Australian Government

Department of Infrastructure, Transport, Regional Development, Communications and the Arts

SAFER FREIGHT VEHICLES

Impact analysis of options for maximum overall width

September 2023

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Executive Summary

This Impact Analysis (IA) follows on from a Safer Freight Vehicles Discussion Paper (Commonwealth of Australia, 2021a), for which the Department of Infrastructure, Transport, Regional Development, Communications and the Arts (the department) considered information from a range of sources to identify any potential barriers or impediments in the National Road Vehicles Standards (the Australian Design Rules or ADRs) to the supply of safer and cleaner heavy freight vehicles.

The main ADR requirement raised by heavy vehicle industry groups as limiting the supply of safer and cleaner heavy freight vehicles is the 2.50 m vehicle width limit, which is the same as Japan, but narrower than other major markets including the European Union (EU) and the United States (US). The supply of safer heavy goods vehicles is further restricted by the absence in the ADRs of exclusions for various types of devices for indirect vision (i.e. mirrors and cameras) and blind spot information systems (e.g. for the detection of vehicles, bicyclists and/or pedestrians) from the measurement of vehicle width and/or length.

The purpose of this IA is therefore to consider the case for increasing the maximum allowable width for freight vehicles in Australia, together with changes to allow various devices for indirect vision (e.g. mirrors, cameras) and monitoring devices to detect other road users (e.g. blind spot information systems for the detection of vehicles, bicycles and/or pedestrians) to be excluded from vehicle width and length measurements.

The IA explores three different policy options. These are Option 1: De-regulation (repeal the current requirements); Option 2: Retain existing standards under the *Road Vehicle Standards Act 2018* (C'th) (RVSA) (business as usual); and Option 3: Implement updated standards under the RVSA. Of these options, only Option 2 and Option 3 were considered viable.

Option 3 was separated into four sub-options: 3.1a (2.55 m wide goods vehicles and trailers), 3.1b (2.55 m wide goods vehicles only), 3.2a (2.60 m wide goods vehicles and trailers), and 3.2b (2.60 m wide goods vehicles only). Each of these sub-options include additional mandatory safety ADRs and exclusions for enhanced devices for indirect vision and monitoring devices to detect other road users from vehicle width and length measurements (for further detail see Chapter 4). The benefits and costs of each of these sub-options were analysed relative to Option 2 (business as usual) in an analysis by the Australian Road Research Board (ARRB). The results of this benefit-cost analysis over a 40 year period for each of these options (assuming an intervention period of 15 years) are summarised in Table 1 to Table 3 below.

Table 1: Summary of the benefits for each option

Benefits	Option 3.1a	Option 3.1b	Option 3.2a	Option 3.2b
Safety	\$628 m	\$558 m	\$689 m	\$612 m
Asset Preservation	\$2.80 m	\$2.42 m	\$5.46 m	\$4.73 m
Vehicle Operation	\$235 m	\$208 m	\$439 m	\$389 m
Environment	\$122 m	\$108 m	\$227 m	\$201 m

Table 2: Summary of the costs for each option

Costs		Option 3.1a	Option 3.1b	Option 3.2a	Option 3.2b
Fitment of safety systems or features and modifications for width (net cost)	Goods vehicles	$236 m	$236 m	$222 m	$222 m
	Trailers	$39.5 m	-	$41.0 m	-
Maintenance of safety systems or features		$41.3 m	$37.2 m	$41.3 m	$37.2 m
Implementation of standards		$0.47 m	$0.47 m	$0.47 m	$0.47 m
Infrastructure updates		$16.8 m	$15.5 m	$16.8 m	$15.5 m

Table 3: Summary of the outcomes of the BCA for each option

Outcomes	Option 3.1a	Option 3.1b	Option 3.2a	Option 3.2b
Benefits	$988 m	$877 m	$1,360 m	$1,206 m
Costs	$334 m	$289 m	$321 m	$275 m
Net Benefits	$654 m	$588 m	$1,038 m	$931 m
BCR	3.0	3.0	4.2	4.4

Public comment was sought on each of the policy options considered in this IA, through the publication of the Safer Freight Vehicles Discussion Paper (Commonwealth of Australia, 2021a) and draft ADRs on the department's website, for a 10-week public comment period, which closed on 30 June 2021. The department has since also consulted further with both jurisdictions and industry stakeholders through its established ADR consultative forums.

The states and territories are broadly supportive of a width limit of 2.55 m for both goods vehicles and trailers, but do not support a move to 2.60 m at this stage. The general position among the jurisdictions is that the Commonwealth should implement a 2.55 m limit as supported by Austroads research to date (Austroads, 2019), and work with the NHVR and Austroads to research the suitability of a 2.60 m limit for the future. Jurisdictions generally support all of the additional proposed mandatory safety technologies for wider freight vehicles; with NSW, VIC and QLD all requesting further mandatory national standards (i.e. ADRs) be implemented to better align with the EU.

Most industry stakeholders support a width limit of 2.60 m for trucks and trailers, including the Truck Industry Council (TIC), the Commercial Vehicle Industry Association of Australia (CVIAA) and the Australian Trucking Association (ATA). These stakeholders argue that this would avoid the need to modify vehicles based on EU and US designs to be narrower for Australia, provide the best access to electric trucks from the world market, and deliver the greatest safety and productivity benefits.

However, some industry stakeholders do not support increasing the width limit for trailers, including the Heavy Vehicle Industry Association (HVIA) and many Australian heavy trailer manufacturers. They are concerned the proposed changes will favour trailer importers and cost Australian trailer manufacturing jobs. These stakeholders consider that domestic trailer manufacturers would need to re-tool and change manufacturing processes to increase trailer width in order to compete with importers, and that the cost of the retooling, transitional costs and potential loss of Australian manufacturing jobs, far exceed any safety or productivity benefits.

Industry stakeholders are broadly supportive of mandatory requirements for ESC, AEB and LDWS. Some industry stakeholders have raised concerns about mandatory side underrun protection, particularly for trailer design types mostly used in regional and remote areas. The Truck Industry Council provided in-principle support for the adoption of a more stringent ADR for devices for indirect vision and the future adoption of an ADR for blind spot information systems, while detailing concerns regarding the suitability of the relevant United Nations (UN) regulations for Australia, and recommendations to address these concerns.

There is widespread support for the department's proposed exclusions for enhanced devices for indirect vision and/or devices to detect other road users from vehicle width and length measurements.

According to the benefit-cost analysis conducted by the ARRB, Option 3.2a (2.60 m wide goods vehicles and trailers) has the highest net benefit of the options examined, at $1,038 m. However, there are some key study limitations relating to productivity benefits (including reductions in trips for wider vehicles) and infrastructure costs that should be addressed before any decision is taken to increase the width limit to 2.60 m for goods vehicles and/or trailers (for further detail see Chapter 7).

As a first step, the IA includes a recommendation for the Australian Government to implement Option 3.1b (2.55 m wide goods vehicles only), which has a net benefit of $588 m. This option is the least sensitive to changes in reductions in trips for increased width, including because the net benefit for this option is mostly derived through an increase in the take-up of safer freight vehicles. Further, the net benefit of allowing 2.55 m wide goods vehicles under this sub-option is a key sub-part of the net benefits for each of the other sub-options. This means whatever option is ultimately identified as the best option, including following further consultation to address the current study limitations, this will at least include 2.55 m wide goods vehicles (i.e. Option 3.1b). The IA also includes recommendations for both industry and jurisdictions to provide more verifiable data to help the department address current study limitations and update the IA, including for the purpose of informing any future decision by the Minister on increasing the width limit for trailers, and/or a 2.6 m width limit (for goods vehicles and/or trailers).

This IA has been written in accordance with Australian Government requirements, addressing the seven assessment questions set out in the Australian Government Guide to Regulatory Impact Analysis (Second edition 2020) (Commonwealth of Australia, 2020):

1. What is the problem you are trying to solve?
2. Why is government action needed?
3. What policy options are you considering?
4. What is the likely net benefit of each option?
5. Who will you consult about these options and how will you consult them?
6. What is the best option from those you have considered?
7. How will you implement and evaluate your chosen option?

In line with the principles for Australian Government policy makers, the regulatory costs for business, governments and the community were quantified for each policy option.

Chapter 1: Introduction

Road vehicle regulation in Australia

Responsibility for vehicle regulation is shared between the Australian Government and the states and territories.

The Australian Government regulates the first supply of vehicles to the Australian market. Under the *Road Vehicle Standards Act 2018* (RVSA) (Commonwealth of Australia, 2019), new road vehicles are required to comply with national vehicle standards known as the Australian Design Rules (ADRs), before they can be offered to the market for use in transport in Australia.

The ADRs set requirements for vehicle safety, environmental performance and theft protection in line with community expectations. Through the department's road vehicle certification system, new vehicle types (models) manufactured in or imported to Australia are assessed and certified as complying with the applicable ADRs. Once the vehicle type has been approved, new vehicles of that type are then permitted to be supplied to the market.

Once vehicles have been supplied to the market, responsibility for regulation (e.g. vehicle registration, in-service standards and operations) passes to the states and territories. This is principally done through legislation based on the Australian Light Vehicle Standards Rules (ALVSRs) and the Australian Road Rules, which are managed by the National Transport Commission (NTC), and the Heavy Vehicle National Law (HVNL) (State of Queensland, 2021), which is administered by the National Heavy Vehicle Regulator (NHVR). Both the ALVSRs and the HVNL have as a general principle that vehicles will continue to comply with the relevant ADRs.

ADR development and review

Since the mid-1980s, the ADRs have been progressively harmonised with internationally based United Nations (UN) vehicle regulations, which are developed by the UN World Forum for Harmonization of Vehicle Regulations. Harmonisation is important because Australian vehicle sales represent less than 2% of the global vehicle market. Harmonising with international vehicle regulations provides Australian consumers with access to the safest vehicles from the global market at the lowest possible cost.

There is an ongoing program of work to develop, review and revise the ADRs. To ensure the ADRs remain fit for purpose, the department monitors international developments and regularly consults with stakeholders, including to identify any implementation issues or changes in factors affecting existing ADRs, as well as benefits associated with introducing new ADRs.

Performance Based Standards (PBS) Schemes

Australia also has two voluntary PBS schemes for heavy vehicles, which are administered by the NHVR and the Western Australian Government. Under these schemes, vehicles are tested against 16 additional safety standards and 4 infrastructure standards, and can receive exemptions from meeting specified clauses of the ADRs and in-service vehicle regulations, including standard limits for vehicle width, length, height and rear overhang, as well as various tow coupling related requirements. These PBS schemes give industry the opportunity to innovate with vehicle design to improve productivity and achieve safer performance while minimising impacts on the environment and road infrastructure. PBS vehicles are permitted to operate on defined road networks that are appropriate for their performance (NHVR, 2019).

Chapter 2: What is the problem?

Regulatory impediments to the supply of safer and cleaner freight vehicles

The National Road Safety Action Plan 2018-2020

At the 18 May 2018 meeting of the then Transport and Infrastructure Council, Ministers endorsed the National Road Safety Action Plan (NRSAP) 2018-2020 (Commonwealth of Australia, 2018a), including Other Critical Action L to Investigate the introduction of safer, cleaner heavy freight vehicles by minimising regulatory barriers. The aim of this action is to increase take up of safer, cleaner heavy freight vehicles (goods vehicles over 4.5 tonnes Gross Vehicle Mass (GVM) and trailers over 4.5 tonnes Aggregate Trailer Mass (ATM)) in Australia.

Other Critical Action L (NRSAP 2018-2020):

Investigate the introduction of safer, cleaner heavy freight vehicles by minimising regulatory barriers

The overall age of the heavy vehicle fleet has an impact on safety as newer vehicles have more safety features. It is proposed to investigate ways to encourage the greater uptake of newer, safer, cleaner vehicles into the Australian fleet, including regulatory requirements and the capacity of the road network to accommodate different sizes of vehicles. To meet current Australian regulations, heavy freight vehicles must be 50 to 100mm (2-4%) less in width than vehicles in other major markets. This costs manufacturers $15-30 million per year to redesign their vehicles, and in some cases reduces the availability of safer, cleaner models.

Regulatory restrictions exist in Commonwealth and state and territory regulations, and include both vehicle size and mass. They were originally introduced to protect infrastructure such as roads, building clearances, and bridge loading limits, and to prevent head-on crashes and reduce conflict with other road users on narrower roads. All parties will examine current regulatory requirements, as well as network capacity for vehicles of different size and mass, where the roadway can safely (sic) accommodate such vehicles and minimise crashes. Subject to this assessment, the Commonwealth will release a discussion paper, ahead of a regulatory package for any agreed changes to heavy freight vehicle width and any other dimensions, and axle transitional mass, in the Australian Design Rules. The NHVR and the state and territory governments will consider additional changes to heavy freight vehicle size and axle mass limits. The aim is to achieve increased take up of safer, cleaner heavy freight vehicles in Australia from a reported 0.1% to be closer to the global average of 2.0%, also leading to a lower average age of the heavy vehicle fleet.

The Safer Freight Vehicles Discussion Paper

In April 2021, the department released a Safer Freight Vehicles Discussion Paper (Commonwealth of Australia, 2021a) on its website for a 10-week public comment period. This paper sought stakeholder feedback on possible changes to the ADRs to facilitate an increased take-up of safer and cleaner heavy freight vehicles in Australia.

In preparing the Safer Freight Vehicles Discussion Paper (Commonwealth of Australia, 2021a), the department considered information from a range of sources to identify any potential barriers or impediments in the ADRs to the supply of safer and cleaner heavy freight vehicles. Importantly, the department's review revealed that the ADRs do not prohibit safer and cleaner heavy freight vehicles from being supplied to the Australian market. Nevertheless, there are some requirements in the ADRs that can make it more difficult and costlier for manufacturers to supply vehicles fitted with advanced safety systems, cleaner engines, and/or more productive design features. Further, the relatively small size of the Australian market limits the number of vehicles across which manufacturers can amortise any additional development costs to meet Australian specific requirements.

The main ADR requirement raised by heavy vehicle industry groups as limiting the supply of safer and cleaner heavy freight vehicles is the vehicle width limit. The supply of safer heavy goods vehicles is further restricted by the absence in the ADRs of exclusions for various types of devices for indirect vision (i.e. mirrors and cameras) and blind spot information systems (e.g. for the detection of vehicles, bicyclists and/or pedestrians) from the measurement of vehicle width and/or length. This IA focusses on policy options to better regulate these aspects of vehicle design.

There are also limits in the ADRs on axle spacing, axle transition mass (the maximum permissible mass placed on the road by an axle or axle group before any retracted/lifted axle must automatically lower), rear overhang (the distance between the centre of the rear axle or axle group of a vehicle and the rearmost point on the vehicle), and the number of axles in an axle group, which can be barriers to the supply of vehicles with more productive, fuel-efficient and/or environmentally friendly axle configurations. While policy options to address these issues are not considered in this IA, this may follow as a subsequent IA proposal. In this respect it is important to highlight that the impacts of any future changes to vehicle axle requirements would be largely separate and distinct from the changes considered for overall vehicle width (as well as exclusions from vehicle width and length measurements) in this IA, so would not significantly impact the outcome of the benefit-cost analysis for this IA.

Vehicle width

There is no one globally accepted vehicle width limit, nor any international (UN) vehicle regulation covering vehicle width. Instead, there are various (and differing) regional and national requirements that apply for vehicle width, including in Australia and in other countries from which Australia imports heavy freight vehicles. The reason for a vehicle width limit is to ensure vehicles can travel safely on the road network, without colliding with other vehicles (including vehicles travelling in the same or opposite directions), vulnerable road users (e.g. pedestrians, bicyclists etc.) in close-proximity to the vehicle, or roadside infrastructure.

In Japan, vehicle width is limited to 2.50 m. In the European Union (EU) vehicle width is allowed to be up to 2.55 m for all vehicles, and up to 2.60 m for goods vehicles and trailers with refrigerated bodywork (with insulated walls of at least 45 mm thick) (EU, 2019). This was increased from a 2.50 m limit for all vehicles in 1996/97. In the United States (US), vehicles are allowed to be up to 2.60 m wide (US Government, 2020).

In Australia, vehicle width is limited within the ADRs (and through in-service vehicle regulations) to 2.50 m (Commonwealth of Australia, 2016a), except for non-standard vehicles, subject to conditions including limited network access under permit and/or notice arrangements. This means that vehicles (including components such as axles) and plant equipment (such as cranes) mounted on heavy vehicles have to be made slightly (2-4%) narrower than for vehicles designed to EU and/or US requirements. This adds costs and slows the development of some new models for the Australian market. Further, it restricts the space available for manufacturers to fit safety and/or emissions control systems, which can make it more difficult and costlier to supply some safer and cleaner models in Australia. These added costs increase freight costs for Australian businesses and the end consumers of the products transported by these vehicles.

Vehicles based on EU or US market designs (including Australian made trucks) currently make up around 60% of new heavy trucks (over 12 tonnes GVM) sold in Australia, and the cost to redesign vehicles for the Australian market has been estimated at $15-30 million per year (Commonwealth of Australia, 2018a). There are further costs in lost productivity through non-standardised load sizes and the necessary reduction of wall thickness (and so reduced thermal efficiency) of refrigerated bodywork. A narrower width limit reduces the space available to fit the standard EU and US size pallets, which can result in some imported products being transferred from these pallets to Australian standard size pallets, which adds costs, including through distribution delays. The thinner insulation used on refrigerated vehicles increases fuel consumption and environmental impacts, including carbon dioxide emissions. Costs to transfer products between different size pallets and increased refrigeration costs for refrigerated freight, are likely transferred to the end consumers of these products, while environmental costs are absorbed by society as a whole.

In future there are likely to be a number of design changes made to trucks for the EU and US markets which manufacturers will find increasingly difficult (or at least not economically worthwhile) to adapt to fit within the 2.50 m vehicle width limit for the relatively small Australian market. These include the re-design of truck cabs to provide an improved direct field of view for the driver (including to meet upcoming regulatory requirements proposed by the EU) and batteries and/or hydrogen storage systems for electric trucks made to fit a 2.55 m (or wider) width limit.

Appendix 4 includes a detailed summary of the current vehicle width limits, including exclusions and conditions, in Australia, the EU, Japan, New Zealand, and the US.

Devices for indirect vision and monitoring devices to detect other road users

Similar to the vehicle overall width, there is no one globally accepted set of exclusions from vehicle width and length measurements, including for devices for indirect vision and monitoring devices to detect other road users (e.g. blind spot information systems for the detection of vehicles, bicycles and/or pedestrians). Instead, there are various regional and national requirements that apply throughout the world, including a differing set of exclusions in Australia, the EU, Japan, New Zealand, and the US.

In the EU, all devices for indirect vision (as defined in the UN Regulation No. 46 (UN R46)) are excluded from the measurement of both vehicle width and length (EU, 2019). These include rear view, close-proximity view and front-view classes of devices for indirect vision, which can be conventional mirrors or camera-monitor systems. All devices for indirect vision and the vehicles to which they are fitted must be approved to UN R46, which includes a minimum defined field of view requirement for each class of device (e.g. rear-view, close-proximity view, front-view etc.), together with pendulum impact test requirements for devices mounted less than 2 m from the ground (i.e. those which would be more likely to impact a pedestrian or light vehicle) and protruding more than 100 mm from the side bodywork. Figure 1 shows an example of a camera-monitor system for indirect vision. The external camera is much smaller and lighter than a conventional mirror, which helps reduce aerodynamic drag and makes it less likely to impact with or obscure the driver's view of other vehicles or pedestrians.

Figure 1: An internal monitor (left) and external camera (right) of a camera-monitor system for indirect vision (source: supplied by Daimler Truck and Bus Australia Pacific)

The EU also allows watching and detection aids (including external elements of blind spot information systems and sensors for automated driving systems) to be excluded from the measurement of the vehicle width and length (EU, 2019), provided:

- the total protrusion of the devices added to the width of the vehicle does not exceed 100 mm; and
- the total protrusion of the devices added to the length of the vehicle does not exceed 250 mm at the front, and 750 mm in total.

In the US, rear view mirrors are excluded from the measurement of vehicle width and length. Cameras for indirect vision, other devices for indirect vision, and blind spot information systems can also be excluded (as non-property carrying devices) from the measurement of vehicle width and length, provided these do not extend more than 3 inches (76 mm) beyond each side or the rear of the vehicle (US Government, 2020).

In Australia, under the ADR for vehicle configuration and dimensions (ADR 43 / Commonwealth of Australia, 2016) and the ADR definitions (Commonwealth of Australia, 2021b), rear vision mirrors (also referred to in the ADRs as rear-view mirrors) are excluded from the measurement of the vehicle width, but not the length. There are no exclusions for other classes of mirrors for indirect vision (e.g. close proximity and front-view mirrors), cameras for indirect vision, or monitoring devices to detect other road users (i.e. detection aids such as blind spot information systems), from the measurement of vehicle width or length. To fit these devices/systems, manufacturers need to make them fit into the already narrower 2.50 m vehicle width envelope for Australia, and/or make the cab or load carrying area of some vehicles shorter than would otherwise be permitted. However, as fitment of blind spot information systems, and close proximity and front-view devices for indirect vision is optional under the ADRs, it can be easier for manufacturers not to fit these, including for many vehicles imported from the EU (where they are standard fitment). Figure 2 and Figure 3 show the minimum additional field of view provided by close proximity (UN Class V) and front-view (UN Class VI) devices for indirect vision, respectively. Lower fitment of blind spot information systems, and close proximity and front-view devices for indirect vision, increases the risk of death and injury for other road users, especially bicyclists and pedestrians.

