materials to and from the M3R works site. The CTMP will include management/mitigation measures to minimise the impact of any truck movements to and from the construction site that occur during peak periods. The key issues will centre on managing site access given that the impact of this traffic on the broader traffic network is assessed as negligible to minor. For example, truck traffic on Sunbury Road may increase by up to two percent.
- Construction Environment Management Plan (CEMP) – A CEMP will be prepared. This plan will address:
  - Management and mitigation of the construction noise and vibration impacts, including procedures for works planned to occur outside normal work hours
  - Management and mitigation of the construction impacts of M3R on the landscape and visual amenity of the project area
  - Minimising the impacts of open excavation through appropriate use of mulch, hydro mulch or soil binder
  - Further minimising dust emissions through dust controls (such as water carts, water sprays, wheel washes and minimising double handling of materials) which will be enforced through the CEMP
  - Location of construction vehicles, equipment, stockpiling, asphalt, and concrete batching plants away from sensitive receptors such as occupied properties on Loemans, Operations, McNabs and Sunbury roads
  - Mitigation measures to control surface water run-off
  - Stockpile management to protect from surface water flows, and to control 'foreign object debris' and dust
  - Soil and water, including erosion and sediment control, emergency spill response procedure, unexpected contamination protocols, soil and water monitoring and inspection, groundwater quality criteria
  - Waste and resources, including spill prevention and hazardous material management
  - Biodiversity, including vegetation management, biodiversity management protocols, weed and disease management, bushfire management, threatened flora salvage and translocation, unexpected finds protocols.

- Cultural Heritage Management Plan (CHMP) – The CHMP is currently being developed, including:
  - A major component of this plan will be to address the detailed assessment of Indigenous Cultural Heritage values that has been completed. The response to this assessment is being prepared in consultation with the Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation. Measures included in the CHMP are likely to include cultural inductions for people working on M3R and procedures for the archaeological salvage and reburial of cultural material.
  - Chapter B7: European Heritage addresses management of the European Heritage sites identified in the assessment study undertaken. The impact on these sites will be mitigated by salvage, recording and documentation. Nevertheless, the impact on one site of exceptional value will still be high.

D4.7.2.3 Community engagement, including complaints management

Effective complaints management will be an important component of managing air quality issues during construction.

Community engagement channels will ensure community stakeholders can keep abreast of construction activities and potential dates and times of impact. This is especially relevant for traffic and access management and where high noise or dust activities are scheduled.

Unforeseen impacts may arise – identified by construction personnel, management or through community engagement or complaints.

D4.7.3 Impact specific strategies: aircraft noise impacts

Aircraft noise is likely to be the most significant ongoing issue associated with the new runway, causing negative impacts for some communities compared to the No Build scenario. During the planning, development and construction of M3R, and also once the runway is operational, Melbourne Airport will work with communities and stakeholders to identify and implement realistic measures to minimise the detrimental effects of noise.

D4.7.3.1 Land use planning

Across the aviation industry, there is a broad range of measures that are being used to address aircraft noise concerns.

Some of these are outside Melbourne Airport's capacity to address, such as the substantial efforts being made to reduce the noise at source (reduce the amount of noise aircraft make). Other measures, such as land use planning around airports to minimise noise-sensitive developments in high-noise areas, are also outside the airport's control.

Nevertheless, Melbourne Airport will continue to press for the highest standards of planning that include appropriate consideration to the potential for aircraft noise impacts. Melbourne Airport will continue to be a strong advocate for the principles and guidelines (NASAG, 2012) presented in the National Airports Safeguarding Framework (NASF), including its recommended use of N-contours in addition to the ANEF.

Melbourne Airport will also continue to support the Victorian Government in its maintenance of the Melbourne Airport Environs Overlay (MAEO), reflecting the latest endorsed ANEF for Melbourne Airport. The Planning Policy Framework refers to the NASF as a policy guideline.

Importantly, the Victorian Government has appointed a standing committee, the Melbourne Airport Environs Safeguarding Standing Advisory Committee (MAESSAC) under the *Planning and Environment Act 1987* to report on:

- Planning proposals of strategic importance within the Melbourne Airport Environs Area and approved Melbourne Airport Master Plan noise contours, and
- 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.

This is a significant initiative to help protect the Airport's current and future operations, and importantly to protect the community from future developments occurring that are incompatible with the future operations of the Airport.

For more detail, see Chapter B2: Land Use and Planning.

D4.7.3.2 Ongoing engagement with stakeholders during detailed planning

As noted above, Melbourne Airport has commenced engagement with the community on M3R, which was begun with the program of engagement with communities potentially affected by aircraft noise when considering the earlier possible east-west orientation of the new runway. For detail on engagement to date, and the engagement plan, see Chapter A6: Stakeholder Engagement.

Since determining that the alignment of the new runway is to be north-south, COVID-19 has impacted the ability of Melbourne Airport to undertake traditional engagement activities. However, Melbourne Airport has undertaken several online community engagement sessions. Given the early stage of the project with conceptual planning only, the sessions have been developed as information sharing and awareness raising opportunities.

This program of community engagement will continue as the process of designing the airspace proceeds. It is important to acknowledge that airspace design is very heavily and very importantly constrained by safety and operational requirements that are often not apparent to observers. Melbourne Airport is committed to ensuring that these requirements are explained so that affected communities can understand why the noise cannot simply be moved somewhere else.

While aircraft noise at a particular level may be inherently annoying to a proportion of the population, both common sense and research underscore that this annoyance will be greater if the noise is perceived as gratuitous, unfair or avoidable. It is therefore important that community engagement on airspace design should be based on a clear understanding of what is and is not possible. Providing clear explanations will continue to be a key focus of all ongoing engagement around aircraft noise issues, and specifically around airspace design.

Melbourne Airport believes that engagement with affected communities is the most effective way to achieve the best reasonable outcomes for aircraft noise, consistent with safety and operational requirements. This is in turn premised on providing clear, comprehensible and meaningful information about aircraft noise to affected – and potentially affected – communities and individuals. This is also discussed in detail below (at Section D4.7.3.3).

D4.7.3.3
Improving information about noise-impacted areas

Fundamental to working with communities to reduce the annoyance from aircraft noise is sharing comprehensible and meaningful information about aviation operations, constraints on those operations, and the impacts of them. Melbourne Airport will continue to update published materials and a detailed website that provides information about aviation operations, the context of those operations and about aircraft noise.

This information has several functions:

- It provides information allowing people to make informed choices about where they live
- It allows residents affected by aircraft noise to understand why it is present, and what can and cannot be done to change the impact of that noise
- It allows residents affected by aircraft noise to consider what options they might have regarding changes to their lifestyles, homes and environments that may reduce the impact of aircraft noise
- It allows residents and residents' groups to provide constructive suggestions and advice that might deliver better noise outcomes through changes to air traffic management, scheduling, flight path design, and aviation businesses operations. Equally, it will assist communities and individuals to understand what is not possible so that expectations remain realistic
- It assists communities and individuals to understand why solutions that might otherwise seem simple or obvious are often not possible. This, in turn, can reduce the additional annoyance that is driven by frustration, feelings of unfairness and the impact of unexpected changes to levels of aircraft noise
- It builds trust between airports and communities by demonstrating the limits of actions that airports can take, which leads to significantly enhanced opportunities for airports and communities to work together on what is possible.

Melbourne Airport maintains a dedicated engagement website for M3R, established to encourage two-way communication between Melbourne Airport and the community. It is part of an engagement strategy that employs multiple channels to lower barriers to community participation and increase awareness of Melbourne Airport, and adds to other traditional channels such as the community phone line and email. The my.melbourneairport.com website includes a link to a 'translation hub' where Melbourne Airport employees have translated information on M3R into several languages.

As part of its information-sharing effort Melbourne Airport has developed a Noise Tool. Melbourne Airport is committed to updating this tool with new information that comes from the development of the MDP and any other sources.

Providing clear explanations will continue to be a key focus of engagement around aircraft noise. This information will also assist the community to make informed decisions about the consequences of aircraft noise and how to respond to those consequences.

Most importantly, Melbourne Airport is committed to delivering the essential aviation infrastructure for the airport to continue to support Melbourne's, Victoria's and indeed Australia's economic and social development. Nevertheless, there are some detrimental consequences of M3R and Melbourne Airport is committed to explaining those consequences openly and honestly.

D4.7.3.4
Airspace design

From the outset, the design of flight paths for the new runway was undertaken to avoid noise impacts on residential areas as much as possible, and a range of mitigation measures have been incorporated into the initial airspace design to achieve this. Changes have focused on aligning flight paths, particularly to the north of the airport, so that they avoid built-up areas when they turn east or west. These changes consider not just existing habitation but also planned future development.

D4.7.3.5 Respite

Respite in its most general form is any period in which aircraft noise is markedly less than at other times. Where this is at random times (dependent on, for example, wind direction) it can be of some use in benefiting those with otherwise substantially intrusive noise. Of more value is respite that can be predictable or regular. In these two circumstances the respite can be used more fully by those affected.