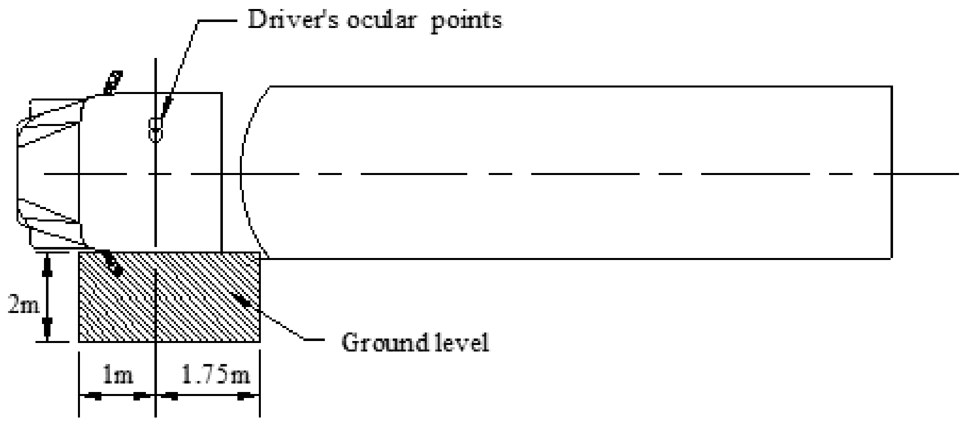

Figure 2: Minimum required field of view under UN R46 for a close-proximity view (Class V) device for indirect vision (source: adapted (for right-hand-drive) from UN R46)

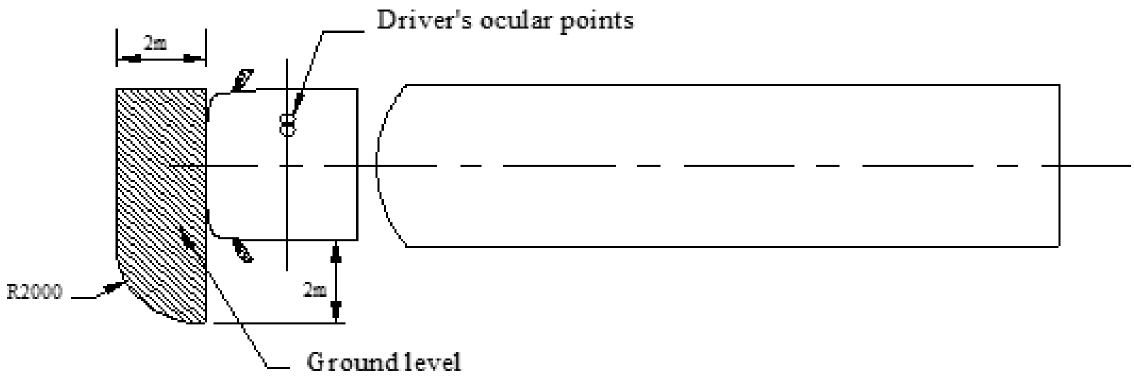

Figure 3: Minimum required field of view under UN R46 for a front-view (Class VI) device for indirect vision (source: adapted (for right-hand-drive) from UN R46)

Slow introduction of safety systems for heavy freight vehicles

In Australia, the introduction of safety systems or features through the market alone is significantly slower for heavy goods vehicles and trailers, than it is for light vehicles. A major reason for this is the nature of construction of heavy vehicles. In comparison to light vehicles (for example cars and Sports Utility Vehicles), heavy vehicles are much more likely to be built to order, with engines, drivetrains, suspensions, brakes, axles and safety systems individually specified by the purchasing business. Heavy vehicles constitute a substantial financial investment and are generally configured for business use. Purchasers may in some instances focus primarily on maximising economic productivity rather than on the safety of other road users.

A significant number of heavy vehicles are also built in Australia and/or specifically for the Australian market. For example, 35.1% of all heavy trucks sold in Australia in 2020 were made locally (see Figure 4 below). Further, many heavy vehicles (including imported vehicles) are supplied as cab-chassis vehicles to be fitted with bodywork (e.g. trays, plant, equipment etc.) by domestic body makers/builders. This means that the regulations of other countries will have a lesser influence on the makeup of the Australian heavy vehicle fleet. In the case of heavy trailers, of which 90-95% are designed and built in Australia, regulations of other countries have even less influence on the vehicles that end up in the fleet.

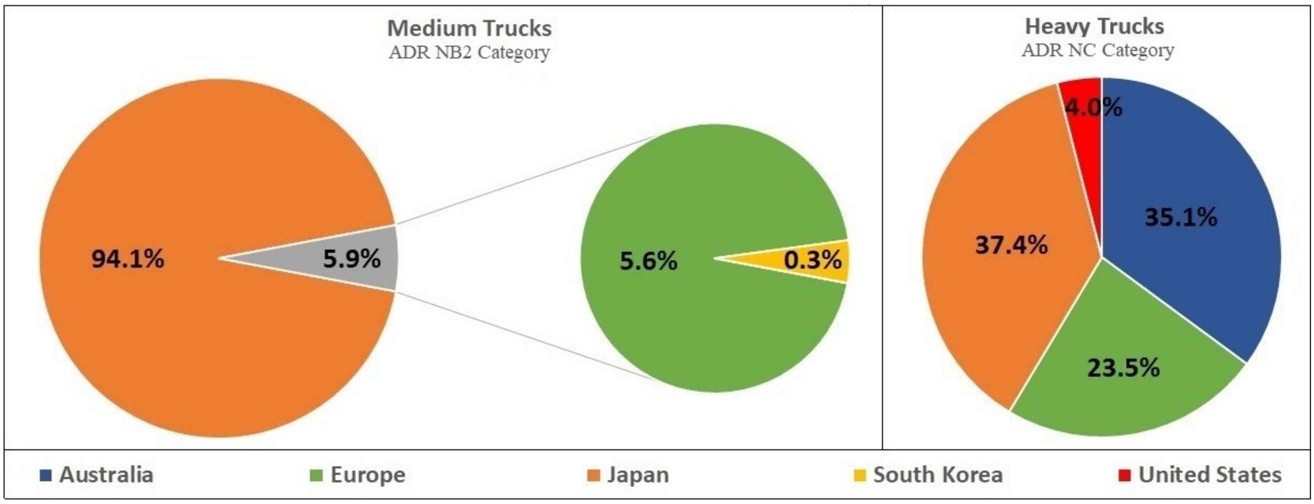

Figure 4: Truck sales in Australia (2020) by country/region of manufacture (source: supplied by the Truck Industry Council)

Chapter 3: Why is government action needed?

Government action may be needed where the market and/or existing government policies or regulations fail to deliver the most efficient and effective outcome(s). This IA focusses on addressing two problems identified as limiting the take-up of safer heavy vehicles in the Australian market. The first problem is that there are some requirements in the current ADRs that can make it more difficult and costlier for manufacturers to supply heavy vehicles fitted with the latest safety systems or features (as well as cleaner engines and/or more productive design features). The most significant of these is the current vehicle width limit of 2.50 m, which adds costs and slows development of some models of heavy vehicles for the Australian market, while also limiting productivity for some sectors of the road freight industry (e.g. through non-standardised load sizes, reduced thermal efficiency of refrigerated bodywork etc.). The supply of safer heavy vehicles is further restricted by the absence in the ADRs of exclusions for various types of devices for indirect vision (i.e. mirrors and cameras) and blind spot information systems (e.g. for the detection of vehicles, bicyclists and/or pedestrians) from the measurement of vehicle width and/or length. The second problem is the relatively slow introduction of safety systems or features for heavy goods vehicles and trailers in Australia, which cannot be fully addressed through the removal of regulatory barriers alone, and will persist without some sort of market intervention. The overall objective of the government actions considered in this IA is to achieve a better outcome, by increasing the take-up of safer freight vehicles through the implementation of policies to address both the problems identified above.

Vehicle dimensions are regulated in Australia and other countries to ensure vehicles can travel safely on the road network, without colliding with other vehicles, vulnerable road users, or roadside infrastructure. Other dimensional and vehicle mass limits exist to manage wear and tear on roads and bridges. However, the current vehicle width limit of 2.50 m in Australia, which is narrower than both the EU and the US, was established when safety technologies and road infrastructure were much less developed. Other overall vehicle dimensional limits and combination limits in Australia, including height and length, are generally much more favourable for heavy vehicle manufacturers and operators than those in overseas markets.

Chapter 4: Policy options considered

In preparing this IA, the department considered several policy options to increase the take up of safer heavy freight vehicles in Australia, including vehicles with enhanced devices for indirect vision and/or monitoring devices to detect other road users, and safer wider vehicles. These include a non-regulatory option, as well as regulation through the ADRs under the RVSA.

Summary of options

Non-regulatory options

Option 1: No intervention	Repeal the current requirements for vehicle dimensions (i.e. width, length, and height) and allow vehicle manufacturers to provide solutions to meet market demand.

Regulatory options

Option 2: Retain existing standards (business as usual)	Retain the existing requirements for vehicle dimensions through the ADRs under the RVSA
Option 3: Implement updated standards	Implement updated requirements for vehicle dimensions through the ADRs under the RVSA

Discussion of options

Option 1: De-regulation (repeal the current requirements)

Under Option 1 the Australian Government would repeal the current ADR requirements for vehicle dimensions (i.e. width, length, and height) and allow vehicle manufacturers to provide solutions to meet market demand.

If there were deregulation by the Australian Government of vehicle dimensions at supply to market, the states and territories would likely endeavour to continue to limit the overall dimensions of vehicles in-service. However, in the absence of any ADR requirements, this would likely conflict with section 78 of the RVSA, which prevents state and territory laws from being used to impose more stringent vehicle standards than the ADRs (Commonwealth of Australia, 2018b). In the absence of any vehicle dimensional limits, some truck operators would choose considerably larger and more productive vehicles. For example, a domestic firm could fit extra wide bodies and/or bodywork (of any width, including over 2.60 m) to cab-chassis vehicles originally made to comply with the width limit in another market (e.g. the EU, the US, Japan etc.). This would be expected to increase productivity for the trucking firms that then operate these vehicles, but would also likely impose significant risks and costs for other road users, insurers and governments, with no control over these costs (i.e. externalities). The likely costs for these affected stakeholders include loss of life, loss of income, permanent injury/disability costs, hospital admission and other medical costs, road crash delays, and infrastructure and property damage.

For the above reasons, this option is not supported by jurisdictions, is not generally sought by peak industry bodies, is not considered viable by the department, and has not been analysed in any further detail.

Option 2: Retain existing standards under the RVSA (business as usual)

Under Option 2 the Australian Government would retain the existing requirements for vehicle dimensions through the ADRs under the RVSA. This is the business as usual (BAU) option, which is considered viable, and has been analysed in detail as the baseline for comparison with other options.

Option 3: Implement updated standards under the RVSA

Under Option 3 the Australian Government would implement updated requirements for vehicle dimensions through the ADRs under the RVSA, to facilitate an increased take up of safer and/or more efficient heavy freight vehicles in Australia. Mandatory requirements for vehicle dimensions have been adopted in other markets, including the major source markets of the EU, Japan, and the US. This option was therefore considered viable, and analysed further in terms of expected benefits and costs to the community.

Options for safer wider heavy freight vehicles

Allowing wider vehicles would reduce the costs of modification of vehicles for the Australian market as well as provide the necessary space to better fit EU mandated safety technologies (such as blind spot information systems) and EU and US mandated environmental technologies (such as Euro VI or equivalent emission control systems) to reduce noxious emissions. Further, some sectors of the road freight industry would be able to complete the same freight task in fewer trips, which reduces both transport costs and exposure related crash risks.

To account for different sources and extent of benefits expected for various categories of heavy freight vehicles, as well as the different width limits for vehicles in the EU and the US, the department decided to analyse four sub-options to allow for safer (and cleaner) wider heavy freight vehicles to be supplied in Australia. Each of these includes a package of new safety ADRs to be mandated for the wider vehicles (those exceeding the current 2.50 m limit). The systems/features included in the safety packages were selected following initial consultation with the Strategic Vehicle Safety and Environment Group, are all covered by international (UN) vehicle regulations, and include ADR development priorities for heavy vehicles under the National Road Safety Action Plan 2018-2020 (Commonwealth of Australia, 2018a), as well as technologies targeted at reducing collisions between heavy vehicles and other road users in close-proximity to these vehicles. For goods vehicles over 4.5 tonnes GVM, these include enhanced devices for indirect vision, Electronic Stability Control (ESC), Advanced Emergency Braking (AEB), Lane Departure Warning Systems (LDWS), Blind Spot Information Systems, Lateral Protection Devices for side underrun protection, and conspicuity markings. For trailers over 4.5 tonnes, these include Roll Stability Control (RSC), Lateral Protection Devices (LPDs) for side underrun protection, and conspicuity markings.

A summary of the ADR vehicle categories for heavy goods vehicles and trailers is provided in Appendix 3. More information on the safety systems/features proposed to be included as part of a package of new safety ADRs (for wider vehicles) is provided in Appendices 5 to 11.

Option 3.1a – Increase the width limit to 2.55 m for goods vehicles and trailers over 4.5 tonnes

Under this option:

- The vehicle width limit for goods vehicles (i.e. trucks) over 4.5 tonnes GVM and trailers over 4.5 tonnes ATM (ADR category NB2, NC, TC (over 4.5 tonnes) and TD vehicles), would be increased from 2.50 m to 2.55 m.
- Permanently fixed webbing-assembly-type devices (such as curtain-side devices) would continue to be excluded from the measurement of the vehicle width, provided the maximum distance across the body of the vehicle, including any part of the devices, is not more than 2.55 m.
- Central tyre inflation systems would continue to be excluded from the measurement of the vehicle width, provided the total lateral (i.e. left + right side) protrusion of such devices/systems (or excluded parts thereof) beyond the overall width, does not exceed 100 mm on each side of the vehicle.

- The wider goods vehicles (those exceeding the current 2.50 m limit) would be required to:
  - meet a new ADR 14/03 – Devices for indirect vision (refer Appendix 5), incorporating the technical requirements of the latest version of the relevant international standard (UN R46/04), but with additional provisions to allow for some alternative styles of mirrors used on trucks in Australia, for example US style cross-view mirrors (refer Glossary in Appendix 2) to be used on bonneted trucks in place of UN style front-view mirrors, provided these allow the driver to see at least 900 mm past the extreme outer edge of the left-hand (near) side of the vehicle;
  - meet ADR 35/07 – Commercial Vehicle Brake Systems, which includes mandatory ESC requirements (referred to in the ADR as a Vehicle Stability Function) – note: this would continue to include exemptions from fitting ESC to trucks with four or more axles and trucks designed for off-road use, as per ADR 35/07 and UN R13;
  - meet ADR 97/00 – Advanced Emergency Braking (refer Appendix 7) for Omnibuses, and Medium and Heavy Goods Vehicles, which incorporates the technical requirements of the latest version of the relevant international standard (UN R131/01) – note: this would continue to include exemptions for trucks with four or more axles and trucks designed for off-road use, as per ADR 97/00, the EU requirements and as recommended in UN R131;
  - meet a new ADR 99/00 – Lane Departure Warning Systems (refer Appendix 8), incorporating the technical requirements of the relevant international standard (UN R130) – note: this would include exemptions for trucks with four or more axles and trucks designed for off-road use, as per the EU requirements and as recommended in UN R130;
  - meet a new ADR 105/00 – Blind Spot Information Systems (refer Appendix 9), incorporating the technical requirements of the relevant international standard (UN R151) – note: this ADR would only apply to goods vehicles over 8 tonnes GVM, as per UN R151 (and from a later date than the other proposed new ADRs – see below);
  - meet a new ADR 106/00 – Side Underrun Protection (refer Appendix 10), incorporating the technical requirements of the latest version of the relevant international standard (UN R73/01) – note: this ADR would not apply to prime movers, as per UN R73; and
  - if over 7.5 tonnes GVM (and excluding prime movers), be fitted with conspicuity markings (refer Appendix 11) in accordance with ADR 13/00 (or any later version of this ADR).
- The wider trailers (those exceeding the current 2.50 m limit) would be required to:
  - meet ADR 38/05 – Trailer Brake Systems, which includes mandatory RSC requirements (referred to in the ADR as a Vehicle Stability Function) – note: this would continue to include exemptions from fitting RSC to trailers with four or more axles in a group and/or four or more tyres in a row of axles, as per ADR 38/05;
  - meet a new ADR 106/00 – Side Underrun Protection (refer Appendix 10), incorporating the technical requirements of the latest version of the relevant international standard (UN R73/01); and
  - be fitted with conspicuity markings (refer Appendix 11) in accordance with ADR 13/00 (or any later version of this ADR).

The ADRs for devices for indirect vision, AEB, ESC, LDWS, and side underrun protection, would be mandatory for goods vehicles exceeding the current 2.50 m width limit (with some limited exemptions – as noted above), from the same date the ADR amendment to allow wider vehicles (under standard approval processes) commences. These ADRs would all be optional for vehicles not exceeding the current 2.50 m width limit, unless mandated through a separate ADR development process to this proposal (e.g. as is currently being considered for LDWS for heavy vehicles) or where already mandated, including from a future date (e.g. AEB and ESC for heavy vehicles). The same principles would be applied in regard to the applicability of the new ADRs for wider trailers – these would be mandatory for trailers exceeding the current 2.50 m width limit, and optional for trailers within the current limit (unless mandated through a separate ADR development process to this proposal or already mandatory).

The new ADR for blind spot information systems (for detection of bicycles) would be mandatory for new heavy goods vehicles over 8 tonnes GVM and exceeding the current 2.50 m width limit, from 1 November 2024 for new models and 1 February 2027 for those models existing in the market prior to the new model date (1 November 2024). This is because this is a relatively new UN regulation, which will not be mandatory for all new heavy goods vehicles (over 8 tonnes maximum permissible mass) in the EU until July 2024.

Where operators (including in particular sectors, such as refrigerated transport) see opportunities to increase productivity through wider goods vehicles and/or trailers, this option would encourage increased take-up of both newer trucks and trailers with more advanced safety systems/features, including but not limited to those prescribed as part of the safety package. It would also substantially reduce width related modification costs for new trucks and trailers sourced from or based on designs for markets with an increased width limit. There would still be some width related modification costs for new trucks and trailers sourced from or based on designs for markets with a 2.60 m width limit, but these should be much reduced compared to the current 2.50 m width limit.

Option 3.1b – Increase the width limit to 2.55 m for goods vehicles over 4.5 tonnes only

Under this option:

- The vehicle width limit for goods vehicles (i.e. trucks) over 4.5 tonnes GVM (ADR category NB2 and NC vehicles), would be increased from 2.50 m to 2.55 m.
- Permanently fixed webbing-assembly-type devices (such as curtain-side devices) would continue to be excluded from the measurement of the vehicle width, provided the maximum distance across the body of the vehicle, including any part of the devices, is not more than 2.55 m.
- Central tyre inflation systems would continue to be excluded from the measurement of the vehicle width, provided the total lateral (i.e. left + right side) protrusion of such devices/systems (or excluded parts thereof) beyond the overall width, does not exceed 100 mm on each side of the vehicle.
- The wider goods vehicles (those exceeding the current 2.50 m limit) would be required to meet each of the proposed new ADRs / ADR requirements listed for goods vehicles under Option 3.1a above.

Where operators (including in particular sectors, such as refrigerated transport) see opportunities to increase productivity through wider goods vehicles, this option would encourage increased take-up of newer trucks with more advanced safety systems/features, including but not limited to those prescribed as part of the safety package. It would also substantially reduce width related modification costs for new trucks sourced from or based on designs for markets with an increased width limit. There would still be some width related modification costs for new trucks sourced from or based on designs for markets with a 2.60 m width limit, but these should be much reduced compared to the current 2.50 m width limit. This option would not encourage any increased take-up (relative to business as usual) of newer/safer trailers, and would not reduce width related modification costs for trailers sourced from or based on designs for markets with either a 2.55 m or a 2.60 m width limit.

Option 3.2a – Increase the width limit to 2.60 m for goods vehicles and trailers over 4.5 tonnes

Under this option:

- The vehicle width limit for goods vehicles (i.e. trucks) over 4.5 tonnes GVM and trailers over 4.5 tonnes ATM (ADR category NB2, NC, TC (over 4.5 tonnes) and TD vehicles), would be increased from 2.50 m to 2.60 m.
- Permanently fixed webbing-assembly-type devices (such as curtain-side devices) would be excluded from the measurement of the vehicle width, provided the maximum distance across the body of the vehicle, including any part of the devices, is not more than 2.60 m.
- Central tyre inflation systems would continue to be excluded from the measurement of the vehicle width, provided the total lateral (i.e. left + right side) protrusion of such devices/systems (or excluded parts thereof) beyond the overall width, does not exceed 100 mm on each side of the vehicle.
- The wider goods vehicles (those exceeding the current 2.50 m limit) would be required to meet each of the proposed new ADRs listed for goods vehicles under Option 3.1a above.
- The wider trailers (those exceeding the current 2.50 m limit) would be required to meet each of the proposed new ADRs / ADR requirements listed for trailers under Option 3.1a above.

Where operators (including in particular sectors, such as refrigerated transport) see opportunities to increase productivity through wider goods vehicles and/or trailers, this option would encourage increased take-up of both newer trucks and trailers with more advanced safety systems/features, including but not limited to those prescribed as part of the safety package. It would also eliminate width related modification costs for new trucks and trailers sourced from or based on designs for markets with an increased width limit.

Option 3.2b – Increase the width limit to 2.60 m for goods vehicles over 4.5 tonnes only

Under this option:

- The vehicle width limit in the ADRs for goods vehicles (i.e. trucks) over 4.5 tonnes GVM (ADR category NB2 and NC vehicles), would be increased from 2.50 m to 2.60 m.
- Permanently fixed webbing-assembly-type devices (such as curtain-side devices) would be excluded from the measurement of the vehicle width, provided the maximum distance across the body of the vehicle, including any part of the devices, is not more than 2.60 m.
- Central tyre inflation systems would continue to be excluded from the measurement of the vehicle width, provided the total lateral (i.e. left + right side) protrusion of such devices/systems (or excluded parts thereof) beyond the overall width, does not exceed 100 mm on each side of the vehicle.
- The wider goods vehicles (those exceeding the current 2.50 m limit) would be required to meet each of the proposed new ADRs / ADR requirements listed for goods vehicles under Option 3.1a above.

Where operators (including in particular sectors, such as refrigerated transport) see opportunities to increase productivity through wider goods vehicles, this option would encourage increased take-up of newer trucks with more advanced safety systems/features, including but not limited to those prescribed as part of the safety package. It would also eliminate width related modification costs for new trucks sourced from or based on designs for markets with an increased width limit. This option would not encourage any increased take-up (relative to business as usual) of newer/safer trailers, and would not reduce width related modification costs for trailers sourced from or based on designs for markets with either a 2.55 m or a 2.60 m width limit.

Proposed changes for vehicles with enhanced devices for indirect vision and/or monitoring devices to detect other road users

To complement each of the options considered for safer wider freight vehicles and to facilitate a greater supply and take up of vehicles with devices and systems to help the drivers of these vehicles to see and/or be aware of the presence of other road users, including cyclists and pedestrians, the ADRs would be amended to:

- Exclude all of the following devices and systems from the measurement of the vehicle width:
  - rear vision mirrors[1] (also referred to in the ADRs as rear-view mirrors);
  - devices for indirect vision, fitted in accordance with a new ADR 14/03 – Devices for Indirect Vision (or any later version of this ADR);
  - any other devices that help the driver to see objects in an area adjacent to the vehicle, including cross-view mirrors (subject to a total protrusion limit below); and
  - monitoring devices fitted as part of an automated driving system and/or a system to inform the driver of the presence of other road users (e.g. vehicles, bicyclists, pedestrians) in an area in close-proximity (within 2 m) to the vehicle body (subject to a total protrusion limit below).
- Limit the total (left + right side) protrusion of all devices except for rear vision mirrors, signalling devices, side-mounted lamps and reflectors, devices for indirect vision, and central tyre inflation systems, excluded from the width of the vehicle, to a maximum of 100 mm (to align with the total protrusion allowed by the EU).
- Exclude all of the following devices and systems, where fitted at the front end of the vehicle, from the measurement of vehicle length:
  - devices for indirect vision, fitted in accordance with a new ADR 14/03 - Devices for Indirect Vision (or any later version of this ADR);
  - any other devices that help the driver to see objects in an area adjacent to the vehicle, including cross-view mirrors (subject to a protrusion limit below); and
  - monitoring devices fitted as part of an automated driving system and/or a system to inform the driver of the presence of other road users in an area in close-proximity (within 2 m) to the vehicle body (subject to a total protrusion limit below).
- Limit the protrusion of all devices except for devices for indirect vision, excluded to the front of the foremost point from which vehicle length is measured (the vehicle 'front end' – see Glossary in Appendix 2), to a maximum of 250 mm (to align with the forward protrusion allowed by the EU).

The new ADR 14/03 would incorporate the technical requirements of the latest version of the relevant international standard for devices for indirect vision (UN R46/04), with additional provisions to allow for US style cross-view mirrors (refer Glossary in Appendix 2) to be used on bonneted trucks in place of UN style front-view devices for indirect vision. As per UN R46, devices for indirect vision would need to meet pendulum impact test requirements, where fitted less than 2 m from the ground, and protruding more than 100 mm from the vehicle bodywork. For a mirror and/or camera-monitor system to be classified as a device for indirect vision it would need to meet the prescribed field of view requirements in the new ADR for the applicable class of device (e.g. front-view device, close-proximity view device etc.) when fitted to the vehicle.

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1 Rear vision mirrors are already excluded from the measurement of the vehicle width and would continue to be excluded under this proposal.

Allowing other devices for a driver to see objects in an area adjacent to the vehicle and monitoring devices to detect other road users in close proximity to the vehicle to protrude up to 100 mm in total (left + right side) beyond the measured width of the vehicle is unlikely to significantly increase the risk of sideswipe collisions with other vehicles or roadside infrastructure. This is because the ADR for rear vision mirrors already allows such mirrors to project up to 230 mm on each side beyond the point from which the vehicle width is measured, provided the mirrors are capable of collapsing to within 150 mm. This means the distance measured across rigid parts to which rear vision mirrors are attached (e.g. metal attachment plates, arms, swivel joints etc.) can already be up to 2.8 m (i.e. 150 mm on either side of a 2.50 m wide vehicle). Further, rear vision mirrors meeting the requirements of the UN Regulation in Appendix A (UN R46) of this ADR, are allowed to protrude up to 250 mm beyond the measured vehicle width (if necessary to comply with field of vision requirements), and are only subject to pendulum impact test requirements where the protrusion beyond the vehicle bodywork exceeds 100 mm.

All the devices and systems that are proposed to be excluded from vehicle width and length measurements would continue to be subject to the existing ADR requirements for external projections. These require exterior objects such as these to be designed and fitted in such a way as to minimise the risk of bodily injury to a person hit by or brushing against the bodywork of a vehicle in the event of a collision. These existing ADR requirements will therefore also serve to limit any risks associated with excluding each of the additional devices/systems as outlined in this proposal (above), from vehicle width and length measurements.

If this package of changes is implemented, further exclusions from vehicle width and/or length measurements could still be considered at a later stage as part of the ongoing ADR review process.

Chapter 5: Likely net benefit of each option

Benefit-cost analysis

The benefit-cost analysis for this IA was conducted by the Australian Road Research Board (ARRB) and is summarised by the department in this chapter. The full report for this ARRB analysis is included in the Annex to this IA.

The benefit-cost methodology used in the ARRB analysis is a Net Present Value (NPV) model. Using this model, the flow of benefits and costs are reduced to one specific moment in time. The time period for which benefits are assumed to be generated is over the life of the vehicle(s). Net benefits indicate whether the returns (benefits) on a policy option outweigh the resources outlaid (costs) and indicate what, if any, this difference is. Benefit-cost ratios (BCRs) are a measure of efficiency of the policy option. For net benefits to be positive, this ratio must be greater than one. A higher BCR in turn means that for a given cost, the benefits pay this back many times over (the cost is multiplied by the BCR). For example, if a project costs $1 million but results in benefits of $3 million, the net benefit would be 3-1 = $2 million while the BCR would be 3/1 = 3.

Two of the policy options outlined in Section 4 of this IA (Option 2: retain existing standards under the RVSA (BAU) and Option 3: implement updated standards under the RVSA), were considered viable to analyse further. The results for Option 3 were compared with what would happen if there was no change to current requirements (Option 2 (BAU)).

The period of analysis is 40 years. This covers the expected life of the policy option (15 years of intervention) plus the time it takes for benefits to work their way through the fleet (around 25 years, the maximum lifespan used for heavy vehicles in this analysis). All benefits and costs reported in this IA are present values as of 1 July 2023, which corresponds to the assumed policy commencement date for Option 3, including each sub-option.

Demand forecasts

To determine benefits and costs for Option 3 relative to BAU (Option 2), the ARRB first needed to establish projections for the number of goods vehicles and trailers over 4.5 tonnes that enter the fleet, as well as the likely uptake of wider vehicles, for each year during the expected 15-year life of this policy option.

Projected fleet size

Based on historical truck sales data provided directly by the Truck Industry Council and historical goods vehicle and trailer registration data published by the Australian Bureau of Statistics, the ARRB estimated the number of new goods vehicles over 4.5 tonnes that enter the fleet each year would increase by 2% per annum and the number of trailers over 4.5 tonnes that enter the fleet each year would increase by 3.3% per annum.

ARRB assumed the total fleet size for Option 3 would be the same as for Option 2.

Projected take-up of wider vehicles

Under Options 3.1a, 3.1b, 3.2a, and 3.2b, the ARRB assumed the rate of take-up of wider freight vehicles would vary by country of origin/manufacture. These assumptions are summarised in Table 4.

Table 4: Assumed take-up of wider vehicles used in the analysis

Country of origin	Assumed take-up of wider freight vehicles (2.55 m or 2.6 m width by option)
Goods vehicles made in the EU or US	Linear increase to 100% at 2.55 m wide in the 2 years from commencement of Options 3.1a or 3.1b.
	Linear increase to 100% at 2.60 m wide in the 2 years from commencement of Options 3.2a or 3.2b.
Goods vehicles made in Australia	Linear increase to 100% at 2.55 m wide in the 15 years from commencement of Options 3.1a or 3.1b.
	Linear increase to 100% at 2.60 m wide in the 15 years from commencement of Options 3.2a or 3.2b.
Goods vehicles made in Japan or Korea	Linear increase to 60% at 2.55 m wide in the 15 years from commencement of Options 3.1a or 3.1b.
	Linear increase to 60% at 2.60 m wide in the 15 years from commencement of Options 3.2a or 3.2b.
Trailers made in Australia	Linear increase to 38% at 2.55 m wide in the 15 years from commencement of Option 3.1a.
	Linear increase to 38% at 2.60 m wide in the 15 years from commencement of Option 3.2a.
Imported trailers	Linear increase to 100% at 2.55 m wide in the 2 years from commencement of Option 3.1a.
	Linear increase to 100% at 2.60 m wide in the 2 years from commencement of Option 3.2a.

Figure 5 and Figure 6 show the resulting modelled take-up of safer wider goods vehicles and trailers (in total volume and percentage terms) for each year during the expected 15-year policy life under each of the options.

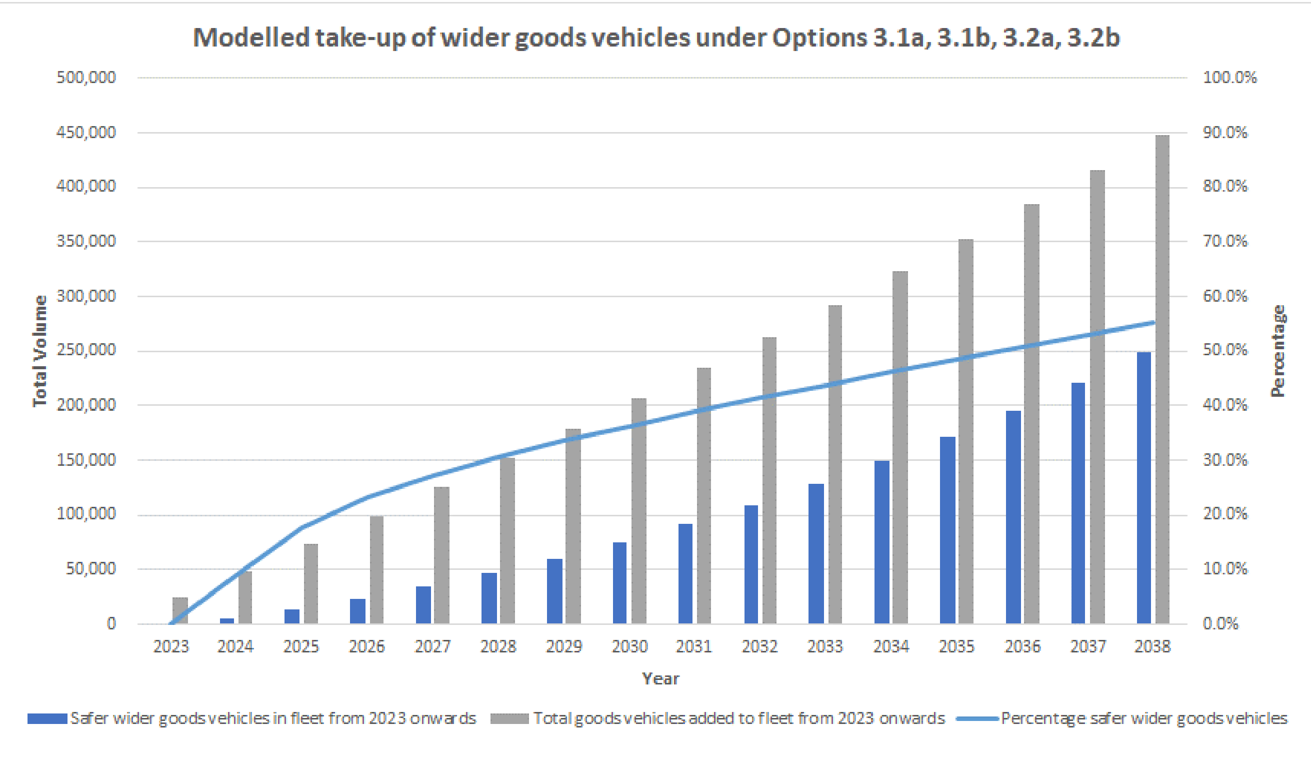

Figure 5: Modelled take-up of wider goods vehicles under Options 3.1a, 3.1b, 3.2a, and 3.2b

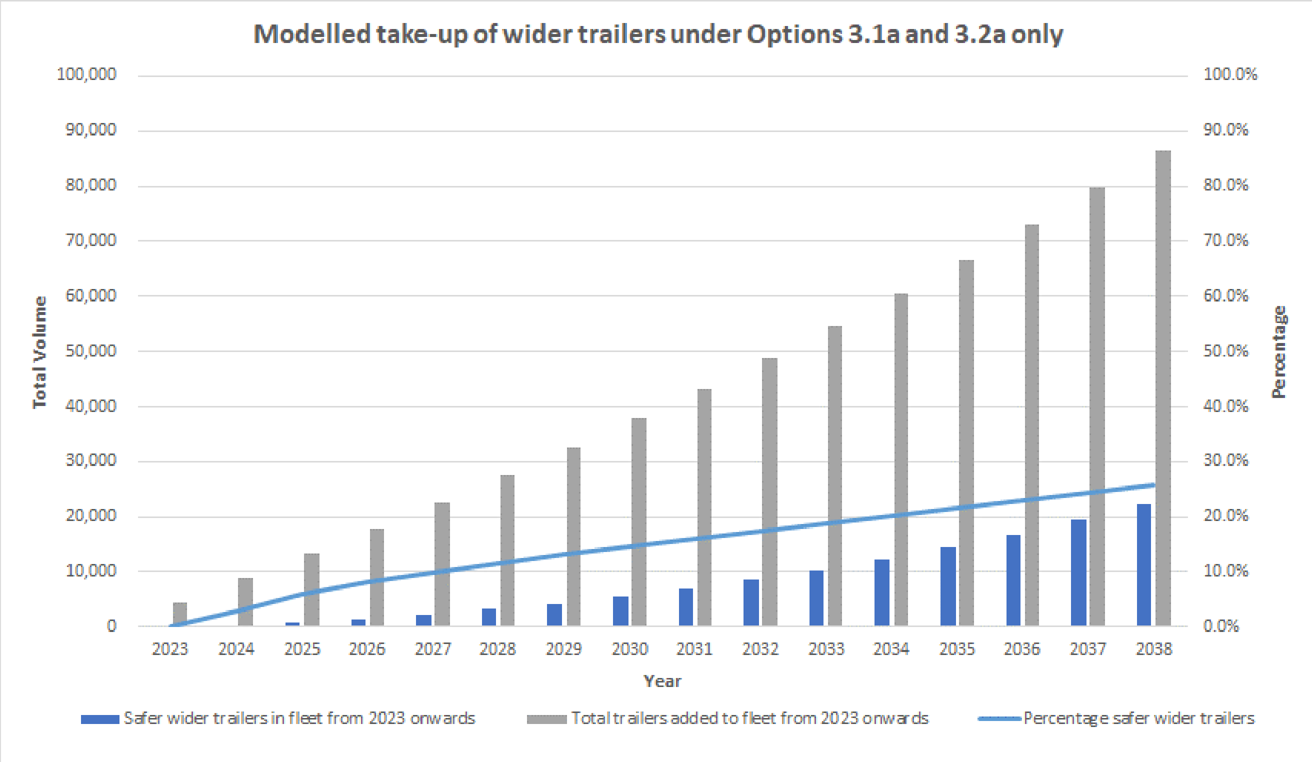

Figure 6: Modelled take-up of wider trailers under Options 3.1a and 3.2a

Benefits

For Option 2, there are no intervention benefits (or costs) as this is the BAU case.

For Option 3, there are benefits through reductions in trips and the associated reductions in crash exposure risk and vehicle operating and environmental costs, as well as asset preservation benefits and benefits from the safety systems or devices required for wider vehicles.

Reduction in trips

Increasing the heavy freight vehicle width limit to either 2.55 m or 2.60 m would allow some sectors of the road freight industry to complete the same freight task in fewer trips. This would reduce exposure related crash risks as well as vehicle operating and environmental costs.

The ARRB used road freight movement data from the Australian Bureau of Statistics to estimate the possible reduction in trips for 2.55 m and 2.60 m wide heavy freight vehicles. In this analysis the ARRB considered that payloads for containerised, and solid and liquid bulk freight (58% of total tonnes carried), are currently limited by in-service axle mass limits, and so would not increase due to any increase in the width limit. This leaves the remaining 42% of freight movements by mass, some of which may be able to be moved in fewer trips. From this data, the ARRB estimated a 0.83% overall reduction in trips for 2.55 m wide freight vehicles, and a 1.63% overall reduction in trips for 2.60 m wide freight vehicles (for all types of freight).

For refrigerated vehicles, the ARRB assumed any increase in the width limit would be used to fit thicker insulation, and so would not result in any increase in payload or any associated reduction in trips.

Safety

Under Options 3.1a, 3.1b, 3.2a, and 3.2b, safety benefits are expected to be achieved through reductions in crash risk due to both a decrease in the overall number of trips required to move the same freight, and the effectiveness of the required safety systems/features. The relative fatal and serious injury crash risk used by the ARRB in the benefit-cost analysis are summarised in Table 5 below. These values represent the difference in overall fatal or serious injury crash risk for a vehicle with the safety system/feature, relative to a vehicle without the safety system/feature. For example, the 93.6% risk for Advanced Emergency Braking (AEB) indicates that this safety system has been estimated to reduce the risk that a heavy truck will be involved in a fatal or serious injury crash by 6.4% (i.e. 100% – 93.6%).

Table 5: Relative crash risks used in the analysis for vehicle safety systems or features

Category	Safety system or feature	Fatality	Serious Injury
Trucks (fleet average for sub-category NB2 and category NC)	Enhanced devices for indirect vision	99.4%	99.4%
	Electronic Stability Control	93.6%	93.6%
	Advanced Emergency Braking	93.6%	93.6%
	Lane Departure Warning	95.6%	95.6%
	Blind Spot Information	99.4%	99.4%
	Side Underrun Protection	98.6%	99.9%
	Conspicuity markings	97.8%	97.8%
Trailers (fleet average for category TC over 4.5 tonnes GTM and category TD)	Side Underrun Protection	98.6%	99.9%
	Conspicuity markings	97.8%	97.8%

To determine the benefits from mandatory fitment of safety systems or features, the ARRB also needed to determine the difference in the number of vehicles fitted with the applicable safety systems or features under Options 3.1a, 3.1b, 3.2a, and 3.2b. Figure 7 shows the BAU take-up of safety systems or features used by the ARRB in the benefit-cost analysis. The ARRB assumed the additional take-up of these safety systems or features relative to BAU would mirror the take-up of wider freight vehicles (see projected uptake of wider vehicles above).

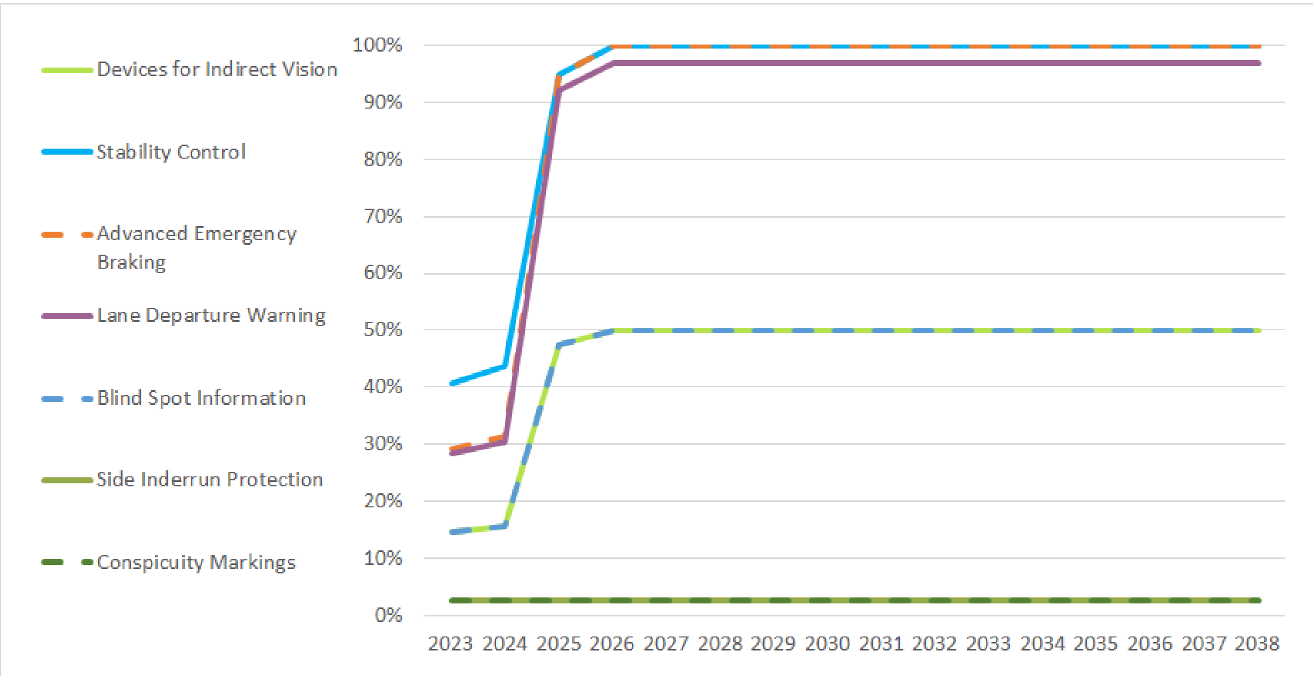

Figure 7: BAU take-up of safety systems or features used in the analysis for heavy freight vehicles

The ARRB also considered there could be an increased risk of frontal impact and side swipe crashes for wider freight vehicles, while also noting this has not been reported in New Zealand where the width limit was increased to 2.55 m in 2017. Conversely, the ARRB also considered there may be a decrease in rollover crashes if manufacturers use the additional width to improve stability by lowering the height of the vehicle centre-of-gravity. As both of these possibilities lack firm data to accurately quantify in the Australian context, and if/where they have an effect may actually cancel each other out, neither have been included in the main benefit-cost analysis, but are nevertheless investigated in the sensitivity analysis. The lack of firm data to quantify these possible impacts in the Australian context is due to a lack of reliable lane width data for much of the network, general network access not previously being granted for 2.55 m or 2.6 m wide vehicles (which means wider vehicles have not been driven in numbers without any special access conditions on narrower roads in the network), and uncertainty in regard to the extent to which any extra width will be used to lower the centre of gravity of vehicles.

The average willingness to pay based crash costs used by the ARRB for fatal and serious injury crashes avoided under Options 3.1a, 3.1b, 3.2a and 3.2b are shown in Table 6 below.

Table 6: Average willingness to pay based crash costs used in the analysis

Fatal crashes	Serious injury crashes
$8,978,147	$333,144

Asset preservation

Asset preservation benefits arise where wider vehicles are able to move the same freight in fewer trips. For Options 3.1a, 3.1b, 3.2a, and 3.2b; the unit asset preservation benefit was estimated by the ARRB at $0.004 per kilometre reduction in vehicle travel relative to BAU (Option 2).

Vehicle operation

The ARRB established average heavy vehicle and trailer operating costs based on parameter values published by the Australian Transport Assessment and Planning Steering Committee. These vehicle operating costs are based on the underlying consumption of fuel, oil, and tyres, and maintenance and repair costs; expressed in $ per vehicle kilometre travelled (VKT). The average vehicle operating costs per VKT used by the ARRB for Options 3.1a, 3.1b, 3.2a and 3.2b are shown in Table 7 below.

Table 7: Average vehicle operating costs per VKT used in the analysis

Freight task	Goods vehicles over 4.5 tonnes	Trailers over 4.5 tonnes
2.50 m non-refrigerated	$0.744	$0.599
2.55 m non-refrigerated	$0.748	$0.602
2.60 m non-refrigerated	$0.752	$0.605
2.50 m refrigerated	$0.856	$0.711
2.55 m refrigerated	$0.838	$0.692
2.60 m refrigerated	$0.827	$0.680

Reductions in overall vehicle operating costs arise under Options 3.1a, 3.1b, 3.2a and 3.2b, due to a combination of the overall reduction in trips required to move the same freight, together with the reduction in operating costs per VKT for wider refrigerated goods vehicles and trailers (with thicker insulation).