Planned respite is more readily achievable when more runway modes are available at an airport. Therefore M3R will increase the random respite as modes are used for operational reasons, and potentially also the planned or regular respite. A clear example of the latter would be the use of the SODPROPS mode at night. The 2026 forecasts suggest that M3R will provide opportunities for frequent use of the green wedge to the north of the airport for both arrivals and departures for much of the night. This would provide night-time respite for many homes to the south of the airport.

A significant feature of any opportunity to provide planned or regular respite is the importance of community consultation to determine how such opportunities can be used. Where the benefits of a respite model are very clear, such as the use of SODPROPS at night, the decision to utilise it is easy to make. Most respite, however, involves moving noise from one community to another. In such cases the views of all affected are critical to making decisions that provide as fair and beneficial an outcome as possible.

D4.7.3.6 Noise Abatement Procedures

Noise Abatement Procedures (NAPs) are designed to help reduce the impact of aircraft noise on the community by preferencing the lowest-impact modes of operation whenever practicable. They comprise a list of preferred runway configurations, preferred flight paths and noise abatement areas (areas with flight restrictions). When followed by air traffic control and pilots, NAPs can provide improved noise outcomes for communities, generally those near airports. NAPs are implemented by air traffic control, with pilots expected to observe NAPs subject to weather and other aircraft requirements.

The impacts of changes in the NAPs can be significant, particularly at night. This is demonstrated by the varying noise outcomes identified in **C4: Aircraft Noise and Vibration** that result from using different operating modes or combinations of them. While the weather, and particularly wind conditions, commonly dictate which operating modes need to be used at certain times, having a hierarchy of mode preferences for use whenever the conditions allow means that there is a far greater likelihood that the lowest noise impact modes will be used as much as practical. Defining the priority and selection of runway modes of operation is one of the NAPs available.

Construction of M3R would increase the options available. In particular, it would allow increased use of the 'green wedge' to the north and west of the airport, particularly at night. The NAPs would give preference to SODPROPS. Under this mode, both arrivals and departures would operate to the north of the airport. This mode can only operate safely when traffic levels are low and weather conditions conducive. Sufficiently low aircraft movements are most likely to occur between 11pm and 6am. However, Melbourne Airport will encourage Airservices to extend the use of this mode beyond those hours whenever possible. Noise forecasts do not assume extended use of this mode.

When SODPROPS cannot be used, the next preferred mode of noise abatement is Segregated Mode when one parallel runway is used for arrivals and the other for departures. Mixed Mode, where both runways are used for departures and arrivals, gives the highest capacity but takes away the flexibility to reduce noise impacts.

Chapter C4: Aircraft Noise and Vibration models the impacts in each of the scenarios for day/evening and night periods. Melbourne Airport is committed to ongoing engagement with communities and stakeholders about the operational preferences and priorities that should be reflected in the NAPs.

Melbourne Airport will remain an active advocate for NAPs that deliver the best possible noise outcomes in its neighbouring communities. It will ensure its understanding of community preferences (obtained through ongoing community engagement) are provided to Airservices as appropriate so that these can be considered in continuous improvements to NAP development and design.

D4.7.3.7 Noise monitoring and management plan

Melbourne Airport takes managing impacts seriously and will work proactively with governments, airlines, Airservices Australia, industry partners and local communities to manage these impacts.

As part of the work to develop the detailed airspace design post-MDP Melbourne Airport will continue to work proactively with stakeholders to develop a Noise Monitoring and Management Plan based on the ICAO 'balanced approach' to managing aircraft noise. This approach includes principles such as reducing the noise at the source (e.g. quieter aircraft engines), enhancing land use planning controls to prevent inappropriate development in noise-sensitive areas, and operational procedures which can be designed to reduce noise impacts for local communities.

Melbourne Airport has little opportunity to contribute directly to technologies that are significantly reducing the noise that a modern aircraft makes compared to its predecessors. This improvement is continuing and often referred to as 'aircraft are getting quieter'. However, despite improvements in individual aircraft noise, overall reductions are not likely as the volume of flights increases over time.

Equally, Melbourne Airport has limited capacity to influence land-use planning and management. However, in its Noise Monitoring and Management Plan it will recognise its continuing role in advocating for, and supporting decision-makers in delivering, effective airport safeguarding policies and compatible land use around Melbourne Airport in order to protect future communities from unnecessary negative impacts on community amenity.

Melbourne Airport is also obliged to provide operational capacity to meet the requirements of the aviation industry with a limited capacity to restrict or limit operations. Even in the field of operational procedures, the airport's capacity to intervene is greatly constrained by the safety and operational requirements of ICAO, CASA, and Airservices Australia. Nonetheless, Melbourne Airport will identify in its Noise Monitoring and Management Plan any opportunities to collaborate with CASA and Airservices Australia to foster and promote evidence-based adjustments to safety and operational requirements that support improved noise outcomes.

D4.7.3.8
Safeguarding policies and compatible land use

Over the long term, inappropriate development around airports can result in unnecessary constraints on airport operations and negative impacts on community amenity due to the effects of aircraft noise.

With this in mind, Melbourne Airport supports the full adoption of the *National Airports Safeguarding Framework* (NASAG, 2012) in all planning regimes and decisions, including reference to a broader suite of aircraft noise metrics when making planning decisions. Melbourne Airport uses this broader set of noise measures to assist communities to understand the impact of actual and potential aircraft noise. The Framework can be downloaded from the Department of Infrastructure, Transport, Regional Development and Communications website.

Melbourne Airport and its surrounding communities continue to benefit from the long-term planning decisions made in the past regarding the Tullamarine site and the safeguarding policies of successive governments. However, despite the current safeguarding framework, the airport has experienced gradual encroachment of urban development within its environs and under flight paths that is not consistent with the optimal protection of airport operations.

Melbourne Airport works with Victorian and local governments to implement the National Airports Safeguarding Framework (NASF) guidelines to protect airport operations and minimise impacts on the community. This includes advocating appropriate land use planning in the vicinity of the airport and actively discouraging noise-sensitive uses in areas currently exposed to aircraft noise or forecast to be exposed in the future.

Further, Melbourne Airport will continue to support the Victorian Government, when necessary, in revision of the Melbourne Airport Environs Overlay (MAEO) to reflect the ANEF contained in the latest Master Plan, and its standing committee Melbourne Airport Environs Safeguarding Standing Advisory Committee (MAESSAC), as discussed in Section D4.7.3.1 above.

D4.7.4
Impact specific strategies: overflight impacts

Although the principal issues raised by aircraft overflight centre on aircraft noise, this section will deal with the broader question of airspace design. Determining how aircraft will approach and depart from the airport is already in its early stages. Online community engagement sessions have already taken place to help inform the community about key elements of the M3R project, including the design of the airspace and flight paths to and from Melbourne Airport.

D4.7.4.1
Airspace and flight path design

Airspace design is heavily constrained by internationally accepted rules and standards intended to ensure standard procedures for approaching and departing airports.

These procedures are established by the International Civil Aviation Organisation and administered in Australia by the Civil Aviation Safety Authority. They provide assurance of safety while allowing the efficient and effective operation of airports. Further constraints arise as a result of the close proximity of Essendon Fields Airport, requiring any designs for Melbourne Airport to be able to safely coordinate with Essendon operations.

The flight paths presented in the preliminary airspace design within this MDP consider prior experience with existing parallel runway systems in Australia; and incorporate international and Australian standards and recommended practices for the design and operation of airspace for parallel runways. Melbourne Airport and its specialist consultants have worked closely with Essendon Fields Airport, with input from Airservices, to form a view of how the ruleset would be applied to the future operation of the Melbourne Basin airspace.

In developing the preliminary airspace design, the flight paths and draft runway operating plan were subject to multiple reviews and iterations to optimise them, with the aim of minimising the unavoidable residual impacts of aircraft noise on communities. However, these concepts are by necessity preliminary. Future developments in airspace design rules, aircraft technology and navigation systems, as well as the detailed design of the future Melbourne Basin air traffic management network, could result in changes to the proposed airspace architecture prior to opening day (and after this as part of business as usual improvements).

The careful design of airspace and flight paths can improve the aircraft noise outcomes for those affected by aircraft noise and overflight, especially those living close to the airport. Section C2.6 in Chapter C2: Airspace Architecture and Capacity summarises the avoidance, mitigation and management measures incorporated into the design of the preliminary airspace and flight paths including:

- Maximum overflight of green spaces, industrial areas and other sites less sensitive to aircraft noise
- A distribution of the noise to avoid, where possible, particular communities having to bear an unfair share of the overflights
- Facilitating take-off and landing procedures that minimise the impact of overflight, for example by allowing Continuous Descent Operations (CDO). Aircraft approaching on a CDO maintain a more constant – and lower – level of engine power through not intermittently increasing power to level off their approach. This means the approach is quieter and more fuel efficient
- Aligning flight paths with the existing flight paths where possible to minimise the extent of newly overflown homes and community facilities.