Environment

The ARRB also established average heavy goods vehicle and trailer environmental costs based on parameter values published by the Australian Transport Assessment and Planning Steering Committee. The average environmental costs per VKT used by the ARRB for Options 3.1a, 3.1b, 3.2a and 3.2b are shown in Table 8 below.

Table 8: Average environmental costs per VKT used in the analysis

Freight task	Goods vehicles over 4.5 tonnes	Trailers over 4.5 tonnes
2.50 m non-refrigerated	$0.385	$0.310
2.55 m non-refrigerated	$0.387	$0.311
2.60 m non-refrigerated	$0.389	$0.313
2.50 m refrigerated	$0.443	$0.356
2.55 m refrigerated	$0.433	$0.347
2.60 m refrigerated	$0.428	$0.341

Reductions in environmental costs arise under Options 3.1a, 3.1b, 3.2a and 3.2b, due to a combination of the overall reduction in trips required to move the same freight, together with lower energy needs per VKT for wider refrigerated goods vehicles and trailers (with thicker insulation).

Costs

For Option 2, there are no intervention costs (or benefits) as this is the BAU case.

For Option 3, there are costs to government to implement and maintain updated regulations, costs (and savings) for manufacturers to modify vehicles for changes in the width limit, costs for manufacturers to fit additional required safety systems or features, costs for heavy vehicle operators to maintain and repair safety systems/features, and infrastructure upgrade costs.

Government

The ARRB assumed there would be an estimated cost of $50,000 per annum for the department to create, implement and maintain the proposed changes to regulation under Options 3.1a, 3.1b, 3.2a and 3.2b. This cost was taken from previous Regulation Impact Statements by the department for new ADRs, and is based on the department's past experience in implementing and maintaining the ADRs.

Vehicle modification for width

Increasing the width limit to 2.55 m would substantially reduce the need for truck manufacturers to modify models based on overseas designs, to make them narrower for Australia. Increasing the width limit to 2.60 m would essentially eliminate the need for trucks to be made narrower for Australia.

The ARRB assumed based on estimates previously provided by the TIC to the department, that increasing the width limit would reduce modification costs for heavy truck models by $21.375 m per annum for a 2.55 m limit (Options 3.1a and 3.1b), and $26.125 m per annum for a 2.60 m limit (Options 3.2a and 3.2b). As not all width related modifications for trucks would cease immediately these cost savings were increased each year in proportion to the increase in the take-up of wider trucks entering the fleet as a percentage of all new truck sales (i.e. $213,750 for each 1% take-up of 2.55 m wide trucks each year, and $261,250 for each 1% take-up of 2.60 m wide trucks each year). As these are savings they were modelled as negative costs. The difference in the reduction in modification costs for a 2.55 m and a 2.60 m width limit were chosen by the ARRB to account for around 20-30% of heavy trucks continuing to be sourced from or based on designs for the US market, where trucks up to 2.6 m wide are allowed. Some, but not all of these models, may still require modifications to fit within a 2.55 m width limit, but these should be much reduced compared to the current 2.5 m limit.

If the width limit were increased to either 2.55 m or 2.60 m, many domestic trailer manufacturers would likely decide to re-tool within a shorter timeframe than normal model/variant replacement cycles to meet market demand from heavy vehicle operators for wider trailers. The ARRB assumed based on an estimate from the HVIA that this would cost domestic trailer manufacturers a total of $31 m for 2.55 m and $33 m for 2.60 m, which would then be spread over a 40-year transition period. From this the ARRB estimated the cost for trailer manufacturers to re-tool to be $0.698 m per annum for each year of the analysis under Option 3.1a and $0.853 m per annum for each year of the analysis under Option 3.2a. For trailers, the ARRB applied the same percentage variation in modifications costs between the 2.55 m and 2.6 m options for width, as was applied for trucks.

Fitment of safety systems or features

In the case of adding particular safety systems or features to vehicles, there will be an upfront cost (by the vehicle manufacturers) under Options 3.1a, 3.1b, 3.2a and 3.2b to fit safety systems/features that would not otherwise have been fitted under Option 2 (BAU).

The wholesale unit fitment costs used by the ARRB for each additional vehicle required to be fitted with the applicable safety systems or features under Options 3.1a, 3.1b, 3.2a and 3.2b are shown in Table 9. For each of these options, the ARRB used these wholesale costs, together with market demand forecasts for fleet growth and the BAU take-up of each of the particular safety features (summarised above), to determine the overall increase in fitment for each year of regulation within the overall analysis period, relative to BAU.

Table 9: Unit fitment costs for safety systems or features used in the analysis

Category	Safety system or feature	Unit cost
Trucks (fleet average for sub-category NB2 and category NC)	Enhanced devices for indirect vision	$1,300
	Electronic Stability Control	$1,444
	Advanced Emergency Braking	$1,804
	Lane Departure Warning	$2,560
	Blind Spot Information	$500
	Side underrun protection	$1,000
	Conspicuity markings	$700
Trailers (fleet average for category TC over 4.5 tonnes GTM and category TD)	Side underrun protection	$2,000
	Conspicuity markings	$1,000

Maintenance and repair of safety systems or features

Once safety systems or features are fitted to a heavy vehicle or trailer, there can be additional costs associated with maintenance, such as replacement and repairs to ensure these continue to operate as intended. The ARRB assumed maintenance and repair costs would be incurred at a rate of 1% of the initial fitment cost, for each year of vehicle service life in the analysis under Options 3.1a, 3.1b, 3.2a and 3.2b.

Infrastructure updates

It is possible that some roads would need to be made wider to maintain existing safety margins for use by wider freight vehicles (i.e. maintain clearance between trucks and other vehicles, and between trucks and roadside infrastructure). However, the ARRB considered that this would only be an issue for roads with lane widths well below the recommended 3.5 m lane widths in Australia, which are also less likely to be significant freight routes. Further, ARRB considered that any issues arising from wider vehicles on specific routes would be managed by local road managers through means such as restricting access for wider vehicles; or repainting line markings (where room is available in shoulders or painted out traffic islands).

Increasing the maximum width limit for heavy trucks and trailers could also add infrastructure costs through increased road wear and/or increased collisions between heavy vehicles and roadside infrastructure. However, the ARRB considered that a 50-100 mm increase in vehicle width would have no significant effect on pavement performance unless the payload and gross mass of the vehicle were dramatically increased (which is not part of this proposal). Wider vehicles would have less scope to wander within a lane than narrower vehicles, which would over time lead to a narrower lateral distribution of tyre loadings within lanes. In relation to this ARRB noted that large scale narrowing of the loading distribution (e.g., narrowing of the distribution edge-to-edge of the order of 500 mm) is known to increase pavement deterioration, but considered a narrowing in the distribution of tyre loadings due to a 50-100 mm increase in vehicle width would be an order of magnitude less than this. Similarly, ARRB considered the likelihood of wider vehicles colliding with roadside infrastructure would be low, but would present a cost. This could partly be managed by local road managers restricting access to wider vehicles where there are obvious risks (e.g. power poles at the immediate roadside) and upgrades at some intersections.

To account for infrastructure update costs for wider freight vehicles, including actions by local road managers to restrict access for wider vehicles on specific routes and upgrades at some intersections, the ARRB added an annual infrastructure update cost of $10 per wider heavy freight vehicle entering the network under options 3.1a, 3.1b, 3.2a and 3.2b.

Benefit-cost analysis results

A summary of the results of the BCA by the ARRB is provided in Table 10 below. A 7% discount rate was used to determine present values for all options.

Table 10: Summary of the outcomes of the BCA for each option

Outcomes	Option 3.1a	Option 3.1b	Option 3.2a	Option 3.2b
Benefits	$988 m	$877 m	$1,360 m	$1,206 m
Costs	$334 m	$289 m	$321 m	$275 m
Net Benefits	$654 m	$588 m	$1,038 m	$931 m
BCR	3.0	3.0	4.2	4.4

From model for the BCA by the ARRB, the department is also able to estimate the likely net benefits and BCR for varying Option 3.1a to allow refrigerated goods vehicles and trailers with insulated walls at least 90 mm thick (on each side) to be up to 2.60 m in width. This variation to Option 3.1a is estimated to provide a net benefit of $682 m with a BCR of 3.0.

Sensitivity analysis

A sensitivity analysis was carried out by the ARRB for each of the viable options, to determine the possible effect of uncertain variables on the outcome of the benefit-cost analysis.

Firstly, while a 7% (per annum) real discount rate was used for all options, the benefit-cost analysis for each viable option was also run with rates of 3% and 10%. Table 11 shows that the net benefits are positive for each option under all three discount rates.

Table 11: Impact of changes to the discount rate on net benefits

Net Benefits	Option 3.1a	Option 3.1b	Option 3.2a	Option 3.2b
Worst Case (10%)	$372 m	$338 m	$611 m	$553 m
Main Analysis (7%)	$654 m	$588 m	$1,038 m	$931 m
Best Case (3%)	$1,497 m	$1,330 m	$2,298 m	$2,039 m

The possible effects of changes in infrastructure update costs, fleet growth, safety feature costs, safety feature effectiveness, frontal and rollover crash risk for wider vehicles, and trip reductions, including both worst-case and best-case scenarios, were all also considered in the sensitivity analysis. The outcomes of these sensitivity tests are shown in Tables 12 to 17 below. The net benefits for each option are positive under all these scenarios. The largest impact on net benefits occurs for changes in trip reductions for wider vehicles, followed by changes in the effectiveness and cost of the mandatory safety systems or features.

Table 12: Impact of changes in infrastructure update costs on net benefits

Net Benefits	Option 3.1a	Option 3.1b	Option 3.2a	Option 3.2b
Worst Case (+20%)	$650 m	$585 m	$1,035 m	$928 m
Main Analysis	$654 m	$588 m	$1,038 m	$931 m
Best Case (-20%)	$657 m	$591 m	$1,042 m	$934 m

Table 13: Impact of changes in fleet growth for heavy freight vehicles on net benefits

Net Benefits	Option 3.1a	Option 3.1b	Option 3.2a	Option 3.2b
Worst Case	$605 m	$544 m	$955 m	$854 m
Main Analysis	$654 m	$588 m	$1,038 m	$931 m
Best Case	$708 m	$638 m	$1,131 m	$1,016 m

Table 14: Impact of changes in the cost of safety systems or features on net benefits

Net Benefits	Option 3.1a	Option 3.1b	Option 3.2a	Option 3.2b
Worst Case (+20%)	$579 m	$521 m	$964 m	$864 m
Main Analysis	$654 m	$588 m	$1,038 m	$931 m
Best Case (-20%)	$728 m	$655 m	$1,113 m	$998 m

Table 15: Impact of changes in the effectiveness of safety systems or features on net benefits

Net Benefits	Option 3.1a	Option 3.1b	Option 3.2a	Option 3.2b
Worst Case (-20%)	$545 m	$491 m	$933 m	$836 m
Main Analysis	$654 m	$588 m	$1,038 m	$931 m
Best Case (+20%)	$762 m	$686 m	$1,144 m	$1,026 m

Table 16: Impact of changes in frontal impact and rollover crash risk for wider vehicles on net benefits

Net Benefits	Option 3.1a	Option 3.1b	Option 3.2a	Option 3.2b
Worst Case (+0.5%)	$586 m	$530 m	$971 m	$873 m
Main Analysis	$654 m	$588 m	$1,038 m	$931 m
Best Case (-0.5%)	$721 m	$647 m	$1,106 m	$989 m

Table 17: Impact of changes in trip reductions achieved by wider freight vehicles on net benefits

Net Benefits	Option 3.1a	Option 3.1b	Option 3.2a	Option 3.2b
Worst Case (-20%)	$485 m	$439 m	$708 m	$639 m
Main Analysis	$654 m	$588 m	$1,038 m	$931 m
Best Case (+20%)	$823 m	$737 m	$1,369 m	$1,223 m

Further sensitivity tests were also undertaken for changes in the take up of wider freight vehicles by market of origin, and changes in the size of the refrigerated fleet as a proportion of the entire heavy freight vehicle fleet. The full ARRB report in the Annex to this IA includes further details of these sensitivity tests. The net benefits for each option remained positive, without much variation, under all these further scenarios.

Distribution of the benefits and costs

In the case of this analysis for heavy freight vehicles, the parties affected by the options are:

Business

Affected businesses include:

- Vehicle manufacturers and importers;
- Component manufacturers and suppliers; and
- Vehicle owners and operators.

There is an overlap between businesses and consumers when considering heavy vehicles. Unlike light vehicles, heavy freight vehicle owners and operators, in general, are purchasing and operating these vehicles as part of a business. This is distinct to businesses that manufacture the vehicles or supply the components. The affected businesses are represented by a number of peak bodies, including:

- the Australian Trucking Association (ATA), that represents trucking operators, including major logistics companies and transport industry associations;
- the Commercial Vehicle Industry Association of Australia (CVIAA), that represents members in the commercial vehicle industry;
- the Heavy Vehicle Industry Australia (HVIA), that represents manufacturers and suppliers of heavy vehicles and their components, equipment and technology; and
- the Truck Industry Council (TIC), that represents truck manufacturers and importers, diesel engine companies and major truck component suppliers.

Governments and represented communities

This includes Australian state, territory, and local governments, and their represented communities.

Impact of viable options

There were two options that were considered viable for further examination – Option 2: retain existing standards under the RVSA; and Option 3: implement updated standards under the RVSA. This section looks at the impact of these options in terms of quantifying expected benefits and costs, and identifies how these would be distributed among affected parties.

Option 2: Retain existing standards under the RVSA (business as usual)

As this option is the BAU case, there are no new benefits or costs allocated. All other viable options are assessed relative to this BAU option, so that what would have happened anyway in the marketplace is not attributed to any proposed policy change.

Option 3: Implement updated standards under the RVSA

As this option, including each of the sub options, involves direct intervention to implement an updated set of standards, the benefits and costs are those that would occur over and above those of Option 2 (BAU).

Benefits

Business

There would be a reduction in vehicle operating costs for heavy vehicle operators, due to a combination of the overall reduction in trips required to move the same freight, together with lower energy consumption per VKT for wider refrigerated goods vehicles and/or trailers (from thicker insulation). From the calculations for the BCA by the ARRB, the department estimates these reductions in vehicle operating costs to be $235 m under Option 3.1a (2.55 m goods vehicles and trailers), $208 m under Option 3.1b (2.55 m goods vehicles only), $439 m under Option 3.2a (2.60 m goods vehicles and trailers), and $389 m under Option 3.2b (2.60 m goods vehicles only). As the road freight sector is highly competitive with relatively low profit margins, it is likely that operators would pass any reduction in their overall costs onto their customers (after accounting for increases in vehicle purchase and maintenance costs for the additional safety technologies – see below), which could then also lower product costs for the end consumers (i.e. the cost of goods moved by road). Overall reductions in costs (savings) would be most likely for the sectors that would benefit more from an increase in width, including operators that transport refrigerated produce (e.g. for supermarkets) or volume limited freight, or use EU and/or US size pallets (including for the distribution of imported goods and/or for export purposes), or could use the additional width for more versatile vehicle designs (e.g. to transport different types of goods/produce on outgoing and incoming trips).

Governments and communities

There would be benefits to the community as a whole, including for governments and heavy vehicle operators, from a reduction in road crashes due to both a decrease in the overall number of trips required to move the same freight (i.e. reduced exposure), and the effectiveness of the required safety systems/features in reducing fatal and serious injury crash risk. The ARRB estimated these savings to be $628 m under Option 3.1a (2.55 m goods vehicles and trailers), $558 m under Option 3.1b (2.55 m goods vehicles only), $689 m under Option 3.2a (2.60 m goods vehicles and trailers), and $612 m under Option 3.2b (2.60 m goods vehicles only).

There would also be asset preservation benefits for governments from the reduction in trips needed by heavy goods vehicles and/or trailers to move the same freight. From the calculations for the BCA by the ARRB, the department estimates these savings to be $2.80 m under Option 3.1a (2.55 m goods vehicles and trailers), $2.42 m under Option 3.1b (2.55 m goods vehicles only), $5.46 m under Option 3.2a (2.60 m goods vehicles and trailers), and $4.73 m under Option 3.2b (2.60 m goods vehicles only).

Finally, there would also be a reduction in environmental costs from road freight transport, due to a combination of the overall reduction in trips required to move the same freight, together with lower energy needs per VKT for wider refrigerated goods vehicles and/or trailers (with thicker insulation). From the calculations for the BCA by the ARRB, the department estimates these savings to be $122 m under Option 3.1a (2.55 m goods vehicles and trailers), $108 m under Option 3.1b (2.55 m goods vehicles only), $227 m under Option 3.2a (2.60 m goods vehicles and trailers), and $201 m under Option 3.2b (2.60 m goods vehicles only). These benefits would be for the community as a whole, including governments and businesses.

Table 18 includes the safety, asset preservation, vehicle operating cost, and environment benefits for each option.

Table 18: Summary of the benefits for each option

Benefits	Option 3.1a	Option 3.1b	Option 3.2a	Option 3.2b
Safety	$628 m	$558 m	$689 m	$612 m
Asset Preservation	$2.80 m	$2.42 m	$5.46 m	$4.73 m
Vehicle Operation	$235 m	$208 m	$439 m	$389 m
Environment	$122 m	$108 m	$227 m	$201 m

Figure 8, Figure 9, Figure 10, and Figure 11 show the total (i.e. cumulative) benefits for each option analysed, at each year of the analysis period. As per all other benefits presented in this IA, these are present values as of 1 July 2023.

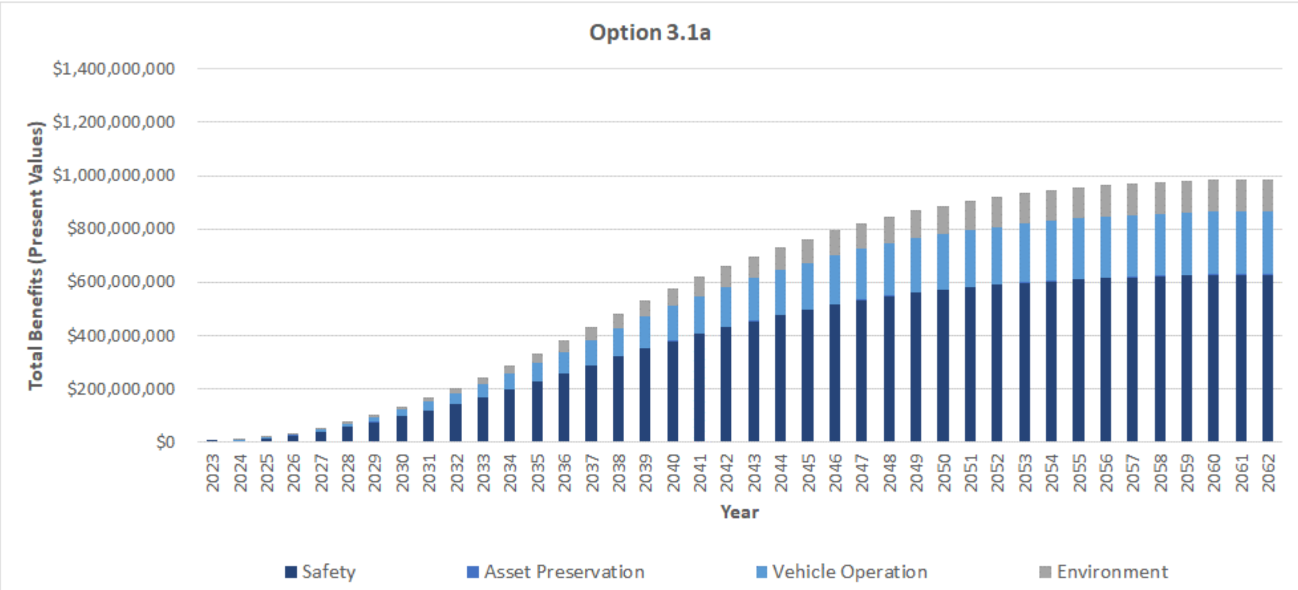

Figure 8: Total (i.e. cumulative) benefits under Option 3.1a at each year of the analysis period

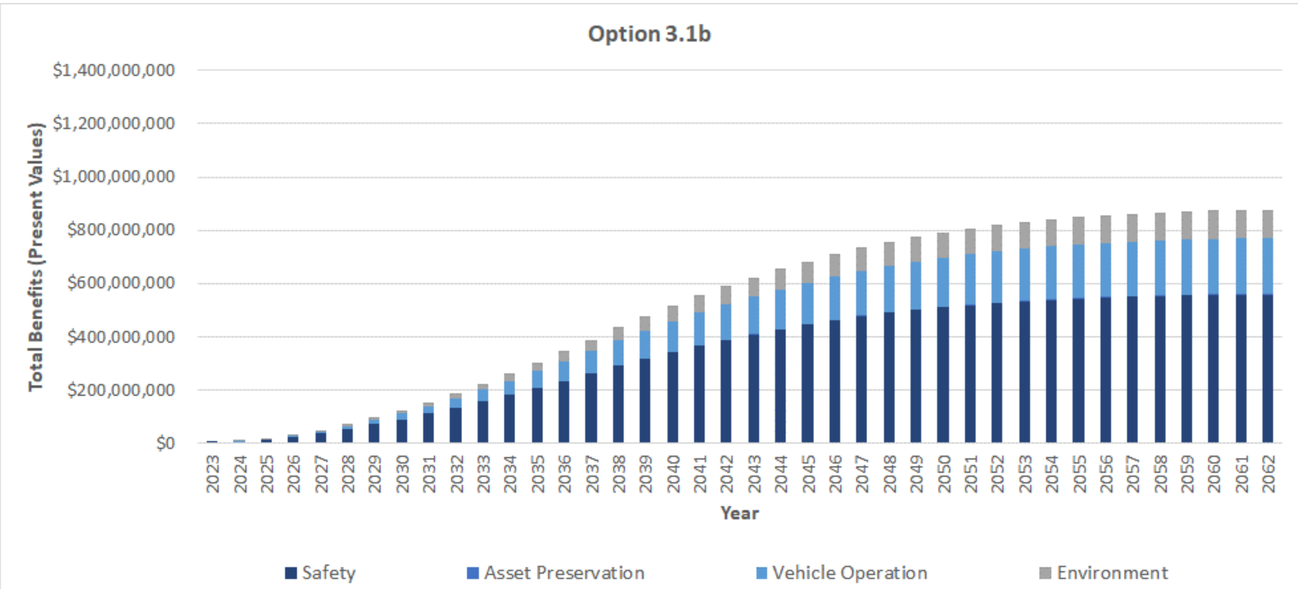

Figure 9: Total (i.e. cumulative) benefits under Option 3.1b at each year of the analysis period

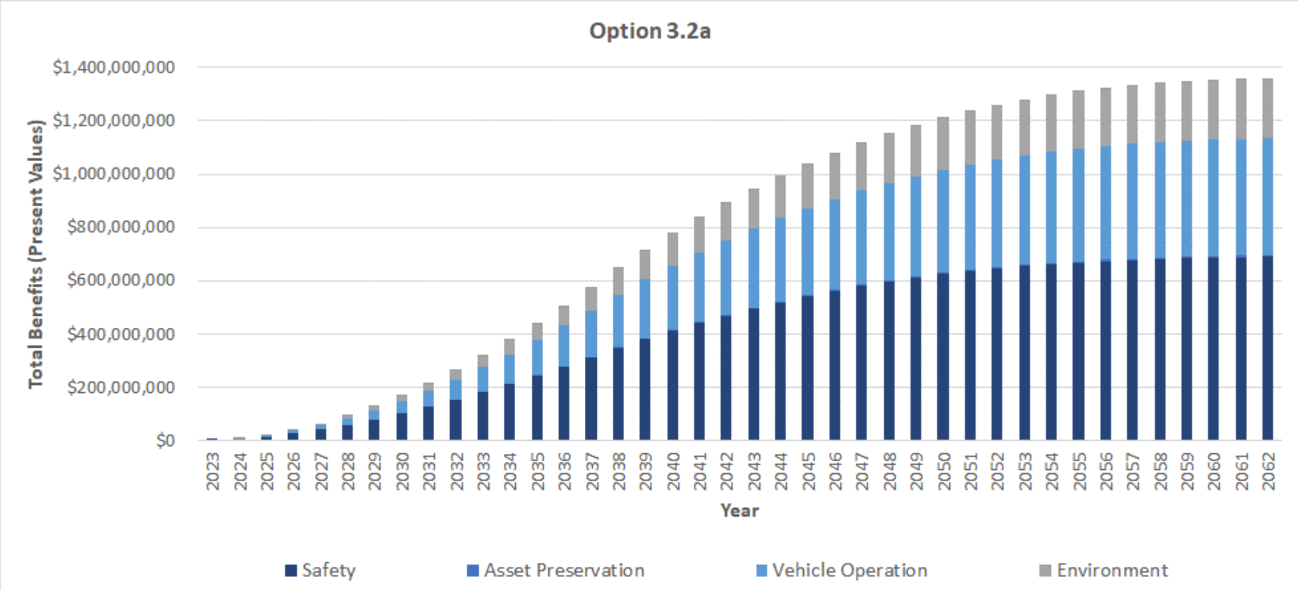

Figure 10: Total (i.e. cumulative) benefits under Option 3.2a at each year of the analysis period

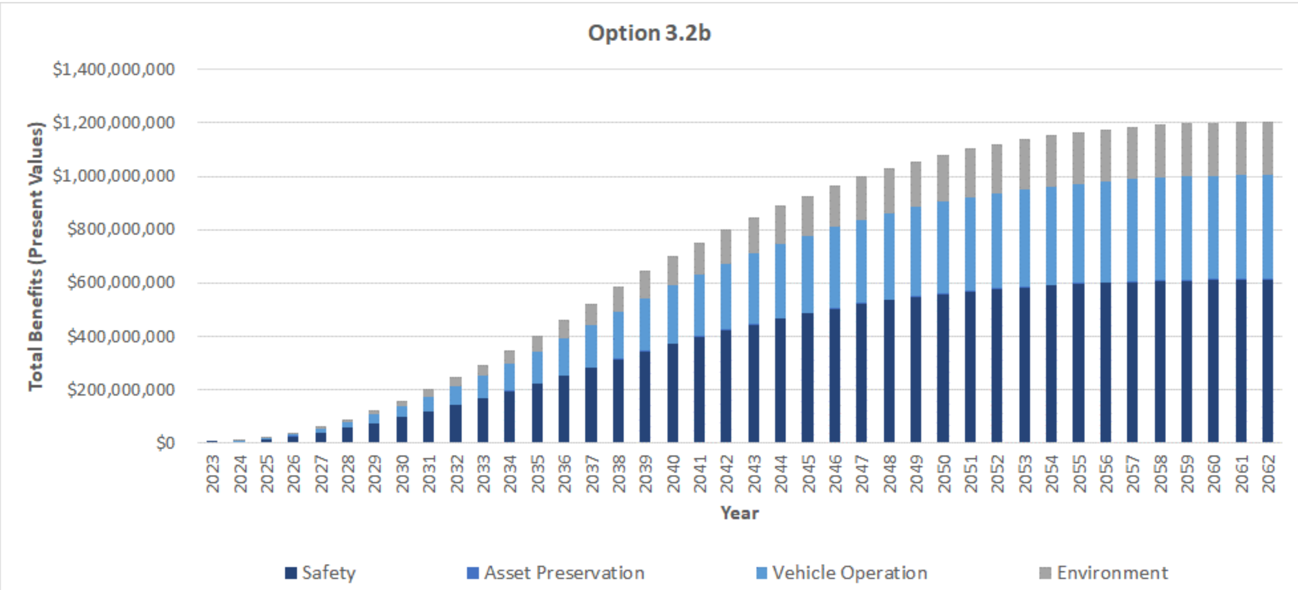

Figure 11: Total (i.e. cumulative) benefits under Option 3.2b at each year of the analysis period

Costs

Business

There would be costs for goods vehicle manufacturers to fit the additional safety systems or features required to be fitted to wider goods vehicles. From the calculations for the BCA by the ARRB, the department estimates the cost for manufacturers to fit these additional safety systems or features would be $298 m for each sub-option. There would also be savings for manufacturers no longer required to modify heavy goods vehicle designs based on overseas models, to be narrower for Australia. From the calculations for the BCA by the ARRB, the department estimates these savings would be $62.5 m under Options 3.1a and 3.1b (all 2.55 m width options), and $76.4 m under Options 3.2a and 3.2b (all 2.60 m width options). Overall (i.e. combining fitment costs and savings for width modifications) there would be net costs of $236 m under Options 3.1a and 3.1b (all 2.55 m width options), and $222 m under Options 3.2a and 3.2b (all 2.60 m width options). It is most likely that these manufacturers would pass this overall increase in costs on to the operators that purchase these goods vehicles, who would then absorb most of it.

There would also be costs for trailer manufacturers to fit the additional safety systems or features required for wider trailers. From the calculations for the BCA by the ARRB, the department estimates the cost for manufacturers to fit these additional safety systems or features would be $32.9 m for each sub-option Option 3.1a (2.55 m goods vehicle and trailers) and Option 3.2a (2.60 m goods vehicle and trailers). Further, there would be costs for domestic trailer manufacturers (over and above that of Option 2) to re-tool within normal model/variant replacement cycles to meet market demand from heavy vehicle operators for wider trailers. From the calculations for the BCA by the ARRB, the department estimates this would cost $6.59 m under Option 3.1a (2.55 m goods vehicle and trailers) and $8.05 m under Option 3.2a (2.60 m goods vehicle and trailers). Overall (i.e. combining fitment costs and costs for width modifications) there would be costs of $39.5 m under Option 3.1a (2.55 m goods vehicle and trailers), and $41.0 m under Option 3.2a (2.60 m goods vehicle and trailers). It is most likely that these manufacturers would pass this increase in costs on to the operators that purchase these trailers, who would then absorb most of it (and this would mostly be offset (and for some sectors entirely offset) by savings from reductions in vehicle operating costs – as discussed above).

There would also be costs for heavy vehicle owners/operators to maintain and repair the additional safety systems or features required to be fitted to wider heavy goods vehicles and/or trailers. From the calculations for the BCA by the ARRB, the department estimates these costs to be $41.3 m under Options 3.1a and 3.2a (2.55 m or 2.60 m goods vehicle and trailer options), and $37.2 m under Options 3.1b and 3.2b (2.55 m or 2.60 m goods vehicle only options).

Governments and communities

There would be a cost for government to develop and implement updated standards. This is estimated to be $0.47 m for each sub-option. There would also be costs for governments to upgrade infrastructure for wider freight vehicles. From the calculations for the BCA by the ARRB, the department estimates these costs to be $16.8 m under Options 3.1a and 3.2a (2.55 m or 2.60 m goods vehicle and trailer options), and $15.5 m under Options 3.1b and 3.2b (2.55 m or 2.60 m goods vehicle only options).

Table 19 includes the costs of safety system fitment and vehicle modification for width (net/combined), maintenance of safety systems, implementation and infrastructure updates for each option.

Table 19: Summary of the costs for each option

Costs		Option 3.1a	Option 3.1b	Option 3.2a	Option 3.2b
Fitment of safety systems or features and modifications for width (net cost)	Goods vehicles	$236 m	$236 m	$222 m	$222 m
	Trailers	$39.5 m	-	$41.0 m	-
Maintenance of safety systems or features		$41.3 m	$37.2 m	$41.3 m	$37.2 m
Implementation of standards		$0.47 m	$0.47 m	$0.47 m	$0.47 m
Infrastructure updates		$16.8 m	$15.5 m	$16.8 m	$15.5 m

Figure 12, Figure 13, Figure 14, and Figure 15 show the total (i.e. cumulative) costs for each option analysed, at each year of the analysis period. As per all other costs presented in this IA, these are present values as of 1 July 2023.

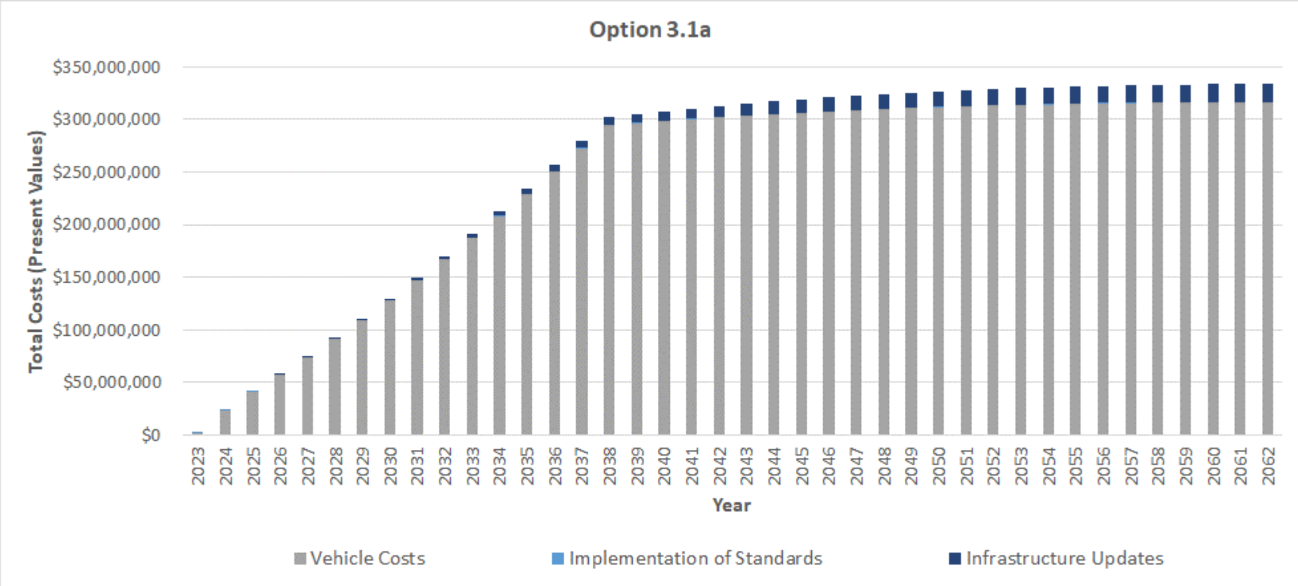

Figure 12: Total (i.e. cumulative) costs under Option 3.1a at each year of the analysis period

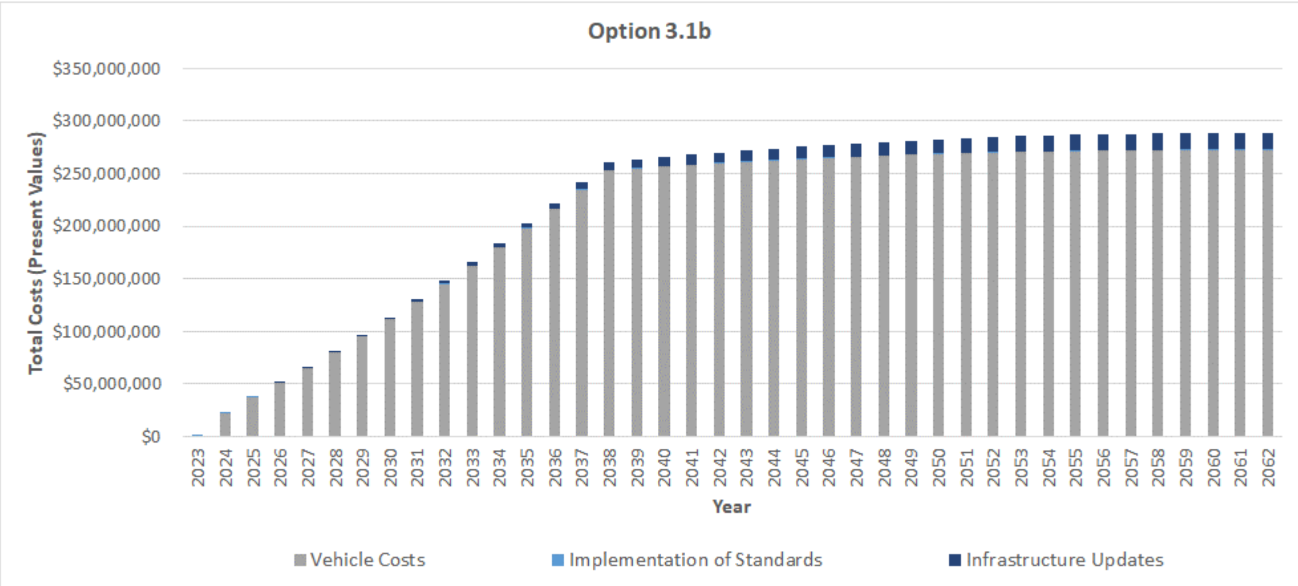

Figure 13: Total (i.e. cumulative) costs under Option 3.1b at each year of the analysis period

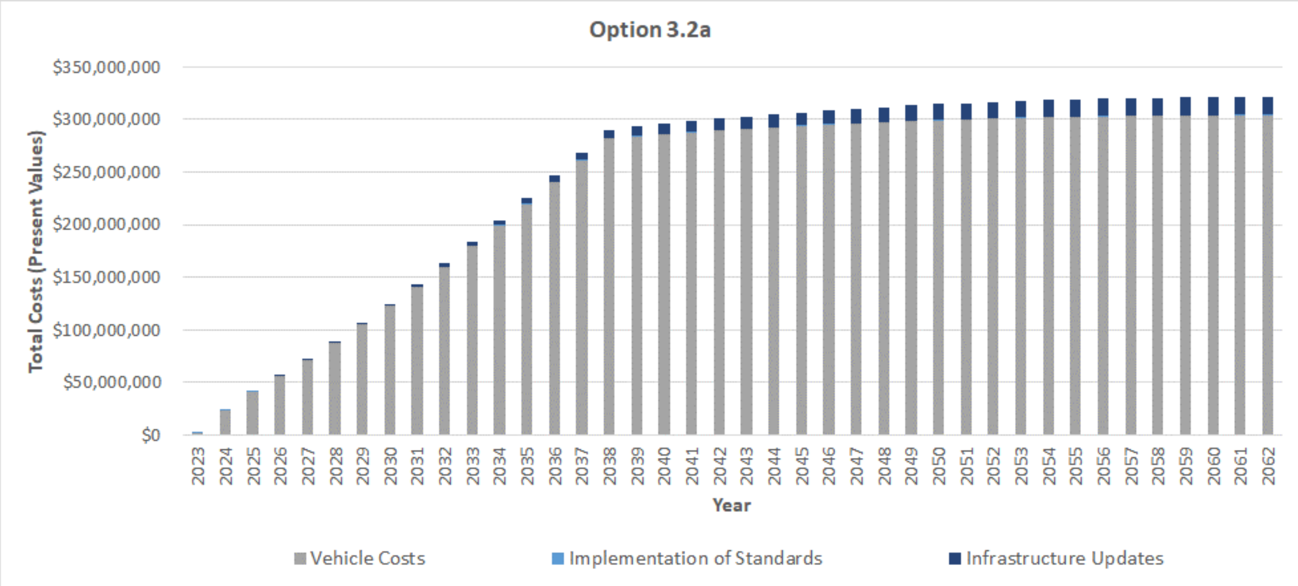

Figure 14: Total (i.e. cumulative) costs under Option 3.2a at each year of the analysis period

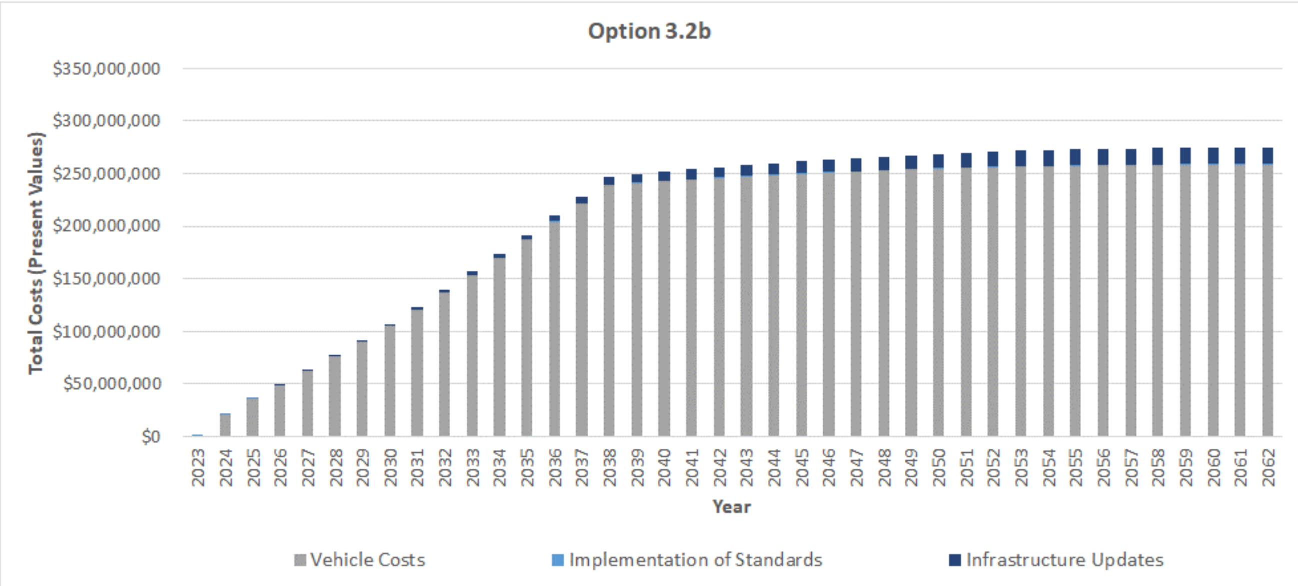

Figure 15: Total (i.e. cumulative) costs under Option 3.2b at each year of the analysis period

Chapter 6: Consultation

General consultation arrangements and committees

It has been longstanding practice for the department to consult widely on proposed new or amended vehicle standards. For many years, there has been active collaboration between the Commonwealth and the state/territory governments, as well as consultation with industry and consumer groups. Much of the consultation takes place within institutional arrangements established for this purpose. The analysis and documentation prepared in a particular case, and the bodies consulted, depend on the degree of impact the new or amended standard is expected to have on industry or road users.

The department undertakes public consultation on significant proposals in order to obtain the views of affected parties, ensure all practical and viable policy alternatives are considered, confirm the accuracy of data on which analyses are based, and ensure there are no implementation barriers and/or unintended consequences. Depending on the nature of the proposed changes, consultation may involve community and industry stakeholders as well as established government committees such as the Technical Liaison Group (TLG), Strategic Vehicle Safety and Environment Group (SVSEG), the Infrastructure and Transport Senior Officials' Committee (ITSOC) and the Infrastructure and Transport Ministers Meeting (ITMM).

- TLG consists of technical representatives of government (Australian and state/territory), the manufacturing and operational arms of the industry (including organisations such as the Federal Chamber of Automotive Industries and the Australian Trucking Association) and of representative organisations of consumers and road users (particularly through the Australian Automobile Association).
- SVSEG consists of senior representatives of government (Australian and state/territory), the manufacturing and operational arms of the industry and of representative organisations of consumers and road users (at a higher level within each organisation as represented in TLG).
- ITSOC consists of state and territory transport and/or infrastructure Chief Executive Officers (CEOs) (or equivalents), the CEO of the National Transport Commission, New Zealand and the Australian Local Government Association.
- ITMM consists of the Australian, state/territory and New Zealand Ministers with responsibility for transport and infrastructure issues.

SVSEG and the TLG are the principal consultative forums for advising on ADR proposals. Membership of the SVSEG is shown at Appendix 12, and membership of the TLG is shown at Appendix 13.

Public comment

The publication of proposed policy options and exposure drafts of implementing ADRs for public comment is an integral part of the consultation process. This provides an opportunity for businesses and road user groups, as well as all other interested parties, to respond to the proposal by writing or otherwise submitting their comments to the department. This helps to identify the likely impacts and enables informed debate on any issues.

Public comment was sought on each of the policy options considered in this IA, through the publication of the Safer Freight Vehicles Discussion Paper (Commonwealth of Australia, 2021a) and draft ADRs on the department's website, for a 10-week public comment period, which closed on 30 June 2021.

The states and territories are broadly supportive of a width limit of 2.55 m for both goods vehicles and trailers, but do not support a move to 2.60 m at this stage. The general position among the jurisdictions is that the Commonwealth should implement a 2.55 m limit as supported by Austroads research to date (Austroads, 2019), and work with the NHVR and Austroads to research the suitability of a 2.60 m limit for the future.

Jurisdictions generally support all of the additional proposed mandatory safety technologies for wider freight vehicles; with NSW, VIC and QLD all requesting further mandatory national standards (i.e. ADRs) be implemented to better align with the EU.

Most industry stakeholders support a width limit of 2.60 m for trucks and trailers, including the Truck Industry Council (TIC), the Commercial Vehicle Industry Association of Australia (CVIAA) and the Australian Trucking Association (ATA). These stakeholders argue that this would avoid the need to modify vehicles based on EU and US designs to be narrower for Australia, provide the best access to electric trucks from the world market, and deliver the greatest safety and productivity benefits.