D4.7.4.2 Information provision and community engagement initiatives

Notwithstanding the design limitations outlined above, in order to allow communities to have constructive input into the design process it is important that the constraints be well understood. Accordingly, Melbourne Airport has begun a process of information sharing through online engagement forums. As airspace design moves from the conceptual stage to detailed design, this process of information sharing and engagement will continue.

Melbourne Airport will also give specific consideration to the impacts of overflight on community facilities such as schools, sporting venues, hospitals, aged care facilities and other community assets that might be sensitive to noise. Where it is not possible to avoid overflight, Melbourne Airport will engage with the management of those facilities to provide information on the impacts of overflight, and on measures that facilities can take to reduce the annoyance and disruption that can come from that overflight.

D4.7.5 Impact specific strategies: ground-based noise and vibration impacts

With respect to operational noise from aircraft, there are established procedures which are successfully applied and which will be maintained once M3R is operational (e.g. the engine ground-running procedure).

While the assessment has shown that additional or enhanced mitigation is not required, due to the minimal increase in operational ground based noise associated with the new runway, additional procedures will be developed that will assist in formalising good practice at the airport including:

- Airport Collaborative Decision Making (A-CDM) – operating efficiency of the airport will be maintained by ensuring that any delays which may result in aircraft being held on the ground are minimised as far as is practicable, which will help to reduce noise and other emissions from ground operations. An example would be to hold aircraft at stand rather than at a taxiway intersection or runway hold point. This is an Airservices Australia initiative to improve information sharing and resultant decision making between Airservices, the airport and airlines
- A number of specific restrictions are imposed on taxiing and APU operation (i.e. use of fixed electrical ground power in preference to APU running) and on engine ground-running maintenance procedures, all of which limit the amount of ground noise which might otherwise occur, particularly at night.

As identified in Chapter C4: Aircraft Noise and Vibration, the vibration effects from overflight only occur in very high-level noise zones (those receiving noise at over 90 A-weighted decibels). Given that there is not expected to be any increase in the small number of properties in this zone, the existing processes for management of this issue will be retained.

D4.7.6 Impact specific strategies: landscape and visual impacts

During construction there will be a variety of visual impacts including vegetation clearing, major earthworks, plant and equipment.

A Construction Environmental Management Plan (CEMP) will be prepared and the following measures undertaken where feasible to avoid, manage and mitigate the construction impacts of M3R on the landscape and visual amenity of the project area:

- Mulch, hydro mulch or soil binder to be used to minimise impacts of open excavation where appropriate
- Set construction vehicles, equipment, stockpiling, asphalt, and concrete batching plants away from sensitive receptors such as occupied properties on Loemans, Operations, McNabs and Sunbury roads.

The longer-term visual and landscape impacts will include partial removal of the Grey Box Woodland and an increase in total area under pavement. There will also be an increase in lighting during the night, and an increase in the number of aircraft approaching and departing the airport. However, the impact of these changes is lessened due to the existing airport runways and terminals already being visible in views towards the site, and by the restricted visibility of the site due to vegetation to the north and south.

There are limitations on the mitigation measures that can be adopted. Due to the operational requirements of an airport, it is not desirable to introduce planting and trees that will attract birds and wildlife. For this reason, the on-site mitigation measures will be restricted to considerations of the location and treatment of airport structures and facilities. The following additional measures will be considered:

- Possible relocation of the airport viewing area from Operations Road
- Screen planting (in accordance with obstacle limitations) to the north of the new 16R/34L runway where possible adjacent to Sunbury Road, to screen ground-level views into the airport from nearby residences at Bulla and rural areas to the north
- All planting proposed for the mitigation of landscape and visual impact will be undertaken in accordance with the Melbourne Airport Planting Guidelines (2014).

The identified mitigation measures, together with the management and monitoring arrangements that will be implemented to manage the impacts of M3R, are detailed in Chapter B12: Landscape and Visual.

D4.7.7 Impact specific strategies: traffic and transport impacts

Overall, the assessment of the construction of M3R indicates that construction traffic will have a moderately higher level of impact on the transport network.

A Construction Traffic Management Plan (CTMP) will be prepared in advance of the construction works, to provide greater clarity on the form and scale of the construction traffic, including the truck fleet that will bring plant and materials to and from the M3R works site. The CTMP will include management/mitigation measures to minimise the impact of any truck movements to and from the construction site that occur during peak periods.

On this basis, it is expected that the scale of the construction activity will be able to be managed and mitigated to the extent that it can be largely accommodated within the capacity of the existing networks with 'minor' adverse impacts.

The transport modelling shows that by 2046 the Build scenario will result in 35 per cent more public transport trips to and from the airport compared to the No Build scenario. To mitigate the impacts of M3R on the public transport network, Melbourne Airport will work with the Victorian Department of Transport (DoT) to improve network coverage, service frequencies and operating spans to meet the expected future demand.

The road-traffic analysis provides greater challenges. The operational impact analysis has indicated that the growth associated with the Build scenario, in comparison to the No Build scenario, will have negligible impact in the early years of the assessment period.

By 2031, some elements of the road network could be approaching capacity limits (under both Build and No Build scenarios) potentially resulting in some operational challenges (e.g. Tullamarine Freeway northbound traffic flows during peak periods). As M3R allows passenger growth to continue, the additional traffic flows could exacerbate these operational challenges and result in significant impacts (depending on the location) if not addressed.

While these network conditions are partly attributable to passenger growth (with or without M3R) they are also attributable to population and employment growth in the northern and north-western suburbs of Melbourne. Therefore, any need for further freeway expansions would not be solely attributable to M3R. Nevertheless, Melbourne Airport will monitor the traffic growth over the forecast period and engage with DoT (and other Victorian Government agencies) to support infrastructure benefiting airport growth and nearby development zones.

To assist in mitigating any impacts of M3R on the external road network, Melbourne Airport will work with DoT to establish a coordinated network of Intelligent Transport Systems infrastructure, particularly within the airport internal network, that is directly connected to DoT traffic management centres. This could be used to integrate with DoT's 'Managed Motorways' system to assist in demand management of traffic flows on the freeway network during peak demand periods. In the longer term, new road projects such as the Outer Melbourne Ring and the Melbourne Airport Link will reduce the reliance on the Tullamarine Freeway as the critical access route to the terminals.

Melbourne Airport strongly supports a passenger rail service between Melbourne city centre and the airport to provide reliable travel times for public transport users, encourage mode shift, and facilitate future growth. The Victorian Government has indicated that construction will begin in 2023 with a target completion date of 2029, subject to relevant Victorian and Commonwealth planning, environment and other government approvals.

The identified mitigation measures together with the management and monitoring arrangements will be implemented to manage the impacts of M3R-generated traffic and potentially improve the level of impact identified in the assessment contained in Chapter B8: Surface Transport.

D4.7.8
Impact specific strategies: air quality impacts

Construction dust impacts were assessed for PM_{10}, $PM_{2.5}$ and Total Suspended Particulates (TSP) at the airport during the construction phase. Sources of dust emissions were quantified based on a worst-case scenario. Modelling was undertaken using Victoria's regulatory air dispersion model AERMOD, and demonstrated predicted peak concentrations of PM_{10} and TSP excluding background were below their respective criteria at sensitive receptors (residences) to the north and south of the airport boundary. While modelling is considered conservative and impacts are likely to be lower, Melbourne Airport will apply additional dust suppression measures (such as avoiding the confluence of worst-case conditions during specific construction activities) to achieve compliance with the standards.

Results of the modelling of airport operations demonstrated compliance with all air quality criteria for all scenarios beyond the airport boundary, except for one scenario (NO_2 in 2046). For this scenario, concentrations above the ambient air quality criteria were observed beyond the airport boundary to the south of the proposed new runway, however no sensitive receptors were affected.

Melbourne Airport will pursue the following strategies to minimise the impact of M3R operations on air quality:

- Continue to install fixed electrical ground power and pre-conditioned air with appropriate agreement from airlines for reducing the use of their aircraft APUs on stands/terminals
- Discourage certain high-emitting types of aircraft via a landing emission charge with appropriate agreement from airlines, (i.e. engine-related charging)
- Encourage single or reduced engine taxiing
- Encourage the use of alternative aircraft taxiing operations (e.g. main engine starts nearer the runway rather than at the terminal or stand)
- Encourage ground handlers to use electric vehicles/ equipment where feasible (electric charging infrastructure is required). Alternatively, a replacement program ensures that only low-emissions equipment is introduced to the airport
- Provide park-and-ride services to reduce the need for road traffic access – where parking is situated in an area that is not considered at risk in terms of air quality and potentially limited to low emission vehicles.

It is important to note that the air quality assessments do not include assumptions about improvements in emissions from motor vehicles and aircraft. With this in mind, Melbourne Airport's program of air quality monitoring, both on and off airport, will be critical to informing future evolution of air quality management strategies.

For more detail see **Chapter B10: Air Quality**.