However, some industry stakeholders do not support increasing the width limit for trailers, including the Heavy Vehicle Industry Association (HVIA) and many Australian heavy trailer manufacturers. They are concerned the proposed changes will favour trailer importers and cost Australian trailer manufacturing jobs. These stakeholders consider that domestic trailer manufacturers would need to re-tool and change manufacturing processes to increase trailer width in order to compete with importers, and that the cost of the retooling, transitional costs and potential loss of Australian manufacturing jobs, far exceed any safety or productivity benefits.

Industry stakeholders are broadly supportive of mandatory requirements for ESC, AEB and LDWS. Some industry stakeholders have raised concerns about mandatory side underrun protection, particularly for trailer design types mostly used in regional and remote areas. The Truck Industry Council provided in-principle support for the adoption of a more stringent ADR for devices for indirect vision and the future adoption of an ADR for blind spot information systems, while detailing concerns regarding the suitability of the relevant UN regulations for Australia, and recommendations to address these concerns.

There is widespread support for the department's proposed exclusions for enhanced devices for indirect vision and/or devices to detect other road users from vehicle width and length measurements. Further, there have been no objections raised to these.

A more detailed summary of the public comments together with department responses is included in Appendix 14.

Informal Working Group on Safer Freight Vehicles

In November 2021, the department established an Informal Working Group to help plan for a successful implementation of the reforms proposed in the Safer Freight Vehicles Discussion Paper (Commonwealth of Australia, 2021a). This was particularly important to ensure a consistent approach and seamless transition could be achieved between the regulation of vehicles at first supply to market and in-service. Four meetings of this group were held between December 2021 and April 2022.

The feedback and agreed outcomes from this informal working group have been considered by the department in finalising the ADRs and determining the compliance information to be collected to implement the recommended policy option. This includes drafting the ADR requirements in a way that allows for cab-chassis and other partially completed vehicles to be supplied without side underrun protection and conspicuity markings, but still requires these to be fitted during the completion of the vehicle (e.g. by a vehicle bodybuilder). It also includes updating the Register of Approved Vehicles (RAV) to include an additional field through which manufacturers would identify vehicles meeting the additional ADR requirements for wider freight vehicles, the form in which the vehicle was added to the RAV (e.g. completed vehicle, prime mover, chassis-cab), and the maximum width for which the vehicle is certified to comply with all applicable ADRs.

SVSEG and TLG

The package of new safety ADRs proposed to be mandated under each of the options for the wider vehicles (those exceeding the current 2.50 m limit) was developed in consultation with the SVSEG during 2018-19. As part of this process the department circulated a paper to members which put forward a possible regulatory package to increase the width limit for freight vehicles fitted with additional proposed safety systems/features. This paper was discussed at a meeting of the SVSEG in 2019 and members were also given the opportunity to submit comments/feedback to the department following this meeting.

Comment on each of the policy options considered in this IA was also sought from SVSEG and TLG, by circulating the Safer Freight Vehicles Discussion Paper (Commonwealth of Australia, 2021) and the draft ADRs to members at the time of publication on the department's website (April 2021). During the 10-week public consultation period, the department held a dedicated session with government members of SVSEG as well as a dedicated session with a general safety standing committee of TLG, to explain the proposed reforms and provide an opportunity for members to ask questions to assist in finalising their submissions.

Following the public consultation, the proposals in this IA and draft implementing ADRs were further discussed as part of two TLG meetings between July and November 2021, a SVSEG meeting in November 2021, and a TLG meeting in November 2022. The feedback and agreed outcomes from these meetings have been considered in refining and analysing the options in this IA, and in particular, to improve and refine the implementing ADRs. For example, the proposed ADR 14/03 for devices for indirect vision has been updated following this consultation to include provisions to allow for some alternative styles of mirrors used on trucks in Australia, including US style cross-view mirrors (refer Glossary in Appendix 2) to be used on bonneted trucks in place of UN style front-view mirrors, US style fender/bonnet/hood mirrors, and a camera-monitor system in combination with an external flat glass main rear-view mirror.

ITMM

At the 16th meeting of Infrastructure and Transport Ministers on 11 February 2022, Ministers agreed to amend the current HVNL regulations to increase the maximum heavy vehicle width from 2.50 m to 2.55 m, in line with the Commonwealth's decision to amend the relevant Australian Design Rules (ADRs), for vehicles that comply with the amended ADRs, and to align the amendment of the current HVNL regulations with the timing of the ADR amendments.

Chapter 7: What is the best option?

The following options were identified earlier in this IA as being viable for analysis:

- Option 2: Retain existing standards under the RVSA (BAU); and
- Option 3: Implement updated standards under the RVSA.

Net benefits

Net benefit (total benefits minus total costs in present value terms) provides the best measure of the economic effectiveness of the options.

According to the benefit-cost analysis conducted by the ARRB, Option 3.2a (2.60 m wide goods vehicles and trailers) has the highest net benefit of the options examined, at $1,038 m. This benefit would be spread over a period of around 40 years, including the assumed 15-year period of regulation followed by a period of around 25 years over which the overall percentage of wider (up to 2.60 m) goods vehicles and trailers fitted with the required safety systems/features continue to rise, including due to older vehicles being deregistered at end of service life.

Options 3.1a (2.55 m wide goods vehicles and trailers), 3.1b (2.55 m wide goods vehicles only), and 3.2b (2.60 m wide goods vehicles only) also had positive net benefits of $654 m, $588 m, and $931 m respectively.

Discussion

Although Option 3.2a (2.60 m wide goods vehicles and trailers) has the highest net benefit according to the ARRB benefit-cost analysis, there are some key study limitations relating to productivity benefits and infrastructure costs that should be addressed before any decision is taken to increase the width limit to 2.60 m for goods vehicles and/or trailers.

It is likely that much of the other freight movements from which the ARRB derived its reduction in trip estimates will involve ongoing use of Australian standard size pallets, including for compatibility with other vehicles in the fleet and between road and rail. This would further limit the reduction in trips for each option, as wider vehicles will not be able to carry any more freight wherever the same Australian standard size pallets continue to be used. Also, heavy vehicles do not always operate at capacity, which may further limit the possible reduction in trips for wider freight vehicles. For example, it is likely that many operators would be able to increase movement of volume-limited-freight on outbound trips, but would achieve little or no productivity gain for backloads. Further, some wider trucks and many wider trailers, would likely include design changes for safer and/or easier loading and unloading, rather than for increasing the load that can be carried on each trip. On the other hand, an increased width limit would allow some operators to more readily and efficiently transport wider EU or US size pallets, and/or to purchase trailers that are better designed to carry multiple load types, including for outbound and return trips. In this respect, further consultation, including detailed review and feedback from heavy freight vehicle operators and distribution companies, may enable better informed estimates to be made of the productivity impacts.

Although the ARRB have assumed the same infrastructure update costs for both a 2.55 m and a 2.60 m width limit, it is possible that there would be some additional infrastructure costs for 2.60 m wide freight vehicles. Further, state and territory governments are currently only supportive of increasing the width limit to 2.55 m, and any increased infrastructure update costs for a 2.60 m width limit would primarily be absorbed by these governments (together with local governments). There should therefore be an opportunity for these other government stakeholders to review and provide feedback on the benefit-cost analysis, including in-particular the infrastructure update costs for 2.60 m wide freight vehicles, before any decision is taken to increase the width limit to 2.60 m for goods vehicles and/or trailers.

In addition to the above benefit-cost analysis related limitations, it is also important to consider the possible impacts of a staged increase in the width limit for both truck and trailer manufacturers. For both trucks and imported trailers, increasing the width limit to 2.55 m would substantially reduce modification costs to make vehicles narrower for Australia, and any subsequent change to allow for 2.60 m wide vehicles should only further reduce these costs. However, such a staged approach would create the greatest modification costs and undesirable regulatory uncertainty for domestic trailer manufacturers. It would therefore be better to reserve any decision in regard to increasing the maximum width limit for trailers until the above limitations of the current analysis are addressed.

None of the above study limitations or staged implementation considerations should stop the Australian Government from implementing Option 3.1b (2.55 m wide goods vehicles only) as soon as possible. This option is the least sensitive to changes in reductions in trips for increased width, including because the net benefit for this option is mostly derived through an increase in the take-up of safer freight vehicles. Further, the net benefit of allowing 2.55 m wide goods vehicles under this sub-option is a key sub-part of the net benefits for each of the other sub-options. This means whatever option is ultimately identified as the best option, including following further consultation to address the current study limitations, this will at least include 2.55 m wide goods vehicles over 4.5 tonnes GVM (i.e. Option 3.1b).

Recommendations

1. As a first step, the Australian Government should implement Option 3.1b (2.55 m wide goods vehicles only), with a policy commencement date as close as reasonably practical to 1 July 2023 (as was assumed and modelled in the ARRB benefit-cost analysis – refer to Chapter 8 below for further explanation of commencement timing).
2. The department should publish this IA on its website and invite further public comment in regard to the possible future implementation of Options 3.1a (2.55 m goods vehicles and trailers), 3.2a (2.60 m goods vehicles and trailers), or 3.2b (2.60 m goods vehicles only).
3. Stakeholders, particularly heavy freight vehicle operators and distribution companies, should provide the department with more detailed and verifiable data to enable better-informed estimates to be made of the likely reduction in trips for 2.55 m and 2.60 m wide heavy freight vehicles (e.g. freight movement by pallets, utilisation of available volumetric capacity etc.), together with likely benefits from design changes for both safer and/or easier loading and unloading of wider freight vehicles and increased versatility to provide greater productivity (e.g. designs that can be better utilised during back-loads).
4. State and territory governments should work together with local governments to identify where there are roads or intersections within the network that are not suitable for 2.60 m wide vehicles, and provide the department with verifiable estimates of the cost to update these and/or implement any access restrictions, to enable a better-informed estimate to be made of the likely infrastructure impact for 2.60 m wide heavy freight vehicles.
5. The department should update the benefit-cost analysis as the actions arising from recommendations 2, 3 and 4 above are completed, and if the outcomes of this justify a further stage of reform, prepare an updated IA for consideration by the Minister.

Chapter 8: Implementation and evaluation

New ADRs or amendments to the ADRs are determined by the responsible minister under section 12 of the RVSA.

Development of safety-related ADRs under the RVSA is the responsibility of the Vehicle Safety Policy and Partnerships (VSP&P) Branch of the department. It is carried out in consultation with representatives of the Australian Government, state and territory governments, manufacturing and operating industries, road user groups and experts in the field of road safety. Under the RVSA, the Minister may consult with state and territory agencies responsible for road safety, organisations and persons involved in the road vehicle industry and organisations representing road vehicle users before determining an ADR.

Implementation of updated standards

Option 3.1b would be implemented with a fixed policy commencement date, to be set as close as reasonably practical to 1 July 2023 (as was assumed and modelled in the ARRB benefit-cost analysis). This would be achieved by commencing an ADR amendment to increase the width limit to 2.55 m for goods vehicles over 4.5 tonnes, on the same fixed date that the new ADR requirements for the additional safety systems/features become mandatory (applicable) for those vehicles exceeding 2.50 m in width. The exact commencement date will be determined by the Government. It is not proposed to include separate new models and all new vehicles applicability dates, as is the normal practice for other new ADRs. This is because the changes proposed under Option 3.1b will simply allow for vehicle type approval under the RVSA of wider goods vehicles that cannot currently comply with all the applicable national road vehicle standards (ADRs), and as a consequence are not yet available for operators to purchase and use in Australia. There will therefore not be the usual need for a transition period for existing models already in the market, which is usually provided through a later applicability date for all new vehicles.

The RAV would be updated to include an additional field through which manufacturers would identify vehicles meeting the additional ADR requirements for wider freight vehicles, the form in which the vehicle was added to the RAV (e.g. completed vehicle, prime mover, chassis-cab), and the maximum width for which the vehicle is certified to comply with all applicable ADRs. This additional information would be required for all goods vehicles approved to exceed 2.50 m in width, and would enable vehicle bodybuilders, in-service regulators and heavy vehicle operators to establish the maximum permissible width for individual vehicles in service.

Following registration of the new and amended ADRs, it is expected that changes would be made to the Heavy Vehicle National Law (HVNL) and the Heavy Vehicle (Mass, Dimension and Loading) (MDL) National Regulation (and the equivalent laws in WA and the NT), to allow for the use in-service of wider goods vehicles meeting the new and amended ADRs, including when used to carry loads up to 2.55 m in width. For example, heavy vehicles exceeding 2.50 m in width are currently defined as restricted access vehicles under the HVNL, and operators must not use these on a road unless the road is one for which the vehicle is allowed to be used under an exemption notice or permit. Further the MDL Regulation currently limits heavy vehicle width, including loads/cargo carried, to 2.5 m (except where an exemption notice or permit allows for the operation of an over-width vehicle and/or load).

Implementation risks

As considered in the benefit-cost analysis by the ARRB, it is possible that some roads would need to be made wider to maintain existing safety margins for use by wider trucks (i.e. maintain clearance between trucks and other vehicles, and between trucks and roadside infrastructure). However, this would only be an issue for roads with lane widths well below the recommended 3.5 m lane widths in Australia, which are also less likely to be significant freight routes. Any issues arising from wider vehicles on specific routes would likely be managed by local road managers through means such as restricting access for wider vehicles; or repainting line markings (where room is available in shoulders or painted out traffic islands). In the absence of appropriate treatments, there could be an increase in frontal impact and/or side swipe crashes for wider trucks, and/or an increase in collisions with roadside infrastructure. This risk may be offset by a reduction in rollover crashes, if manufacturers use the additional width to improve stability by lowering the height of the vehicle centre-of-gravity.

Review and evaluation of standards

As Australian Government regulations, the ADRs are subject to review every ten years as resources permit. This is important to check if regulation is still needed and identify if/where an ADR can be improved, including to account for changes in technology, consumer preferences, international standards and other regulatory requirements. This ensures that the ADRs remain relevant, cost effective and do not become a barrier to the importation of safer and/or lower emissions vehicles and vehicle components. Each of the new and amended ADRs to implement the recommended option would be scheduled for a full review on an ongoing basis and in line with this practice. Further, UN regulations are revised on an ongoing basis, and the department reviews the possible adoption of UN regulations and their revisions into the ADRs as they become available.

The Bureau of Infrastructure, Transport and Regional Economics (BITRE) regularly publishes road crash statistics for Australia, including quarterly and annual summaries of trauma from road crashes in which one or more heavy trucks or buses were involved. Each of the states and territories also publish police reported road crash data, including for crashes involving heavy vehicles. Further, in May 2021, the Australian Government committed $16.5 million over four years to establish the National Freight Data Hub. The department expects that these data sources, together with the details of the wider freight vehicles added each month and year to the RAV, will be used to collectively inform and support future evaluation(s) of the implementation of the recommended option in terms of the key metrics for success, including the impacts of the increase in the number of wider freight vehicles in the fleet over time on both road safety (i.e. fatal and serious injury crashes) and productivity (e.g. freight movement costs).

State and territory government vehicle registration authorities and road agencies would be able to identify where wider freight vehicles are involved in crashes, by linking the Vehicle Identification Number(s) from police reported crashes to those for the wider freight vehicles added to the RAV. This could be used to monitor and report back any changes (positive or negative) in crash trends to the Commonwealth, including for particular accident codes of interest, such as frontal impacts, rollovers and lane side swipes.

Exemption from sunsetting

A national road vehicle standard (ADR) made under section 12 of the RVSA is not subject to the sunsetting provisions of section 50 of the *Legislation (Exemptions and Other Matters) Act 2003* through section 12 of the *Legislation (Exemptions and Other Matters) Regulation 2015 (table item 56C)*. A similar exemption was previously granted in respect of national standards made under section 7 of the *Motor Vehicle Standards Act 1989* (MVSA) (item 40, section 12 of the *Legislation (Exemptions and Other Matters) Regulation 2015*). This exemption is important to ensure that ADRs continue to remain in force, and available to regulators and industry.

It is appropriate that standards made under section 12 of the RVSA remain enduring and effective to regulate ongoing road worthiness of vehicles throughout their useful life and reduce regulatory burden on vehicle manufacturers.

The exemption was granted to ADRs as they facilitate the establishment and operation of the intergovernmental vehicle standard regime that Commonwealth, State and Territory governments rely on to regulate the safety of vehicles on public roads.

While the ADRs are regularly updated to reflect changes in technology, it is not possible to apply these new standards retrospectively to vehicles that are already in use. With former ADRs being available on the Federal Register of Legislation, State and Territory governments can use them to ensure vehicles continue to comply with the ADRs that were in force when they were first supplied to the market.

Requiring vehicle manufacturers to redesign existing models to comply with new ADRs would be a costly and onerous exercise. Vehicle manufacturers should not be expected to continually redesign existing vehicles. Ongoing product recalls of vehicles in the fleet would be needed to comply with new ADRs and this would undermine consumer confidence, with significant financial impact to vehicle manufacturers. The exemption from sunsetting allows vehicle manufacturers to focus their efforts on ensuring new models supplied to the market comply with the ADRs.

The exemption from sunsetting does not mean that ADRs do not undergo regular evaluations. ADRs are subject to regular reviews, as resources permit, and when developments in vehicle technology necessitates updates to requirements. Comprehensive parliamentary scrutiny is available through these reviews.

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Appendix 1 – Acronyms and abbreviations

ABS	Antilock Brake System
AEB/AEBS	Advanced Emergency Braking (System)
ADR	Australian Design Rule
ALVSRs	Australian Light Vehicle Standards Rules
ARRB	Australian Road Research Board
ARTSA	Australian Road Transport Suppliers Association (now part of the HVIA)
ATA	Australian Trucking Association
ATM	Aggregate Trailer Mass
BAU	Business as Usual
BCR	Benefit-Cost Ratio
BITRE	Bureau of Infrastructure, Transport and Regional Economics
BSIS	Blind Spot Information Systems
BTE	Bureau of Transport Economics (now BITRE)
CEO	Chief Executive Officer
CVIAA	Commercial Vehicle Industry Association of Australia
ESC	Electronic Stability Control
EC	European Commission
EU	European Union
GVM	Gross Vehicle Mass
HVIA	Heavy Vehicle Industry Association
HVNL	Heavy Vehicle National Law
IA	Impact Analysis
ITMM	Infrastructure and Transport Ministers Meeting
ITSOC	Infrastructure and Transport Senior Officials' Committee
LDWS	Lane Departure Warning System
LPDs	Lateral Protection Devices
MVSA	*Motor Vehicle Standards Act 1989*
NHVR	National Heavy Vehicle Regulator
NPV	Net Present Value
NTC	National Transport Commission
OBPR	Office of Best Practice Regulation
PBS	Performance Based Standards
RAV	Register of Approved Vehicles
RSC	Roll Stability Control
RVSA	*Road Vehicles Standards Act 2018*
SVSEG	Strategic Vehicle Safety and Environment Group
SVTG	Safe Vehicles Theme Group

TIC	Truck Industry Council
TLG	Technical Liaison Group
UN	United Nations
US	United States
VKT	Vehicle Kilometres Travelled

Appendix 2 – Glossary

Advanced Emergency Braking (AEB)	A system that can automatically detect a potential forward collision and activate the vehicle braking system to decelerate the vehicle with the purpose of avoiding or mitigating a collision.
Aggregate Trailer Mass (ATM)	The total mass of the laden trailer when carrying the maximum load recommended by the manufacturer. This will include any mass imposed onto the drawing vehicle when the combination vehicle is resting on a horizontal supporting plane.
Antilock Brake System (ABS)	A portion of a service brake system that automatically controls the degree of rotational wheel slip relative to the road at one or more road wheels of the vehicle during braking.
Axle	One or more shafts positioned in a line across a vehicle, on which one or more wheels intended to support the vehicle turn.
Axle Group	Either a single axle, tandem axle group, triaxle group, or close coupled axle group.
B-Double	A combination of vehicles consisting of a prime mover towing two semi-trailers.
Benefit-Cost Ratio (BCR)	The ratio of expected total (gross) benefits to expected total costs (in terms of their present monetary value) for a change of policy relative to business as usual.
Blind Spot Information System	A system to inform the driver of a possible collision with another road user (e.g. vehicle, motorcycle, bicycle, pedestrian etc.) in close proximity to the vehicle.
Close Coupled Axle Group	Two axles with centres not more than 1.0 m apart (regarded under the ADRs as a single axle); three axles with centres not more than 2.0 m apart (regarded under the ADRs as a tandem axle group); or four or more axles with centres not more than 3.2 m apart (regarded under the ADRs as a tri-axle group).
Conspicuity Marking	A device intended to make a vehicle more clearly visible, when viewed from the side or rear (or in the case of trailers, additionally from the front), by the reflection of light emanating from a light source not connected to the vehicle.
Converter Dolly	A trailer with an axle group and a fifth wheel coupling near the middle of its load-carrying surface, designed to convert a semi-trailer into a dog trailer.
Cross-view mirror	A mirror that can be adjusted to enable a driver to see all points on a transverse horizontal line that is 1 m above a flat horizontal portion of road, 300 mm forward of the front end of the vehicle, and extends across the full width of the vehicle.
Device for Indirect Vision	Devices intended to give a clear view of the rear, side or front of the vehicle within the fields of vision defined in UN R46. These can be conventional mirrors, camera-monitors or other devices able to present information about the indirect field of vision to the driver.
Discount Rate	A rate of interest used to translate costs which will be incurred and benefits which will be received across future years into present day values.

Dog Trailer	A trailer with two axle groups of which the front axle group is steered by connection to the drawing vehicle.
Electronic Stability Control	A vehicle stability function.
Fatal Crash	A crash for which there is at least one death.
Fifth Wheel Assembly	A fifth wheel coupling including any turn-table, mounting plate, sliding assembly, load cell and other equipment mounted between the towing vehicle chassis and the trailer skid plate, but not including any attachment sections.
Fifth Wheel Coupling	A device, other than the skid plate and the kingpin (which are parts of a semi-trailer), used with a prime mover, semi-trailer or a converter dolly to permit quick coupling and uncoupling and to provide for articulation.
Front End	The foremost point on the vehicle including the bumper bar; over-riders; tow hook; and bull bar if standard equipment.
Gross Vehicle Mass (GVM)	The maximum laden mass of a motor vehicle as specified by the manufacturer.
Gross Trailer Mass (GTM)	The mass transmitted to the ground by the axle or axles of the trailer when coupled to a drawing vehicle and carrying its maximum load approximately uniformly distributed over the load bearing area, and at which compliance with the appropriate ADRs has been or can be established.
Heavy Freight Vehicle	Any goods vehicles greater than 4.5 tonnes GVM or any trailer greater than 4.5 tonnes ATM.
Lane Departure Warning System	A system to warn the driver of an unintentional drift of the vehicle out of its travel lane.
Lateral Protection Device	A combination of longitudinal member(s) and link(s) (fixing elements) to the chassis side members or other structural parts of the vehicle, designed to offer effective protection to pedestrians, cyclists or motorcyclists against the risk of falling under the sides of the vehicle and being caught under the wheels. Parts of the vehicle can also be used as lateral protection devices.
Net Benefit	The sum of expected benefits (in monetary terms), less expected costs associated with a change of policy relative to business as usual.
Net Present Value (NPV)	The difference between the present economic value (determined using an appropriate discount rate) of all expected benefits and costs over time due to a change of policy relative to business as usual.
Prime Mover	A motor vehicle built to tow a semi-trailer.
Rigid Truck	A motor vehicle with a GVM greater than 4.5 tonnes constructed with a load carrying area. Includes a rigid truck with a tow bar, draw bar or other coupling on the rear of the vehicle.
Rear End	The rearmost point on the vehicle including the bumper bar, over-riders and tow hook or towbar if standard equipment.
Rear Overhang	The distance measured horizontally and parallel to the longitudinal axis of the vehicle between the rear end of the vehicle and the centre of the rear axle group.

Retractable Axle	An axle with a means of adjustment enabling it to be raised or lowered relative to the other axles in the axle group.
Road Crash Fatality	A person who dies within 30 days of a crash as a result of injuries received in that crash.
Semi-trailer	A trailer that has one axle group or a single axle towards the rear; and a kingpin and skid plate at the front for coupling to the fifth wheel assembly of a prime mover, another semi-trailer or a converter dolly.
Truck Tractor	A prime mover.
Unladen Mass	The mass of the vehicle in running order unoccupied and unladen with all fluid reservoirs filled to nominal capacity including fuel, and with all standard equipment.
Vehicle Stability Function	An electronic control function for a vehicle that improves the dynamic stability of the vehicle.
Vision Support System	A system to enable the driver to detect and/or see objects in the area adjacent to the vehicle.

Appendix 3 – Heavy goods vehicle and trailer categories

A two-character vehicle category code is shown for each vehicle category. This code is used to designate the relevant vehicles in the national road vehicle standards (the ADRs), and in related documentation.

The categories listed below are those relevant to vehicles greater than 4.5 tonnes '*Gross Vehicle Mass*' and trailers greater than 4.5 tonnes *'Gross Trailer Mass'* (Heavy Vehicles).

Goods Vehicles (N)

A motor vehicle constructed primarily for the carriage of goods and having at least 4 wheels; or 3 wheels and a '*Gross Vehicle Mass*' exceeding 1.0 tonne.

A vehicle constructed for both the carriage of persons and the carriage of good shall be considered to be primarily for the carriage of goods if the number of seating positions times 68 kg is less than 50% of the difference between the '*Gross Vehicle Mass*' and the '*Unladen Mass*'.

The equipment and installations carried on certain special-purpose vehicles not designed for the carriage of passengers (crane vehicles, workshop vehicles, publicity vehicles, etc.) are regarded as being equivalent to goods for the purposes of this definition.

A goods vehicle comprising two or more non-separable but articulated units shall be considered as a single vehicle.

Medium Goods Vehicle (NB)

A goods vehicle with a '*Gross Vehicle Mass*' exceeding 3.5 tonnes but not exceeding 12.0 tonnes.

Sub-category NB2 – over 4.5 tonnes, up to 12 tonnes '*Gross Vehicle Mass*'

Heavy Goods Vehicle (NC)

A goods vehicle with a '*Gross Vehicle Mass*' exceeding 12.0 tonnes.

Trailers (T)

A vehicle without motive power constructed to be drawn behind a motor vehicle.

Medium Trailer (TC)

A trailer with a *'Gross Trailer Mass'* exceeding 3.5 tonnes but not exceeding 10 tonnes

Heavy Trailer (TD)

A trailer with a *'Gross Trailer Mass'* exceeding 10 tonnes

Appendix 4 – Summary of vehicle width requirements by market

Table 20: Australian vehicle width limit, including summary of exclusions and conditions

Overall width limit	
2.50 m	
Exclusions	**Conditions**
Rear vision mirrors	May project up to 230 mm (on each side) beyond the vehicle width (without mirrors), if capable of collapsing to 150 mm. If less than 2 m above the ground when vehicle is loaded to its technically permissible maximum laden mass (i.e. GVM) – may project up to 250 mm (on each side) beyond the vehicle width (without mirrors), but only if necessary to comply with UN R46 field of view requirements. If more than 2 m above the ground when vehicle is loaded to its technically permissible maximum laden mass (i.e. GVM) – may project as much as necessary (on each side) to comply with UN R46 field of view requirements.
Signalling devices Side-mounted lamps and reflectors	
Permanently fixed webbing-assembly-type devices such as curtain-side devices	The maximum distance measured across the body of the vehicle including any part of the devices must not exceed 2.55 m.
Anti-skid devices mounted on wheels Central tyre inflation systems Tyre pressure gauges	

Table 21: EU and UK vehicle width limits, including summary of exclusions and conditions

Overall width limit	
2.60 m for refrigerated vehicles with insulated walls at least 45 mm thick; 2.55 m for all other vehicles	
Exclusions	**Conditions**
Devices for indirect vision as defined in UN R46	The devices and the vehicles they are fitted to must fully comply with UN R46.
The deflected part of the tyre walls	
Tyre failure tell-tale devices Tyre-pressure indicators	Provided the total protrusion of the devices added to the width of the vehicle does not exceed 100 mm.
Side-marker lamps, end-outline marker lamps, side-retro-reflectors, direction indicator lamps, rear position lamps, service-door lighting systems	Provided the total protrusion of the devices added to the width of the vehicle does not exceed 100 mm.
Retractable lateral guidance devices intended for use on guided bus system	Excluded, if not retracted and provided the total protrusion of devices added to the width of the vehicle does not exceed 100 mm.
Retractable steps	Excluded, when vehicle is in a stand-still position and provided the total protrusion of devices added to the width of the vehicle does not exceed 100 mm.
Watching and detection aids including radars	Provided the total protrusion of the devices added to the width of the vehicle does not exceed 100 mm.
Devices and equipment especially designed to reduce aerodynamic drag	Excluded, provided that they do not protrude by more than 50 mm on each side from the outermost width of the vehicle and they do not increase the loading capacity. Such devices must be designed to be retractable when the vehicle is at standstill in such a way that the maximum authorised width is not exceeded and they do not impair the capability of the vehicle to be used for intermodal transport. Where the devices and equipment are in service, the vehicle width must not exceed 2.65 m.
Customs sealing devices and their protection	Provided the total protrusion of the devices added to the width of the vehicle does not exceed 100 mm.
Devices for securing the tarpaulin and their protection	Excluded, provided they do not project more than 20 mm (on each side) where they are no more than 2 m from ground level, and no more than 50 mm (on each side) where they are more than 2 m from ground level. The edges must be rounded to a radius of not less than 2.5 mm.
Flexible parts of a spray-suppression system Flexible mudguards	Provided the total protrusion of the devices added to the width of the vehicle does not exceed 100 mm.
Safety railings on vehicle transporters	Excluded for vehicles designed and constructed to transport at least two other vehicles and for which the safety railings are more than 2.0 m, but not more than 3.7 m from the ground and do not project more than 50 mm from the outermost side of the vehicle. The vehicle width including the safety railings must not exceed 2.65 m.
Antennas used in vehicle-to-vehicle and vehicle-to-infrastructure communications	Provided the total protrusion of the devices added to the width of the vehicle does not exceed 100 mm.
Flexible hoses of tyre pressure monitoring systems	Provided they do not protrude by more than 70 mm on each side from the outermost width of the vehicle.

Table 22: Japanese vehicle width limit, including summary of exclusions and conditions

Overall width limit	
2.50 m	
Exclusions	**Conditions**
Any outward-opening windows, ventilators, rear-view mirrors, and [other] devices for confirming rearward vision	Must not protrude 250 mm or more outwards from the outermost part of the motor vehicle.
Blind spot information systems for the detection of bicycles	Must not protrude more than 100 mm outwards from the outermost part of the motor vehicle.

Table 23: New Zealand vehicle width limit, including summary of exclusions and conditions

Overall width limit	
2.55 m	
Exclusions	**Conditions**
Collapsible mirrors	Must not extend more than 240 mm beyond the side of the vehicle. Must not extend more than 1.49 m beyond the vehicle longitudinal centreline.
Side marker lamps and direction indicators	
Central tyre inflation systems	Must not extend more than 75 mm beyond the outside of the tyre on the drive axles of a heavy motor vehicle.
Hub odometers	Must not extend more than 50 mm beyond one side of a vehicle from a non-lifting, non-steering axle whose outer casings are of a light colour, provided the hub odometer is fitted on the axle that causes the least over width.
Cab exterior grab rails	Must not extend more than 1.325 m beyond the vehicle longitudinal centreline.
The bulge towards the bottom of a tyre	
Cameras or close-proximity monitoring systems mounted on the side exterior of a vehicle	Must not extend more than 70 mm from the sidewall of the vehicle.
Devices for improving the aerodynamic performance of a vehicle	Must not extend more than 25 mm from either side of a vehicle.

Table 24: US vehicle width limit, including summary of exclusions and conditions

Overall width limit	
2.60 m	
Exclusions	**Conditions**
Rear view mirrors	
Turn signal lamps	
Handholds for cab entry/egress	
Splash and spray suppressant devices	
Load induced tyre bulge	
Non-property carrying devices or components thereof	Provided the devices do not extend more than 3 inches (76 mm) beyond each side of the vehicle.

Appendix 5 – Devices for indirect vision

Devices for indirect vision are fitted to vehicles to give the driver a clear view of prescribed zones to the rear, side or front of the vehicle. These can be conventional mirrors, camera-monitors, or other devices able to present information about the indirect field of vision to the driver.

The recognised international standard for devices for indirect vision is the UN Regulation No. 46 (R46) – Uniform provisions concerning the approval of devices for indirect vision and of motor vehicles with regard to the installation of these devices (UN, 2016). It is applicable for passenger vehicles and goods vehicles (UN category M and N vehicles), as well as two-wheeled, three-wheeled and light quadricycle vehicles (UN L category vehicles) with enclosed bodywork.

UN R46 requires vehicles to be fitted with multiple devices for indirect vision to give the driver a clear view of prescribed fields of vision to the side, rear and front of the vehicle. The required fields of vision must be obtained from the minimum number of compulsory devices for indirect vision (i.e. mirrors or camera-monitor devices) set out in Table 25 below. Figure 16 shows the minimum required fields of vision to be provided by the devices for indirect vision for goods vehicles over 3.5 tonnes maximum mass. In addition, for goods vehicles over 7.5 tonnes, the field of vision must also be such that the driver can see the larger required view area (on the passenger side) shown in Figure 17 below. This additional area may be viewed using a combination of direct view, and indirect vision devices of classes IV (wide-angle view), V (close-proximity view), and/or VI (front-view).

Under UN R46, devices for indirect vision must not project substantially more beyond the vehicle bodywork than is necessary to comply with the field of vision requirements. Further, external mirrors that are less than 2 m above the ground (measured at the mirror lower edge with the vehicle at the maximum technically permissible mass) must not project more than 250 mm beyond the overall width of the vehicle (measured without mirrors). All devices for indirect vision, which are fitted less than 2 m above the ground, and protrude more than 100 mm from the vehicle bodywork, are required to meet pendulum impact test requirements.

For camera-monitor devices for indirect vision, the UN R46 requirements also include provisions for the image quality (e.g. maximum distortion, minimum frame rate, image formation time, system latency etc.), resolution and magnification, activation and de-activation, and the arrangement of the monitors in the vehicle (relative to the driver).

Table 25: Minimum number of devices for indirect vision for goods vehicles over 3.5 tonnes maximum mass

Class of device for indirect vision	Minimum number of compulsory devices for indirect vision
Class I (Rear-view device)	Optional (no requirements for the field of view)
Class II (Main rear-view device)	Compulsory 1 on the driver's side 1 on the passenger's side
Class III (Main rear-view device)	Not permitted
Class IV (Wide-angle view device)	Compulsory 1 on the driver's side 1 on the passenger's side
Class V (Close-proximity view device)	Compulsory 1 on the passenger's side[1] [1] Unless the required field of vision can be perceived through the combination of Class IV device and a Class VI device. Optional on the driver's side Mirrors must be at least 2 metres above the ground – a tolerance of 10 cm may be applied for goods vehicles ≤ 7.5 tonnes
Class VI (Front-view device)	Compulsory for goods vehicles over 7.5 tonnes 1 front-view device[2,3] [2] A vision support system may instead be used for a vehicle that cannot fulfil this requirement using a front-view device, in which case the vision support system must be able to detect an object of 50 cm height and with a diameter of 30 cm within the required field of vision for a front-view device. [3] Not mandatory if the driver can see, taking into account the obstructions by the A-pillars, a straight line 300 mm in front of the vehicle at a height of 1,200 mm above the road surface and which is situated between a longitudinal vertical plane parallel to the longitudinal vertical median plane going through the outermost side of the vehicle at the driver's side and a longitudinal vertical plane parallel to the longitudinal vertical median plane 900 mm outside the outermost side of the vehicle opposite to the driver's side. Optional for goods vehicles ≤ 7.5 tonnes Mirrors must be at least 2 metres above the ground

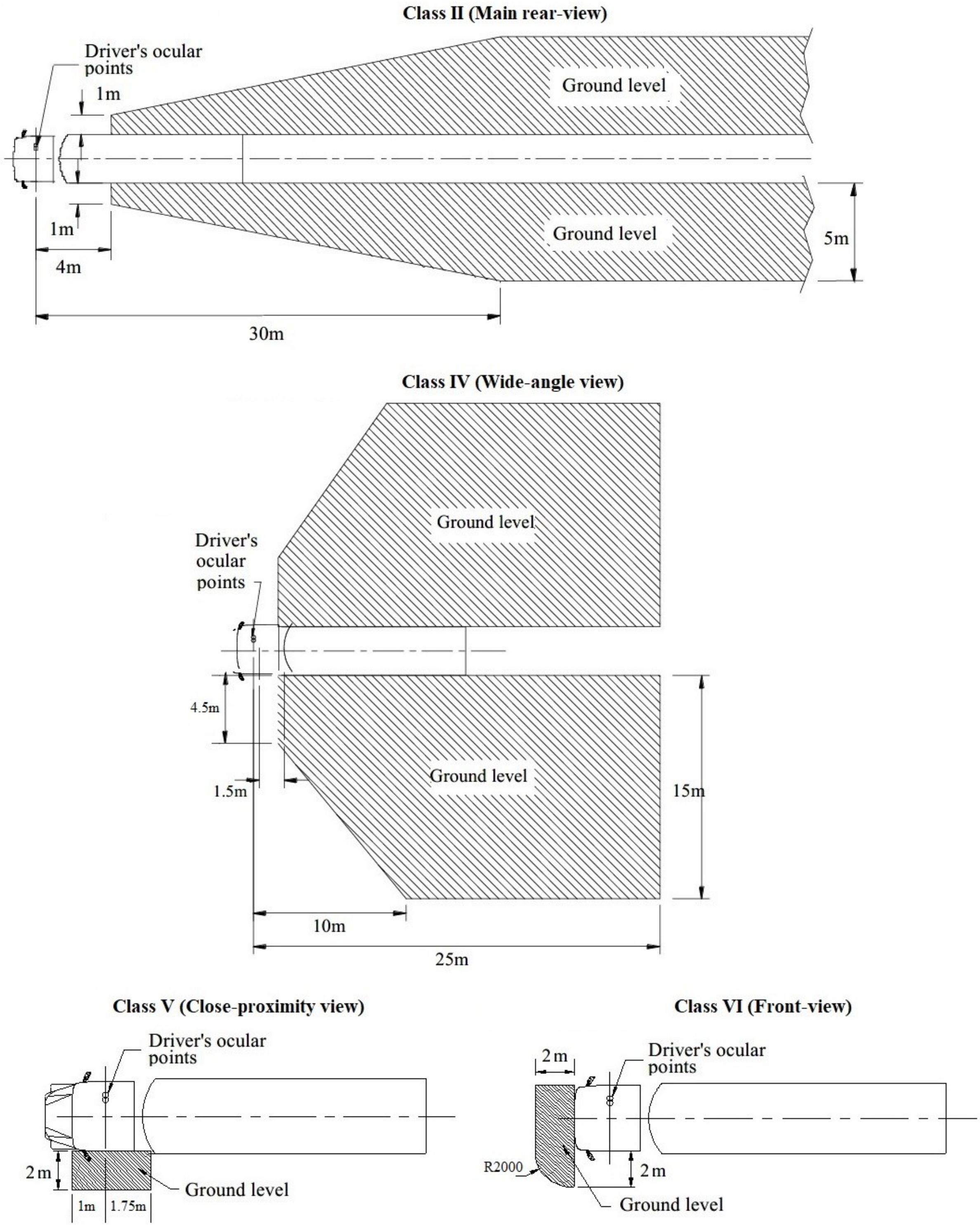

Figure 16: Minimum required fields of vision for goods vehicles over 3.5 tonnes maximum mass (note: class VI is optional for goods vehicles ≤ 7.5 tonnes) (source: adapted (for right-hand-drive) from UN R46)

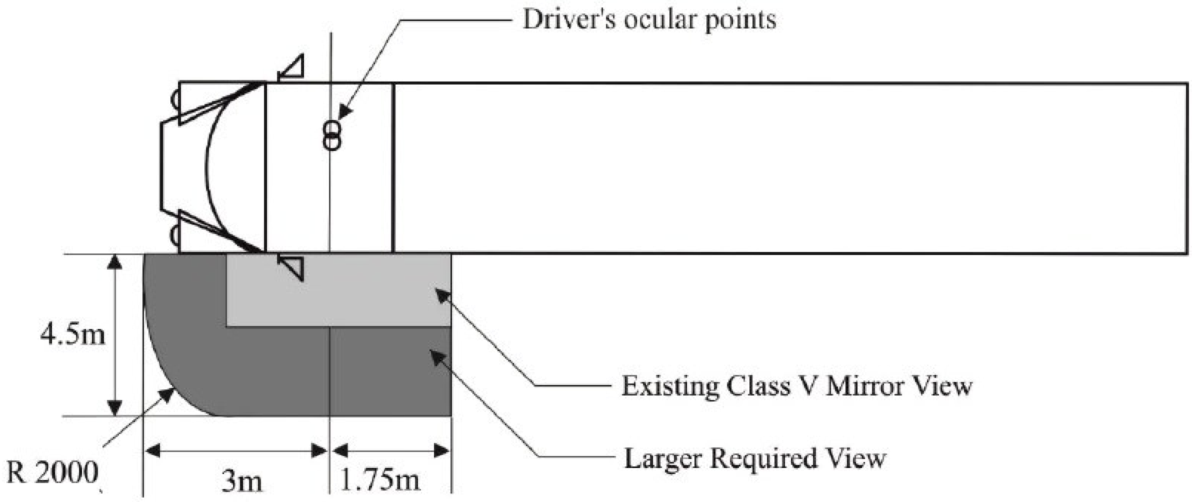

Figure 17: Larger required field of vision on the passenger's side (note: required view may be achieved using a combination of direct view and indirect vision devices of classes IV, V, and/or VI) (source: adapted for right-hand-drive from UN R46)

Appendix 6 – Electronic Stability Control

Electronic Stability Control (ESC) systems for heavy vehicles are designed to reduce the number of crashes due to vehicle (or combination vehicle) understeer (ploughing out), oversteer (spinning out), and/or rollover. ESC systems for heavy vehicles typically consist of an electronic control unit that monitors data received from a steering-wheel-angle sensor, a combined yaw rate and lateral acceleration sensor, Antilock Brake System (ABS) wheel speed sensors, and load sensors, as well as the driver's control inputs to the steering and braking systems and to the engine, together with the engine output (e.g. torque and speed) and the vehicle speed.

Common causes of rollover crashes include entering corners at too high a speed, sudden steering manoeuvres to avoid other vehicles or obstacles and shifting of loads such as liquids in tanks. Heavy vehicles are usually much more prone to rollover than light vehicles, because they have a much higher gross mass together with an elevated centre of gravity.

Understeer or oversteer occur when there is not enough grip/friction between one or more tyres and the road to oppose lateral tyre forces. When the front tyres have utilised all available grip/traction the vehicle will tend to understeer (turn less sharply than the driver intends), and when the rear tyres have utilised all available grip/traction the vehicle will tend to oversteer (turn more sharply than the driver intends).

ESC systems for heavy vehicles automatically reduce engine torque and apply the vehicle (and any towed trailer) brakes, whenever the system determines based on the vehicle lateral acceleration and wheel speed sensor data that the vehicle is at risk of rolling over. ESC systems for heavy vehicles also automatically reduce engine torque and apply the vehicle (and/or any towed trailer) brakes, when the system determines based on the steering wheel angle and yaw rate sensor data that the vehicle is understeering or oversteering. Understeer is typically corrected for by selective application of the inside rear brake(s) of the vehicle, while oversteer is typically corrected for by selective application of the outside front brake of the vehicle together with automatic application of any towed trailer brakes.

The rollover control function within heavy vehicle ESC systems also includes a learning function, to account for the considerable difference in the unladen and fully laden mass of these vehicles as well as significant variations in the load distribution (including on each axle and the load height/centre of gravity). The rollover control function is programmed with two pre-set lateral acceleration threshold (trigger) values. When the level one (lower) threshold is reached (or exceeded) (commonly 0.25g), the system will send a low-pressure test pulse to apply the brakes (ARTSA 2011). From these test pulses, the system determines based on the difference in wheel slip (measured by ABS wheel speed sensors) on each side of the vehicle how close the wheels on the inside of the turn are to leaving the ground. If it determines the wheels on the inside of the turn are close to lifting it will intervene to slow the vehicle/combination. If it determines the vehicle is not in danger of a rollover it will raise the level 1 lateral acceleration threshold a little, and will keep doing this until it determines the lateral acceleration is approaching a value slightly below that at which it must brake the vehicle (or vehicle combination) to avoid a rollover. Whenever the level two (higher) lateral acceleration threshold is reached (or exceeded), the system will intervene to slow the vehicle/combination. If the load condition changes (as indicated by axle load sensors) or the ESC system power is turned off (e.g. at an ignition cycle), the level one threshold is reset and the learning process repeats (ARTSA 2011). Engine torque data may also be used in the estimation of vehicle/combination mass.

The Australian Design Rule 35/07 – Commercial Vehicle Brake Systems (ADR 35/07) includes a mandatory requirement for ESC (referred to in the ADR as a Vehicle Stability Function) to be fitted to omnibuses and goods vehicles over 3.5 tonnes GVM. There are exemptions from mandatory ESC fitment for articulated omnibuses, route service omnibuses, heavy goods vehicles with four or more axles, and vehicles designed for off-road use (as defined in an Appendix to the ADR). ADR 35/07 is applicable (mandatory) from 1 November 2022 for new model omnibuses and goods vehicles over 3.5 tonnes GVM, and 1 February 2025 for all (new) omnibuses and goods vehicles over 3.5 tonnes GVM (Commonwealth of Australia, 2018c).