D4.7.9
Harnessing opportunities and benefits

D4.7.9.1
Jobs and economic development

The total construction cost of M3R is expected to be $1.8 billion. These costs will be incurred between 2020 and 2026 inclusive, with the bulk of the spend occurring in 2023–25. Airservices Australia will also incur significant costs associated with infrastructure and equipment through the construction period. During the construction an additional 650+ construction-related jobs are expected to be created in the Melbourne Airport local area. There will be flow-on impacts to other industries in the area, including accommodation and food services, retail trade and transport, postal and warehousing.

Following this, once the new runway is operational, the economic activity associated with Melbourne Airport will grow progressively as air traffic demand grows and the increased capacity provided by the new runway enables this greater demand to be met. International and domestic tourism are expected to grow faster under the Build scenario than the No Build scenario. **Figure D4.9** shows Victoria's Gross State Product in millions of dollars and employment in thousands of people from 2026-46 under the Build scenario and the percentage change or increase this represents over a No Build scenario.

The health impact assessment prepared for this MDP identifies that a person's economic status has a significant bearing on their health and wellbeing, and that whether or not they have a job is a key socio-economic indicator. The delivery of significant numbers of jobs would therefore have a beneficial impact on health and wellbeing outcomes. These health and wellbeing outcomes arise from individual, family and community health gains and the avoidance of indirect mortality associated with improved economic outcomes for individuals and their families. These are likely to be even more beneficial in the recovery period following the COVID-19 pandemic.

For more information about the positive impact that employment has on people's health and wellbeing see **Chapter D3: Health Impact**.

D4.7.9.2
Potential to adopt new technologies for airspace design and operation

Australia's widespread early adoption of international initiatives towards new aircraft-navigation technologies means that the aircraft fleet is already well equipped to take best advantage of any update to international rules governing airspace design and operation. Over time, this may lead to further opportunities to improve aircraft noise outcomes near Melbourne Airport but such opportunities have not been considered in the current assessment.

Table D4.9
Economic impact analysis findings: Victoria ($m) (Source: Centre of Policy Studies, 2020)

Analysis criteria	Opening		+5 years		+16 years		+20 years	
	$m	% change	$m	% change	$m	% change	$m	% change
Real GSP	476,370	0	554,768	0.07	643,202	0.19	851,978	0.54
Employment (thousands of persons)	3,492	0	3,722	0.11	4,195	0.62	4,429	0.84

D4.7.10
Monitoring and continual improvement

The social impacts of aviation as described in this analysis are many and varied, although the direct impact of aircraft noise is most prominent. All impacts of the construction and operation of M3R will be subject to detailed monitoring. This includes the use of Airservices' aircraft overflight noise monitoring, Melbourne Airport's air quality monitoring, environmental monitoring as a key element of the CEMP, additional air quality and noise monitoring during construction and importantly, monitoring of feedback from the public. Social impacts cannot be fully monitored without careful regard to society's responses. This monitoring will take the form of complaint monitoring, engagement through forums such as the CACG meetings, public forums, and published and social media monitoring.

Noise monitoring and improvement will also continue through the formal processes for Melbourne Airport's five-yearly Master Plan. This applies most particularly to reviewing the impact of property development within noise contours around the airport.

The airport's environmental management relating to air quality was developed further in 2019 through an update to the Air Quality Monitoring Program, in support of the Environment Strategy published in the 2018 Master Plan. The 2022 Airport Environment Strategy has been drafted as part of the 2022 Master Planning process.

A Cultural Heritage Management Plan is already in development in consultation with relevant groups and experts based on an assessment of Indigenous heritage values on the site. The Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation is a key partner in the development and implementation of this plan. Management of the European heritage sites will include ongoing consultation with historical societies, experts and Heritage Victoria (HV) based on a separate assessment of this heritage.

D4.8
CONCLUSION

Melbourne Airport is a key economic generator and social connector for the Greater Melbourne area and state of Victoria. The airport is currently Australia's second busiest passenger airport and the main aviation hub for southern Australia. In the 12 months to June 2019, Melbourne Airport facilitated the movement of 37.3 million passengers. In the 2019 financial year, 308,947 tonnes of air freight passed through Melbourne Airport, representing 35 per cent of Australia's total export freight market (APAC, 2019).

The population and related economic and social activity in the Greater Melbourne area is growing and with this comes the demand for increased aviation capacity for passenger and freight transport. A four-runway system was envisaged for Melbourne Airport when it was developed in the 1960s. Melbourne Airport has been actively planning for its expanded runway system since 1990. The M3R implements one of two additional runways planned for Melbourne Airport. This proposal will establish a parallel north/south runway system that would become the dominant direction for air traffic flow at Melbourne Airport instead of the current mix of north/south and east/west traffic.

Melbourne Airport is recognised in Plan Melbourne as a key transport gateway for the state. Transport gateways are economic and employment centres, playing a significant economic and employment generating role for the region, state and country. The construction and operation of M3R is forecast to add over 4.5 billion dollars a year to Victoria's GSP by 2046. Prior to the impact of COVID, the airport's operations directly supported 18,567 jobs which would grow to 30,837 by 2046 of which over 2,000 jobs would be attributable to M3R.

Modelling has demonstrated that the current Melbourne Airport runways will not be able to cope with the increase in aircraft movements that will come with the growth of Victoria's economy and population. This will be the case most particularly at peak times in the morning and evenings, when there are a large number of domestic flights for business as well as the arrival of many international flights. Without M3R, by 2026 delays caused by limitations in runway capacity would reach an average of 15 minutes across the day. When conditions restricted the airport to single runway operations, this average delay would stretch to 40 minutes.

From a ground-based perspective, construction of M3R would lead to a range of amenity-related impacts (such as air quality, traffic and transport, visual amenity and ground based noise) for areas very close to the airport.

As the majority of sensitive receivers are at least one kilometre away from the development footprint, the potential for social impacts associated with construction activities is low. There may be moderate to minor adverse impact on road transport in the local vicinity of the airport, and on arterial roads elsewhere on the road network, from M3R construction activity. However, these temporary negative impacts would be balanced by positive impacts as a result of the creation of jobs associated with M3R. In addition to the economic benefits of job creation as described in the Chapter D3: Health Impact, employment is a key contributing factor to a person's health and wellbeing.

On opening, by 2026, M3R would change the community's exposure to aircraft noise. For this MDP the preliminary airspace design has been developed to enable impact assessment to be undertaken. A concerted effort has been made to design flight paths that avoid populated areas as much as possible to reduce on the ground noise impacts from aircraft operations. Approval for a final airspace design will be sought closer to M3R's opening year (by 2026).

The necessary outcome of parallel north/south runways is that areas to the north and south of the airport would receive more frequent noise, while areas to the east and west of the airport would see a dramatic reduction in aircraft noise. During the night, implementation of the night NAPs will place the noisiest operations over the least-populated land to the north of the airport.

On opening in 2026, it is estimated that all M3R Build scenarios would provide an increase in the number of dwellings within the N70 day & evening (6am to 11pm) equals 5 contour compared to the No Build. Option 1 provides the lowest increase (an estimated 3,866 dwellings) with Option 2 the largest, reflecting a deliberate strategy of sharing noise impacts across more homes. Mixed Mode is utilised more in 2046 to accommodate forecast demand. It is estimated that 4,903 more dwellings within the N70 day and evening (6am to 11pm) equals 5 contour compared to No Build.

However, implementation of M3R provides the opportunity to reduce the number of dwellings within the N60 five or more contour at night (11pm to 6am) using noise-preferred runway operation modes. This reduces the number of homes across Melbourne that would be exposed to noise events that may induce waking between the hours of 11pm and 6am by 34 to 55 per cent in 2026 (depending on the operational mode chosen) and 29 to 51 per cent in 2046.

As outlined in this SIA, day and evening noise impacts associated with M3R would have the greatest social impact on established urban areas to the south of the airport. Melbourne Airport takes managing impacts seriously and will work proactively with governments, airlines, Airservices, industry partners and local communities to manage these impacts. As part of the work to develop the detailed airspace design (post MDP), Melbourne Airport will continue to work proactively with stakeholders to develop a noise monitoring and management plan in which information sharing and community engagement will be key factors. This engagement will take place via the CACG, key stakeholder engagement, and ongoing community outreach programs.

In addition to mitigation actions that have been included in the infrastructure and airspace design to reduce noise as much as possible, Melbourne Airport will continue to work with the Victorian Government and local councils to implement the relevant principles and guidelines presented in the NASF to protect airport operations and the community from exposure to aircraft noise. This includes advocating for appropriate land use planning in the vicinity of the airport, using appropriate metrics to identify noise-sensitive areas, and actively discouraging development in noise-sensitive areas. The NASF, including N contours, must be considered in all planning decisions.

Table D4.10 provides a summary of the social impact assessment for M3R. Based on the significance assessment, these impacts include low, medium, high, and beneficial impacts, both temporary and permanent. The beneficial impacts – particularly relating to health resulting from reduced noise-induced awakenings and improved employment and economic activity – are considered to outweigh the negative impacts. However, this is not to disregard the impact of the negative impacts, such as noise effects, on those affected.

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Table D4.10
Impact assessment summary

Environment aspect & baseline condition	Assessment of original impact					
	Original Impact	Mitigation inherent in design/practice	Duration	Significance		
				Severity	Likelihood	Impact
Construction						
Aviation activity Disruption to aircraft movements for short periods	Reduced availability of flights, delays on-airfield	Minimised construction interruptions and scheduling for low traffic times	Short-term	Minor	Likely	Medium
Employment Direct creation of 650 construction jobs and further indirect jobs	Employment opportunities and flow-on health and social benefits	N/A	Short-term	Beneficial	Almost certain	Beneficial
Road access to airport Existing traffic volumes (See also **Chapter B8: Surface Transport**)	Additional truck trips introduced to northern and southern road networks	Careful construction management planning through construction Traffic Management Plan (CTMP)	Short-term	Minor	Almost certain	Medium
Support services Local businesses will benefit from construction activity	Increased local activity related to staff (e.g. cafes, accommodation, transport, equipment hire)	N/A	Short-term	Beneficial	Likely	Beneficial

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Mitigation and/or management measures	Assessment of residual impact					
	Residual Impact	Duration	Significance		
			Severity	Likelihood	Impact
Construction (cont.)					
Advance notice to airlines -enabling appropriate scheduling	Minor delays	Short-term	Negligible	Likely	Negligible
Beneficial – no mitigation required					
Refinement and application of CTMP. Ongoing assessment of road performance and liaison with DoT and local governments	Continual improvement of CTMP if/when opportunity identified	Short-term	Negligible	Unlikely	Negligible
Beneficial – no mitigation required					

Environment aspect & baseline condition (cont.)	Assessment of original impact (cont.)					
	Original Impact	Mitigation inherent in design/practice	Duration	Significance: Severity	Significance: Likelihood	Significance: Impact
Construction (cont.)						
Community initiatives New (and continued) community activities	Opportunity to build community engagement, and awareness of the project	N/A	Short-term	Beneficial	Possible	Beneficial
Aircraft noise and overflights 'Unusual' flight paths during construction	Temporary changes to flight paths due to changed use of the airport for construction – 'unusual' overflight noise	Temporary and small-scale requirement - construction planning shall minimise requirement	Short-term	Minor	Possible	Low
Ground-based noise and vibration Noise/vibration resulting from construction site (See also Chapter B9: Ground-based noise and vibration)	Impacts anticipated similar to regular airport operations – potential community annoyance and concern	Noise Construction management planning to minimise (use daytime as much as possible, barriers/enclosures, etc) – noting site generally remote from community	Short-term	Minor to Moderate	Likely	Medium
		Vibration Construction management planning to minimise (use daytime as much as possible) – noting site generally remote from community	Short-term	Negligible	Possible	Negligible
Landscape and visual amenity Construction will be visible from a number of viewpoints (See also **Chapter B12: Landscape and Visual**)	Potential community annoyance and concern.	Construction planning has considered visual amenity (siting depots, etc.)	Short-term	Moderate (max.)	Likely	Medium
Air quality Dust and pollutants from construction activities and vehicles (See also **Chapter B10: Air Quality**)	Modelling indicates potential impacts for sensitive receptors north of airport - below levels of health concern	Construction management includes dust suppression and traffic management to reduce unnecessary pollution	Short-term	High (max.)	Likely	High
Heritage Known Indigenous and European sites located in impact area (See also **Chapter B6: Indigenous Cultural Heritage** and **Chapter B7: European Heritage**)	Some heritage sites will be affected – potential discovery of new sites during construction	Approved Cultural Heritage Management Plan (CHMP) and salvage protocols to be followed – values to be recorded and preserved wherever possible	Short-term	High (max.)	Almost Certain (max.)	Extreme
Operation						
Access for people and goods Increased aviation capacity meet demand	Melbourne Airport will avoid the delays, cancellations and unavailability of flights that it otherwise faces	N/A	Permanent	Beneficial	Almost certain	Beneficial
Employment Airport and operational jobs (direct) and diffuse (Victorian) related industries (initially 500 p/a increasing to 2000+ p/a)	Beneficial economic and social outcomes for communities near the airport and beyond, including Victoria in general	N/A	Permanent	Beneficial	Almost certain	Beneficial
Infrastructure and services Support for Victorian economy and enabler of economic growth.	Positive impact - increased economic activity for aviation business (direct) and diffuse Victorian related industries and general economy (indirect)	N/A	Permanent	Beneficial	Almost certain	Beneficial

Mitigation and/or management measures (cont.)	Assessment of residual impact (cont.)				
	Residual Impact	Duration	Significance		
			Severity	Likelihood	Impact
Construction (cont.)					
Beneficial – no mitigation required					
Advice to community through public announcement if significant	Information to public will allay many concerns	Short-term	Negligible	Unlikely	Negligible
Enhanced noise management (especially at night) – communication with community	Information to public will allay many concerns	Short-term	Minor	Possible	Low
No further mitigation required					
Ongoing review of construction management, responsiveness to community comments	Assurance to communities that impacts being kept to minimum	Short-term	Moderate (max.)	Likely	Medium
Monitor dust and pollution and improve management if needed	Continual improvement of CTMP if/when opportunity identified	Short-term	Moderate (max.)	Possible	Medium
Monitoring during construction to manage any unforeseen heritage sites/issues	Some impact on sites will be unavoidable – heritage protocols to salvage/preserve shall minimise loss	Short-term	High	Almost Certain	High
Operation (cont.)					
Beneficial – no mitigation required					
Beneficial – no mitigation required					
Beneficial – no mitigation required					

Environment aspect & baseline condition (cont.)	Assessment of original impact (cont.)					
	Original Impact	Mitigation inherent in design/practice	Duration	Significance: Severity	Significance: Likelihood	Significance: Impact
Operation (cont.)						
Community initiatives Melbourne Airport engagement within its local area	Melbourne Airport already has a range of community programs and will look for new initiatives - building social cohesion, and community support	N/A	Permanent	Beneficial	Possible	Beneficial
Aircraft noise (day) Increased and new daytime populations affected by aircraft noise	While there are benefits for some communities, significant impacts are projected for communities receiving increased and/or new noise (e.g. communication interference, annoyance)	Flight paths designed to minimise impacts on residential areas where possible Engagement with community to identify preferred operating mode/s, information sharing, ongoing community engagement	Permanent	Major	Almost certain	Extreme
Aircraft noise (night) Reduced night noise for some communities (east-west of airport) but both new and increased impacts for some communities (north-south of airport)	Changed flight activity (opening – 2026) will introduce change noise environment – traffic increase to 2046 will realise community impacts (e.g. sleep disturbance)	Flight paths designed to minimise impacts on residential areas where possible Engagement with community to identify preferred operating modes, information sharing, ongoing community engagement	Permanent	Major	Almost certain	Extreme
Overflight Overflight extends well beyond the noise contours and can affect sensitive individual	Can create concern over crashes, and over property value (shown not to be affected) as well as extend noise concerns to sensitive individuals (beyond noise impact contours)	Information sharing and engagement to address misinformation and provide assurance of safety, noise mitigation, and maintenance of property values	Permanent	Moderate	Likely	Medium
Ground-based noise and vibration There will be some ground-based noise and vibration reaching beyond the airport boundary (See also **Chapter B9: Ground-based Noise and Vibration**)	This noise and vibration can annoy some close neighbours of the airport but does not have any health impacts	Layout of airport considers these issues. Ongoing engagement and information sharing assists in reducing annoyance.	Permanent	Minor	Likely	Medium
Landscape and visual amenity Expansion of airport infrastructure will increase impact on landscape and visual amenity (See also **Chapter B12: Landscape and visual**)	The new runway and associated infrastructure will impact on the landscapes as seen from various viewing sites off airport	Planting, offsets and and other post-construction rehabilitation will reduce these impacts	Permanent	Minor	Likely	Medium
Traffic and transport Congestion on surrounding road infrastructure is already substantial (See also **Chapter B8: Surface Transport**)	Travel time on roads (including buses and taxis) is already increased by peak hour loads	This infrastructure is not part of the airport, and therefore requires engagement with local, state and federal governments Various improvement plans have been detailed by Governments	Permanent	Moderate	Possible	Medium
Air quality M3R will not result in, nor contribute to health standards for air quality being exceeded (with one very limited exception) (See also **Chapter B10: Air Quality**)	Health impacts of air pollution are assessed as negligible, although there may be perceived concerns which can cause annoyance	Ongoing air quality monitoring and information sharing	Permanent	Negligible	Unlikely	Negligible

Mitigation and/or management measures (cont.)	Assessment of residual impact (cont.): Residual Impact	Significance: Duration	Severity	Likelihood	Impact
Operation (cont.)					
Beneficial – no mitigation required					
Responsiveness to community engagement where possible, ongoing information sharing, engagement with community facilities affected Melbourne Airport will continue to work proactively with stakeholders to develop a Noise Monitoring and Management Plan based on the ICAO 'Balanced Approach' to managing aircraft noise Advocate for implementation of NASF guidelines	Opportunity during detailed airspace design (and post-operation) to identify further mitigation opportunities and further reduce noise impacts Community engagement feedback on segregated mode options to be considered in final detailed airspace design	Permanent	High	Likely	High
Responsiveness to community engagement where possible, ongoing information sharing, engagement with community facilities affected Melbourne Airport will continue to work proactively with stakeholders to develop a Noise Monitoring and Management Plan based on the ICAO 'Balanced Approach' to managing aircraft noise Advocate for implementation of NASF guidelines	Opportunity during detailed airspace design (and post-operation) to identify further mitigation opportunities and further reduce noise impacts Community engagement feedback on segregated mode options to be considered in final detailed airspace design	Permanent	High	Likely	High
Ongoing engagement and information sharing enhanced by feedback (including complaints) for continuous improvement in information presentation and consideration of new mitigation options	Can reduce concerns based on lack of information of lack of readily accessible information but some concerns will remain	Permanent	Minor	Possible	Low
Ongoing engagement can identify further opportunities for amelioration both by airport and affected community	Can reduce some impacts but some concerns will remain	Permanent	Minor	Possible	Low
Ongoing engagement can identify further opportunities for amelioration by airport (including viewing areas for enthusiasts, on- and off-airport offset sites)	There is limited scope to address concerns due to safety requirements limiting planting options near runways	Permanent	Minor	Possible	Low
Ongoing engagement with governments at all levels can identify continuous improvement opportunities, particularly when linked to technology advances	Ongoing peak hour traffic disruption and be anticipated	Permanent	Minor	Unlikely	Low
Responsiveness to monitoring results and community engagement	Unforeseen impacts can be addressed	Permanent	Negligible	Rare	Negligible

APPENDIX D4.A
COMMUNITY FACILITY LIST

LGA	Grouping	Name	N-above Metric
City Of Brimbank	Aged Care	Cumberland Manor	N60 Night
			N70 Day & Evening
		Doutta Galla Grantham Green Aged Care Facility	N70 Day & Evening
		Fronditha Thalpori Aged Care Services - St Albans	N70 Day & Evening
		Mekong Cairnlea Vietnamese Aged Care	N70 Day & Evening
		Villa Maria Catholic Homes St Bernadettes Aged Care Residence	N60 Night
			N70 Day & Evening
	Child Care Centres and Kindergartens	Big Childcare - Keilor Ps Oshc	N70 Day & Evening
		Big Childcare - Overnewton Acc Keilor Oshc	N70 Day & Evening
		Big Childcare - St Augustines Ps Oshc	N70 Day & Evening
		Camp Australia - Holy Eucharist School Oshc	N70 Day & Evening
		Camp Australia - St Albans East Primary School Oshc	N70 Day & Evening
		Camp Australia - St Bernadettes Primary School Oshc	N70 Day & Evening
		Cradles To Crayons Early Learning Centre	N70 Day & Evening
		Dorothy Carlton Preschool	N70 Day & Evening
		Epalock Crescent Kindergarten	N70 Day & Evening
		Goodstart Early Learning Kealba	N70 Day & Evening
		Goodstart Early Learning Keilor Village	N70 Day & Evening
		Jackson School Theircare	N70 Day & Evening
		Jindi Woraback Childrens Centre	N70 Day & Evening
		Kealba Kindergarten	N70 Day & Evening
		Keilor Basketball Stadium Creche	N70 Day & Evening
		Keilor Gatehouse	N70 Day & Evening
		Keilor Park Preschool	N70 Day & Evening
		Keilor Village Preschool	N70 Day & Evening
		Kelly Club Oshc Albion North Primary School	N70 Day & Evening
		North Sunshine Kindergarten	N70 Day & Evening
		Phoenix Street Childrens Centre	N70 Day & Evening
		Pink Lotus Family Day Care P/L	N70 Day & Evening
		Shine Early Learning St Albans	N70 Day & Evening
		Southwold Street Kindergarten	N70 Day & Evening
		St Albans East Preschool	N70 Day & Evening
		St Albans Main Road East Early Learning Centre	N70 Day & Evening
		St Albans Meadows Ps Oshc - Extend	N70 Day & Evening
		St Mary Of The Assumption Oshc Kealba	N70 Day & Evening
		The Hive Early Learning Centre Sunshine	N70 Day & Evening
		U Park Ps Theircare	N70 Day & Evening
		Willis Street Kindergarten	N70 Day & Evening

	2026				2046			
	No Build	Mixed Mode	Option 1	Option 2	No Build	Mixed Mode	Option 1	Option 2
	5-9	10-19	10-19	10-19	5-9	20-49	20-49	10-19
		5-9	10-19	5-9		5-9	5-9	5-9
		10-19	10-19	10-19				5-9
	5-9	5-9	5-9	5-9				
				5-9				
		5-9	5-9			5-9	5-9	5-9
	10-19		10-19	5-9				
	20-49	100-199	200+	100-199		200+	200+	200+
		20-49	20-49	50-100		50-100	50-100	50-100
		10-19		20-49		5-9	5-9	5-9
		10-19		10-19		5-9	5-9	5-9
		10-19		10-19				
		5-9				5-9	5-9	
		10-19		20-49		10-19	5-9	10-19
	10-19		10-19	5-9				
		10-19		5-9				
		20-49		20-49		20-49	20-49	20-49
	20-49	100-199	200+	100-199	5-9	100-199	100-199	100-199
		10-19	5-9	10-19				
		5-9		10-19				
		20-49		20-49		20-49	20-49	20-49
	20-49	50-100	50-100	50-100	20-49	50-100	50-100	50-100
		20-49	10-19	20-49		20-49	20-49	20-49
	10-19	20-49	50-100	50-100		5-9	5-9	10-19
	10-19	100-199	200+	100-199		200+	200+	200+
	5-9		10-19	5-9				
		5-9	5-9			5-9	5-9	5-9
		5-9	5-9			5-9	5-9	5-9
		10-19		10-19		5-9	5-9	5-9
		10-19		20-49		5-9	5-9	10-19
		10-19		20-49		10-19	5-9	10-19
		10-19		20-49		10-19	5-9	10-19
		5-9		10-19				
		10-19	5-9	10-19		5-9	5-9	5-9
		10-19		20-49		10-19	10-19	10-19
		5-9	5-9			5-9	5-9	5-9
		10-19		10-19		5-9		5-9
		10-19		10-19		5-9		5-9

LGA (cont.)	Grouping (cont.)	Name (cont.)	N-above Metric (cont.)
City Of Brimbank (cont.)	Community Centres and Neighbourhood Houses	Biggs Street Community Centre	N70 Day & Evening
		Dempsterpark Hall	N70 Day & Evening
		Good Shepherd Community House	N70 Day & Evening
		Grantham Green Hall	N70 Day & Evening
		Green Gully Sports Pavilion	N70 Day & Evening
		Kealba Hall	N70 Day & Evening
		Keilor Community Hub	N70 Day & Evening
		Keilor Park Community Hall	N70 Day & Evening
		Old Shire Hall	N70 Day & Evening
		Overnewton Gatehouse Hall	N70 Day & Evening
		St Albans Community Centre	N70 Day & Evening
		St Bernadettes Community Centre	N70 Day & Evening
	Hospitals	Dr Scope	N60 Night
		Fresenius Medical Care Sunshine Dialysis Clinic	N70 Day & Evening
		Keilor Private	N60 Night
			N70 Day & Evening
		Sunshine Hospital	N70 Day & Evening
		Sunshine Private Day Surgery	N70 Day & Evening
	Libraries	Keilor Community Hub/Keilor Library	N70 Day & Evening
		Keilor Library	N70 Day & Evening
	Places of Worship	Melbourne Murugan Temple	N70 Day & Evening
		Brimbank Anglican Church	N70 Day & Evening
		Cypriot Turkish Islamic Community	N70 Day & Evening
		Cyprus Turkish Islamic Community	N70 Day & Evening
		Holy Eucharist Parish	N70 Day & Evening
		Keilor City Church	N70 Day & Evening
		Keilor Downs Christian Church "The House Of Prayer" Inc	N70 Day & Evening
		Keilor Uniting Church In Australia St Stephen	N70 Day & Evening
		Melbourne Murugan Temple	N70 Day & Evening
		Seventh Day Adventist Reform Movement	N70 Day & Evening
		St Bernadettes	N70 Day & Evening
		Sunshine Polish Charity Association Inc	N70 Day & Evening
		Uniting Church Keilor	N70 Day & Evening
	Schools and Education Facilities	Albion North Primary School	N70 9am-3pm
		Furlong Park School For Deaf Children	N70 9am-3pm
		Keilor Primary School	N70 9am-3pm
		Overnewton Anglican Community College	N70 9am-3pm
		Overnewton Anglican Community College - Keilor Main Campus	N70 9am-3pm
		St Albans East Primary School	N70 9am-3pm
		St Albans East Primary School - St Albans East Deaf Facility	N70 9am-3pm
		St Albans Heights Primary School	N70 9am-3pm
		St Albans Meadows Primary School	N70 9am-3pm

	2026 (cont.)				2046 (cont.)			
	No Build	Mixed Mode	Option 1	Option 2	No Build	Mixed Mode	Option 1	Option 2
		5-9		10-19				
		5-9	5-9			5-9	5-9	5-9
		10-19		20-49		10-19	10-19	10-19
		5-9	10-19	10-19				
		5-9		5-9				
		20-49		20-49		20-49	20-49	20-49
	5-9	100-199	200+	100-199		200+	200+	200+
	10-19	20-49	20-49	20-49		5-9	5-9	10-19
	10-19	100-199	200+	100-199		200+	200+	200+
		10-19		20-49		10-19	10-19	10-19
				10-19				
	10-19		10-19	5-9				
		10-19	10-19	5-9		10-19	10-19	5-9
	5-9		10-19	10-19				
	5-9	20-49	20-49	10-19	5-9	20-49	20-49	20-49
	10-19	100-199	200+	100-199		200+	200+	200+
	5-9	5-9	10-19	10-19				
	5-9		10-19	10-19				
	10-19	100-199	200+	100-199		200+	200+	200+
	10-19	100-199	200+	100-199		200+	200+	200+
	10-19	20-49	50-100	20-49		50-100	50-100	50-100
	100-199	200+	100-199	100-199	100-199	200+	200+	200+
				5-9				
				5-9				
		10-19		10-19		5-9	5-9	5-9
	100-199	200+	100-199	100-199	100-199	200+	200+	200+
		5-9		10-19				
	20-49	100-199	200+	100-199		100-199	200+	100-199
	10-19	20-49	50-100	20-49		50-100	50-100	20-49
	10-19	20-49	50-100	50-100			10-19	20-49
		5-9				5-9	5-9	
			5-9					
	20-49	100-199	200+	100-199		100-199	200+	100-199
			5-9					
	5-9		5-9					
	10-19	20-49	50-100	50-100		50-100	50-100	50-100
		10-19	10-19	20-49		20-49	20-49	20-49
		10-19	10-19	20-49		20-49	20-49	20-49
				5-9				
				5-9				
		5-9		5-9				
				5-9				

LGA (cont.)	Grouping (cont.)	Name (cont.)	N-above Metric (cont.)
City Of Brimbank (cont.)	Schools and Education Facilities (cont.)	St Albans Secondary College	N70 9am-3pm
		St Augustines Primary School	N70 9am-3pm
		St Pauls Kealba Catholic School	N70 9am-3pm
	Senior Citizens	Green Gully Reserve	N70 Day & Evening
		St Bernadette Community Centre	N70 Day & Evening
		Stacc	N70 Day & Evening
City of Hobsons Bay	Aged Care	Altona Gardens Care Community	N60 Night
		Florence Age Care	N60 Night
		Marina Residential Aged Care Service	N60 Night
		Squires Place	N60 Night
		Tlc Marina Aged Care	N60 Night
City of Hume	Aged Care	Baptcare Brookview Community	N60 Night
		Estia Health Coolaroo	N60 Night
	Child Care Centres and Kindergartens	Attwood Child Care Centre And Kindergarten	N70 Day & Evening
		Attwood House Community Centre	N70 Day & Evening
		Big Childcare - Mickleham Primary School Oshc	N70 Day & Evening
		Camp Australia - Holy Child Primary School - Dallas Oshc	N70 Day & Evening
		Camp Australia - Sirius College - Dallas Campus Oshc	N70 Day & Evening
		Coolaroo South Kindergarten At Coolaroo South Primary School	N70 Day & Evening
		Creative Garden Early Learning Tullamarine	N70 Day & Evening
		Dallas Kindergarten At Dallas Brooks Community Primary School	N70 Day & Evening
		Ilim Learning Sanctuary - Dallas	N70 Day & Evening
		Kids Haven Childcare	N70 Day & Evening
		Quality Care Family Day Care	N70 Day & Evening
		Tullamarine Early Learning Centre	N70 Day & Evening
		Upfield Kindergarten At Dallas Brooks Community Primary School	N70 Day & Evening
		Westmere Childrens Services Centre	N70 Day & Evening
		Westmere Children's Services Centre	N70 Day & Evening
	Community Centres and Neighbourhood Houses	Redstone Hill Comm Centre South (Proposed Development)	N70 Day & Evening
		Attwood Neighbourhood House	N70 Day & Evening
		Dallas Community Hall	N70 Day & Evening
		Future Yellow Gum Community Centre (2036/37)	N70 Day & Evening
		Jack Mckenzie Bulla Community Centre	N70 Day & Evening
		Jack Mckenzie Community Centre	N70 Day & Evening
		Lancefield Road Psp - Community Facility (Proposed Development)	N70 Day & Evening
		Lancefield Road Psp - Community Facility (Proposed Development)	N70 Day & Evening
		Mickleham Community Centre	N70 Day & Evening
		Yellow Gum Comm Centre 2036/37	N70 Day & Evening
	Maternal & Child Health Centres	Westmere Childrens Services Centre	N70 Day & Evening

	2026 (cont.)				2046 (cont.)			
	No Build	Mixed Mode	Option 1	Option 2	No Build	Mixed Mode	Option 1	Option 2
				5-9				
		5-9		5-9				
		5-9		5-9		5-9	5-9	5-9
		5-9		5-9				
	10-19		10-19	5-9				
				5-9				
	5-9	5-9	5-9	5-9	5-9	5-9	5-9	10-19
	5-9				5-9			
	10-19			5-9	10-19			10-19
	5-9				5-9			
	5-9			5-9	5-9	5-9	5-9	10-19
	5-9				10-19			
	5-9				5-9			
	100-199				100-199			
	20-49				20-49			
		5-9	5-9					
	100-199				100-199			
	100-199				100-199			
	20-49				10-19			
	5-9				5-9			
	50-100				20-49			
	5-9							
	20-49				20-49			
	5-9							
	10-19	20-49	20-49	10-19				
	50-100				20-49			
	100-199				50-100			
	100-199				50-100			
		5-9		5-9		5-9		5-9
	10-19				10-19			
	5-9							
		5-9	10-19	10-19		5-9	5-9	5-9
		20-49		50-100		10-19	10-19	10-19
		20-49		50-100		10-19	10-19	20-49
		5-9	10-19	10-19			5-9	5-9
		5-9	10-19	10-19			5-9	5-9
		5-9	5-9					
		5-9	10-19	10-19		5-9	5-9	5-9
	100-199				100-199			

LGA (cont.)	Grouping (cont.)	Name (cont.)	N-above Metric (cont.)
City of Hume (cont.)	Places of Worship	Australian Islamic Cultural Centre	N70 Day & Evening
		Broadmeadows Mosque	N70 Day & Evening
		Melbourne International Airport Musala	N70 Day & Evening
		St Marys Anglican	N70 Day & Evening
	Schools and Education Facilities	Attwood Police Complex	N70 9am-3pm
		Dallas Brooks Community Primary School	N70 9am-3pm
		Holy Child School	N70 9am-3pm
		Hume Valley School - Narrun Campus	N70 9am-3pm
		Ilim College - Dallas Campus	N70 9am-3pm
		Parkville College	N70 9am-3pm
		Sirius College - Dallas Campus	N70 9am-3pm
		Sirius College - Meadow Fair Campus	N70 9am-3pm
		Westmere Crescent Preschool	N70 9am-3pm
	Senior Citizens	Lynda Blundell Centre	N70 Day & Evening
		Lynda Blundell Seniors Centre	N70 Day & Evening
City of Maribyrnong	Aged Care	Footscray House	N60 Night
	Child Care Centres and Kindergartens	Cherry Crescent Preschool	N70 Day & Evening
		Goodstart Early Learning Braybrook	N70 Day & Evening
		Kelly Club Oshc Christ The King Primary School	N70 Day & Evening
	Community Centres And Neighbourhood Houses	Braybrook Maidstone Neighbourhood House	N70 Day & Evening
	Places of Worship	Quang Minh Buddhist Temple	N70 Day & Evening
	Schools and Education Facilities	Rosamond Special School	N70 9am-3pm
City of Moonee Valley	Aged Care	Blue Cross Riverlea Aged Care	N60 Night
			N70 Day & Evening
		Cyril Jewel House	N60 Night
			N70 Day & Evening
		Doutta Galla Aged Care	N60 Night
			N70 Day & Evening
		Edenvale Manor	N60 Night
			N70 Day & Evening
		Former Milleara Primary School	N60 Night
			N70 Day & Evening
		Holloway Hostel	N60 Night
			N70 Day & Evening
		Mekong Senior Citizens	N60 Night
			N70 Day & Evening
		Ron Conn Nursing Home	N60 Night
			N70 Day & Evening
		Wintringham Ron Conn Nursing Home	N60 Night
			N70 Day & Evening

	2026 (cont.)				2046 (cont.)			
	No Build	Mixed Mode	Option 1	Option 2	No Build	Mixed Mode	Option 1	Option 2
	10-19				5-9			
	100-199				100-199			
	50-100	10-19	20-49	10-19	10-19	5-9		
		10-19		20-49				5-9
	20-49				20-49			
	20-49				10-19			
	20-49				20-49			
	5-9				5-9			
	20-49				20-49			
		5-9		5-9				
	20-49				20-49			
	5-9							
	10-19				10-19			
	100-199				100-199			
	100-199				100-199			
	5-9			5-9	5-9			5-9
		5-9	5-9	5-9		5-9		
		5-9						
		5-9						
	5-9	10-19	5-9	10-19		5-9		
		10-19	5-9	5-9				
		5-9						
	10-19	5-9	5-9	10-19	10-19	5-9	5-9	10-19
	50-100	100-199	20-49	50-100	20-49	100-199	50-100	100-199
	10-19			10-19	10-19	5-9	5-9	10-19
	20-49	50-100	50-100	20-49	5-9	20-49	20-49	20-49
	10-19	10-19	10-19	10-19	10-19	10-19	10-19	20-49
	20-49	50-100	20-49	20-49	10-19	20-49	20-49	20-49
	10-19	10-19	10-19	10-19	10-19	10-19	10-19	20-49
	50-100	100-199	50-100	50-100	50-100	100-199	100-199	100-199
	10-19			10-19	10-19	5-9	5-9	10-19
	20-49	100-199	20-49	50-100	20-49	50-100	50-100	50-100
	10-19			5-9	10-19			10-19
		20-49	20-49	10-19		5-9		
	10-19			10-19	10-19	5-9	5-9	10-19
	20-49	50-100	50-100	20-49	5-9	20-49	20-49	20-49
	10-19			5-9	10-19			10-19
	5-9	20-49	20-49	20-49		5-9	5-9	10-19
	10-19			5-9	10-19			10-19
	5-9	20-49	20-49	20-49		5-9	5-9	10-19

LGA (cont.)	Grouping (cont.)	Name (cont.)	N-above Metric (cont.)
City of Moonee Valley (cont.)	Child Care Centres and Kindergartens	A/H Heights Early Years Centre Prev 2a Clarendon	N70 Day & Evening
		Airport West Child Care Cooperative	N70 Day & Evening
		Avondale Heights Early Years Centre	N70 Day & Evening
		Bimi Early Learning And Kindergarten	N70 Day & Evening
		Community Oshc Services Avondale Heights	N70 Day & Evening
		Community Oshc Services St Martin De Porres	N70 Day & Evening
		Essendon Fields Kinder Haven	N70 Day & Evening
		Little Stars Early Education Centre	N70 Day & Evening
		Milleara Gardens Pre School	N70 Day & Evening
		Milleara Integrated Learning & Development Centre	N70 Day & Evening
		Rhonda Davis Kindergarten	N70 Day & Evening
		St Peters East Keilor Oshclub	N70 Day & Evening
	Community Centres and Neighbourhood Houses	Burley Griffin Community Centre	N70 Day & Evening
		Avondale Heights Vet Hospital	N70 Day & Evening
		H&C Dental Image	N70 Day & Evening
		Isaac Family Clinic	N70 Day & Evening
		Lakkis Optometry	N70 Day & Evening
		Medical & Laser Pain Clinic	N70 Day & Evening
		Military Road Medical Centre	N70 Day & Evening
		North Western Osteopathic Clinic	N70 Day & Evening
		St George Family Practice	N70 Day & Evening
		Total Wellness Physiotherapy	N70 Day & Evening
		Better Life Hearing Service	N70 Day & Evening
		Centreway Medical Centre	N70 Day & Evening
		Dorevitch Pathology	N70 Day & Evening
		Family Medical Centre	N70 Day & Evening
		Keilor Dental Group	N70 Day & Evening
		Ladybug House	N70 Day & Evening
		Massage Therapy Centre	N70 Day & Evening
		Medical And Dental Surgery	N70 Day & Evening
		Melbourne Pathology Keilor East	N70 Day & Evening
		Niddrie Veterinary Clinic	N70 Day & Evening
		North Western Medical Services	N70 Day & Evening
		North Western Provate Clinic	N70 Day & Evening
		Sanctum, Centre For Personal And Corporate Excellence	N70 Day & Evening
		Sole Podiatry - East Keilor	N70 Day & Evening
		Specialist Consulting Rooms, Tms Clinics Australia	N70 Day & Evening
		Specialists Consulting Rooms, Dr Sunil Datta	N70 Day & Evening
	Libraries	Avondale Heights Learning Centre & Sports Hall	N70 Day & Evening
	Maternal & Child Health Centres	Avondale Heights Maternal Child Health Centre	N70 Day & Evening

	2026 (cont.)				2046 (cont.)			
	No Build	Mixed Mode	Option 1	Option 2	No Build	Mixed Mode	Option 1	Option 2
		20-49	10-19	10-19				
			20-49	20-49				10-19
	10-19	20-49	20-49	20-49	5-9	10-19	5-9	10-19
			5-9	5-9				
		20-49	20-49	10-19		5-9		5-9
		20-49	20-49	10-19		5-9	5-9	5-9
				10-19				
		20-49	20-49	20-49		5-9	5-9	5-9
	20-49	100-199	50-100	50-100	20-49	100-199	50-100	100-199
		10-19	10-19	5-9				
	10-19	50-100	20-49	20-49	5-9	20-49	20-49	20-49
	5-9	20-49	20-49	20-49		10-19	5-9	5-9
	10-19	50-100	20-49	20-49		20-49	10-19	20-49
		20-49	20-49	10-19		5-9	5-9	5-9
		20-49	10-19	10-19				
		20-49	20-49	10-19		5-9		5-9
		10-19	10-19	5-9				
		20-49	10-19	5-9				
		5-9	5-9					
		20-49	20-49	20-49		10-19	5-9	10-19
		10-19	10-19	5-9				
		20-49	20-49	10-19		5-9		5-9
	10-19			5-9	10-19			
		10-19	10-19	5-9				
				5-9				
		10-19	10-19	5-9				
	10-19		5-9	5-9	10-19			
		5-9	5-9					
		10-19	10-19	5-9				
			5-9	10-19				
	10-19		5-9	10-19	10-19			
	5-9		5-9	10-19	5-9			
	10-19		5-9	10-19	10-19			
		5-9	5-9					
		5-9	5-9					
		5-9	5-9					
		20-49	10-19	10-19				
		20-49	10-19	10-19				
		20-49	10-19	10-19				
	10-19	50-100	20-49	20-49	5-9	20-49	20-49	20-49

LGA (cont.)	Grouping (cont.)	Name (cont.)	N-above Metric (cont.)
	Places Of Worship	Churches Of Christ Church	N70 Day & Evening
		Greek Church	N70 Day & Evening
		Salvation Fellowship Church	N70 Day & Evening
		St Christopher's Church	N70 Day & Evening
		St Martin De Porres Church	N70 Day & Evening
		St Peters Church	N70 Day & Evening
	Schools and Education Facilities	Avondale Primary School	N70 9am-3pm
		Essendon Keilor College - Niddrie Campus	N70 9am-3pm
		Niddrie Primary	N70 9am-3pm
		Penleigh Essendon Grammar	N70 9am-3pm
		St Martin De Porres Primary School	N70 9am-3pm
		St Peters School	N70 9am-3pm
City of Whittlesea	Aged Care	Estia Health Epping Vic	N60 Night
		Green Gables Private Hostel	N60 Night
		Queens Lodge	N60 Night
City of Wyndham	Correctional Facilities	Port Phillip Prison	N60 Night
Shire of Melton	Child Care Centres and Kindergartens	Diggers Rest Preschool	N70 Day & Evening
		Diggers Rest Ps Theircare	N70 Day & Evening
		Ymca Diggers Rest Early Learning Centre	N70 Day & Evening
	Maternal & Child Health Centres	Diggers Rest Maternal And Child Health	N70 Day & Evening

	2026 (cont.)				2046 (cont.)			
	No Build	Mixed Mode	Option 1	Option 2	No Build	Mixed Mode	Option 1	Option 2
	10-19				5-9			
	5-9	20-49	20-49	20-49		10-19	10-19	10-19
	5-9	20-49	20-49	20-49		5-9	5-9	5-9
			5-9	5-9				
		20-49	20-49	10-19		5-9	5-9	5-9
	5-9	20-49	20-49	20-49		10-19	5-9	5-9
		10-19	5-9	5-9				
			5-9	10-19				
			5-9	10-19				
	5-9				5-9			
		10-19	5-9	5-9				
		10-19	10-19	5-9				
					5-9			
					5-9			
	5-9				10-19			
	5-9				10-19			
		5-9		5-9				
		5-9		5-9				
		5-9		5-9				
		5-9		5-9				

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