ADR 35/07 includes performance-based test requirements for omnibuses and prime movers over 12 tonnes GVM. These vehicles must either be approved to UN R13/11 or meet a detailed series of clockwise and anticlockwise J-turn tests and pass/fail criteria set out in the ADR. The J-turn test course consists of a straight entrance lane connected to a curved lane section. The straight section of the lane is 3.7 metres wide, and the curved section of the lane is 3.7 metres wide for prime movers and 4.3 metres wide for buses. Figure 18 shows an example of a suitable J-turn test course (configured for anticlockwise steering) for a prime mover.

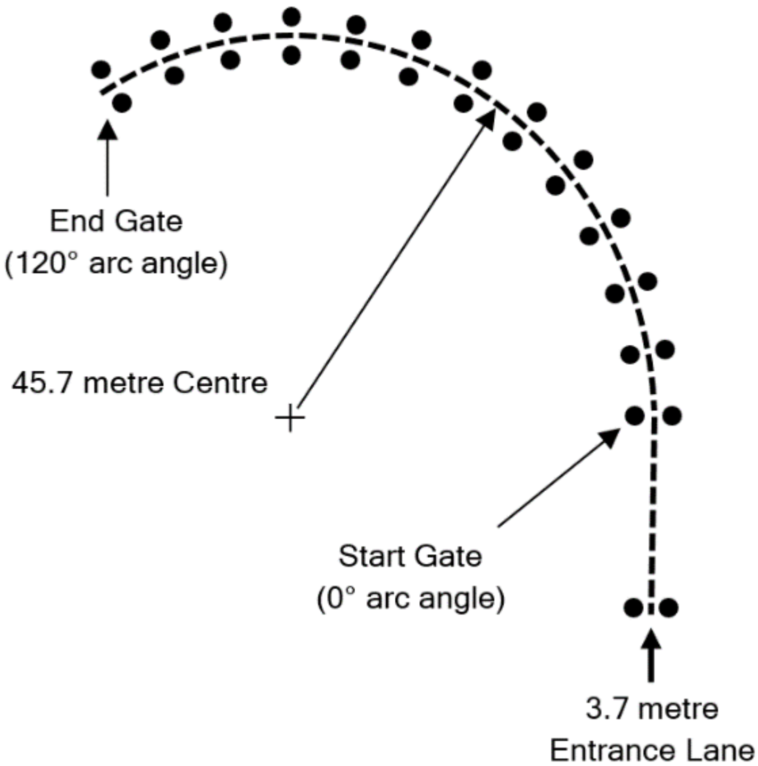

Figure 18: Example of a suitable J-turn test course (in anticlockwise direction) for a prime mover

In each ADR 35/07 J-turn test, the test driver accelerates the vehicle along the entrance lane before crossing the start gate at a designated entrance speed. The driver then attempts to keep all wheels of the vehicle within the test track by steering the vehicle through the curved section of track without braking. The minimum lateral acceleration at which the ESC activates (i.e. intervenes) must be no greater than 0.4 g (which corresponds to an entrance speed of 48 km/h where a 45.7 m (150 feet) radius is used for the curved section of track). The vehicle must meet minimum deceleration requirements as it progresses through the test curve, at the vehicle's minimum ESC activation speed and at least 1.25 times the minimum ESC activation speed. The ESC system must also automatically reduce the driver-requested engine torque by at least 10% when the vehicle is driven through the J-turn at an entrance speed equal to the vehicle's minimum ESC activation speed.

The recognised international standard for heavy vehicle braking is the UN Regulation No. 13 (R13) – Uniform provisions concerning the approval of vehicles of categories M, N and O with regard to braking (UN, 2014a). This regulation covers general braking including compatibility between towing vehicles and trailers, as well as ABS and ESC, and the fitment of standard connectors to provide power to electronic brake systems on trailers. To meet the latest version of this regulation (UN R13/11), omnibuses, and goods vehicles over 3.5 tonnes (with limited exemptions) must be equipped with an ESC system (also referred to in UN R13 as a Vehicle Stability Function) incorporating both directional control and rollover control. There are exemptions from ESC fitment for omnibuses with provisions for standing passengers, articulated omnibuses, heavy goods vehicles with more than three axles, vehicles designed for off-road use (UN category G vehicles – as defined in the UN Consolidated Resolution on the Construction of Vehicles), and special purpose vehicles.

Under UN R13/11, the rollover control function within heavy vehicle ESC systems is tested on and off in one of two test types. The directional control function within ESC systems is tested on and off in one of eight test types. However, the test procedures and pass/fail criteria are not defined in the regulation. These are instead determined through agreement between the UN approval authority and the vehicle manufacturer.

Both ADR 35/07 and UN R13/11 also include functional requirements to help ensure that ESC systems will work effectively for a wider range of instability scenarios than are simulated by the tests alone, as well as requirements for an optical warning signal to indicate ESC interventions to the driver and a warning signal to indicate any failure of this system.

Appendix 7 – Advanced Emergency Braking

Advanced Emergency Braking (AEB) systems for heavy vehicles are designed to avoid or mitigate the severity of rear end collisions with other vehicles in the same lane. Some systems can also detect and help to avoid collisions with pedestrians and/or bicyclists. AEB systems for heavy vehicles typically consist of an electronic control unit that monitors data received from camera and/or radar sensors at the front of the vehicle.

An AEB system for a heavy vehicle will first provide the driver with a forward collision warning, when it determines based on the vehicle camera and/or radar sensor data that the vehicle is at risk of a rear end collision with another vehicle in the same lane. If the driver does not react (from around 1.4 seconds of the first warning) to brake the vehicle, the AEB system will then commence an emergency braking phase to avoid or at least mitigate the severity of the impending collision. This is left as late as possible (within 3 seconds of a collision), including to allow the driver to steer (if appropriate) to avoid an impact, and to minimise the risk of the emergency braking phase commencing where not needed (e.g. through a false positive intervention). This means the deceleration can be very rapid and uncomfortable for a driver, especially as the vehicle gets closer to impact, which also serves to discourage drivers from adapting their behaviour to rely on AEB (which is a driver assistance system only) to brake for them. During any phase of action taken by the AEB system (i.e. the warning or emergency braking phases), the driver can at any time through a conscious action (e.g. by a steering action or an accelerator kick-down or operating the direction indicator control), take control and override the system.

The recognised international standard for AEB for heavy vehicles is the UN Regulation No. 131 (R131) – Uniform provisions concerning the approval of motor vehicles with regard to the Advanced Emergency Braking Systems (AEBS) (UN, 2014b). It is applicable for omnibuses (UN category M_2 and M_3 vehicles), and goods vehicles with a maximum mass over 3.5 tonnes (UN category N_2 and N_3 vehicles).

In the introduction (for information) of UN R131 it is noted that there are sub-groups of vehicles where the benefit is uncertain because they are primarily used in conditions other than highway conditions (e.g. buses with standing passengers, off-road vehicles and construction vehicles), and there are other sub-groups where the installation of AEB would be technically difficult regardless of the benefit (e.g. position of the sensor on off-road vehicles and special purpose vehicles, etc.). This information is provided to assist countries to decide which vehicles (if any) to exempt when incorporating this UN regulation into regional or national law. For example, the EU has exemptions (in EU regional law) from the fitment of AEB for buses with provision for standing passengers, vehicles with more than three axles, vehicles designed for off-road use (UN category G vehicles – as defined in the UN Consolidated Resolution on the Construction of Vehicles) and certain other special purpose vehicles.

To meet UN R131, an AEB system must be active at vehicle speeds above 15 km/h (unless manually deactivated). If a means (e.g. switch) is provided to manually deactivate the AEB system, the AEB function must be automatically re-instated at the start of each new ignition on (run) cycle, and a constant optical warning must be provided to inform the driver when the AEB system is deactivated. The performance of the AEB system is assessed in a stationary target test and a moving target test. The target vehicle used for both these tests must be a regular high-volume series production passenger car, or a soft target representative of such a vehicle in terms of its identification characteristics. At the start of the functional part of each test the subject vehicle must be travelling at a speed of 80 ± 2 km/h and is at a distance of at least 120 m from the target vehicle. For goods vehicles at least two collision-warning modes must be provided in accordance with Table 26, before the commencement of the emergency braking phase. Any speed reduction during the warning phase must not exceed either 15 km/h or 30% of the total subject vehicle speed reduction, whichever is higher. The emergency braking phase cannot start before the time to collision with the target vehicle is 3.0 seconds or less.

Table 26: Summary of UN R131/01 collision warning mode, subject vehicle speed reduction, and moving test target speed requirements for goods vehicles

Subject vehicle	Stationary Target			Moving Target			
	Timing of warning modes/means		Speed Reduction	Timing of warning modes/means		Speed Reduction	Target Speed
	At least 1	At least 2		At least 1	At least 2		
Goods vehicles > 8 tonnes[1]	At least 1.4 s before the start of emergency braking	At least 0.8 s before the start of emergency braking	At least 20 km/h	At least 1.4 s before the start of emergency braking	At least 0.8 s before the start of emergency braking	No impact	12 ± 2 km/h
Goods vehicles > 3.5 tonnes and ≤ 8 tonnes[2,3,4]	At least 0.8 s before the start of emergency braking	Before the start of emergency braking	At least 10 km/h	At least 0.8 s before the start of emergency braking	Before the start of emergency braking	No impact	67 ± 2 km/h

[1] For goods vehicles > 8 tonnes, the acceptable warning modes/means are acoustic and haptic (e.g. vibration of the steering wheel).

[2] For goods vehicles > 3.5 tonnes and ≤ 8 tonnes, the acceptable warning modes/means are acoustic, haptic and visual.

[3] All vehicles with pneumatic brake systems must meet the requirements for goods vehicles > 8 tonnes.

[4] Goods vehicles > 3.5 tonnes and ≤ 8 tonnes may be certified to the requirements for goods vehicles > 8 tonnes in which case the requirements of the first row apply.

UN R131 also includes failure warning signal, deactivation warning signal, and false reaction tests for the AEB system. In the false reaction test, the subject vehicle is driven for a distance of at least 60 m, at a constant speed of 50 ± 2 km/h to pass centrally between two stationary passenger cars, a distance of 4.5 m apart and facing in the same direction of travel as the subject vehicle. To pass this test, the subject vehicle must not provide any collision warning or initiate any emergency braking phase/response.

Appendix 8 – Lane Departure Warning Systems

Lane Departure Warning Systems (LDWS) are designed to warn a drowsy or otherwise distracted or inattentive driver of an unintentional drift of the vehicle out of its travel lane. LDWS typically use camera and/or radar sensors to constantly monitor lane markings on the road ahead to detect any unintentional drift of the vehicle out of its lane. When an LDWS detects an unintentional lane departure, it will warn the driver using an escalating combination of visual, audible, and/or haptic (e.g. steering wheel vibration) alerts. LDWS will not provide a warning and will automatically deactivate, when the direction indicator is used. LDWS will usually also automatically deactivate when the vehicle is travelling along a road where the sensors cannot detect lane markings.

The recognised international standard for LDWS for heavy vehicles is UN Regulation No. 130 (R130) – Uniform provisions concerning the approval of motor vehicles with regard to the Lane Departure Warning System (LDWS). It is applicable for omnibuses (UN category M_2 and M_3 vehicles), and goods vehicles with a maximum mass over 3.5 tonnes (UN category N_2 and N_3 vehicles).

In the introduction (for information) of UN R130 it is noted that there are sub-groups of vehicles where the benefit is uncertain because they are primarily used in conditions other than highway conditions (e.g. buses with standing passengers, off-road vehicles and construction vehicles), and there are other sub-groups where the installation of LDWS would be technically difficult regardless of the benefit (e.g. vehicles equipped with split windshields, asymmetrical cabs, windshield of high thickness, front hood vehicles, vehicles with front mounted equipment, etc.). This information is provided to assist countries to decide which vehicles (if any) to exempt when incorporating this UN regulation into regional or national law. For example, the EU has exemptions (in EU regional law) from the fitment of LDWS for buses with provision for standing passengers, vehicles with more than three axles, vehicles designed for off-road use (UN category G vehicles – as defined in the UN Consolidated Resolution on the Construction of Vehicles) and certain other special purpose vehicles.

To meet UN R130, a LDWS must be active at vehicle speeds above 60 km/h (unless manually deactivated). If a means (e.g. switch) is provided to manually deactivate the LDWS, the LDWS function must be automatically re-instated at the start of each new ignition on (run) cycle, and a constant optical warning must be provided to inform the driver when the LDWS is deactivated. The LDWS is required (when active) to warn the driver if the vehicle crosses over a visible lane marking, when there has been no purposeful demand to do so (including for both straight sections, and curved sections having an inner lane marking with a radius ≥ 250 m). The performance of the LDWS is assessed in a series of four tests conducted at a speed of 65 ± 3 km/h. Two of these tests are performed by gently drifting the vehicle to the left, so that the vehicle crosses the lane markings at two different rates of departure within the range 0.1 to 0.8 m/s. The other two tests are performed by gently drifting the vehicle to the right, so that the vehicle crosses the lane markings at two different rates of departure within the range 0.1 to 0.8 m/s. In all tests, the required lane departure warnings must be provided before the outside of the tyre on the front wheel closest to the lane markings passes more than 0.3 m beyond the outside edge of the lane markings. UN R130 also includes failure warning signal and deactivation warning signal tests for the LDWS.

Appendix 9 – Blind Spot Information Systems

Blind Spot Information Systems (BSIS) are designed to inform the driver of a possible collision with another road user (e.g. vehicle, motorcycle, bicycle, or pedestrian) in close-proximity to the vehicle. BSIS typically use radar and/or camera sensors to detect other vehicles, pedestrians, and/or bicyclists in a zone (or zones) a driver is unable to see by direct vision alone. When a BSIS detects a potential collision, it will warn the driver by means of visual, audible, and/or haptic (e.g. steering wheel vibration) alert(s).

The recognised international standard for BSIS is UN Regulation No. 151 (R151) - Uniform provisions concerning the approval of motor vehicles with regard to the Blind Spot Information System for the Detection of Bicycles (UN, 2020b). It is applicable for goods vehicles with a maximum mass over 8 tonnes (UN category N_2 > 8 tonnes and N_3 vehicles). Goods vehicles with a maximum mass between 3.5 and 8 tonnes (UN category N_2 vehicles ≤ 8 tonnes) and omnibuses (UN category M_2 and M_3 vehicles) may be approved at the request of the manufacturer. UN R151 only covers blind spot systems to inform the driver of a possible collision with a bicycle on the near side of a vehicle (the left side of a vehicle for left-hand traffic or the right side of a vehicle for right-hand traffic). It does not include requirements for systems to detect other vehicles and/or pedestrians, although manufacturers may use the same sensors (i.e. radars and/or cameras) to detect other road users in addition to bicyclists.

To meet UN R151 (UN, 2020b), a BSIS for the detection of bicyclists must be active for all forward vehicle speeds from standstill up to 30 km/h, and pass a range of dynamic and static performance tests. This includes a series of dynamic tests with the subject vehicle (i.e. the truck with BSIS fitted) passing a dummy bicyclist on the near side, at various subject vehicle and bicycle speeds, as well as various lateral separation distances between the subject vehicle and the dummy bicyclist. In each of these dynamic tests, the BSIS must provide a signal to inform the driver of the presence of a bicyclist before the subject vehicle crosses a prescribed line. Two different static tests are also conducted with the subject vehicle stationary and the bicyclist moving. In one of the static tests, the dummy bicyclist is moved in a perpendicular direction (from the near side) to pass in front of the stationary subject vehicle. In the other static test, the dummy bicyclist is moved in a parallel direction alongside the stationary subject vehicle (also on the near side). In each of these static tests, the BSIS must provide a signal to inform the driver of the presence of a bicyclist before the dummy bicyclist passes beyond a specified point (on each path of travel respectively). UN R151 also includes requirements for the BSIS to warn the driver by means of an optical (i.e. visual), acoustic, and/or haptic signal when the risk of a collision with a bicyclist increases. This warning signal must differ in mode or activation strategy from the initial information signal to inform the driver of the presence of a bicyclist. The BSIS must also automatically de-activate when it cannot operate properly due to contamination of its sensors (e.g. by mud, snow or ice) or in low light conditions, and must provide the driver with a failure warning whenever the system is in a state (including due to automatic deactivation) in which it will no longer meet the performance requirements of the regulation.

Appendix 10 – Side underrun protection

Side underrun protection can be provided on heavy freight vehicles through the installation of lateral protection devices (LPDs). These offer protection to pedestrians, cyclists or motorcyclists against the risk of falling under the sides of a goods vehicle or trailer, and being caught under the wheels, in particular when heavy vehicles are turning in urban areas. LPDs are made up of a combination of longitudinal member(s) and link(s) (fixing elements) to the chassis side members or other structural parts of the vehicle.

The recognised international standard for side underrun protection is the UN Regulation No. 73 (R73) – Uniform provisions concerning the approval of:

I. Vehicles with regard to their lateral protection devices (LPD);

II. Lateral protection devices (LPD); and

III. Vehicles with regard to the installation of LPD of an approved type according to part II of this regulation.

UN R73 applies to goods vehicles and trailers with a maximum mass over 3.5 tonnes (UN category N_2, N_3, O_3, and O_4 vehicles). It does not apply to tractors for semi-trailers (i.e. prime movers) and vehicles designed and constructed for special purposes where it is not possible, for practical reasons, to fit LPDs.

Under UN R73, LPDs may consist of a continuous flat surface, or of one or more horizontal rails/members, or a combination of surfaces and rails. Further, components permanently affixed to the vehicle (e.g. fuel tanks, air tanks, tool boxes, battery boxes etc.) can be used as LPDs, as long as they comply with the design and performance requirements of the regulation. LPDs may also be designed to have several adjustment positions at the side of the vehicle, including for example to include elements that can be moved to provide access to storage space under the vehicle (e.g. for trailer gates, a spare wheel carrier etc.).

To meet UN R73, LPDs must not increase the overall width of the vehicle, or be any more than 150 mm inboard (at the main part of the outer surface) of the outermost planes between which the maximum vehicle width is measured. Further, the rear end (rearmost 250 mm) of an LPD must not be any more than 30 mm inboard of the outermost edge of the rear tyres (excluding any bulging of the tyres near the ground). Combinations of surfaces and rails must form a practically continuous LPD member from front to rear, with no more than a 25 mm gap permitted between adjacent components. Where horizontal rails are used in LPDs, these must be at least 50 mm high for UN category N_2 and O_3 vehicles, and at least 100 mm high for UN category N_3 and O_4 vehicles. The vertical gap between rails must not be any more than 300 mm.

Figure 19 and Figure 20 include example illustrations of the fitment of LPDs for a rigid truck and a semi-trailer respectively, including key UN R73 dimensional/position requirements. For all vehicles, the lower edge of the LPD must not be any more than 550 mm from the ground. The permissible gaps at the front, rear and upper edge of the LPD vary by vehicle category and design/purpose (e.g. truck, semi-trailer, full-trailer etc.). In the case of a vehicle having two steered axles, an LPD is not required between these axles if the longitudinal distance between the centrelines of the axles is no greater than 2.1 m.

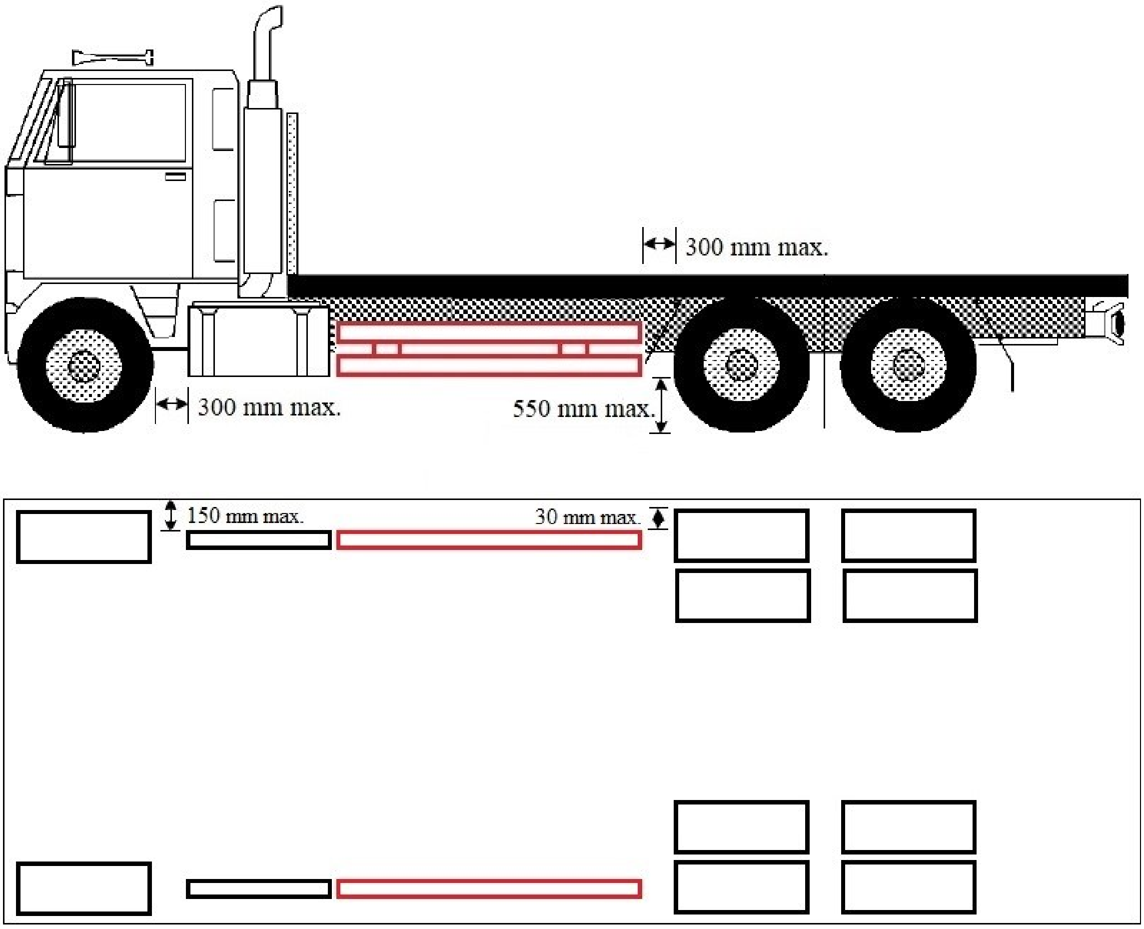

Figure 19: Illustration (side view and overhead/plan view) of a rigid truck utilising fuel tanks and horizontal rails/members on each side as LPDs for side underrun protection, including key UN R73 dimensional limits

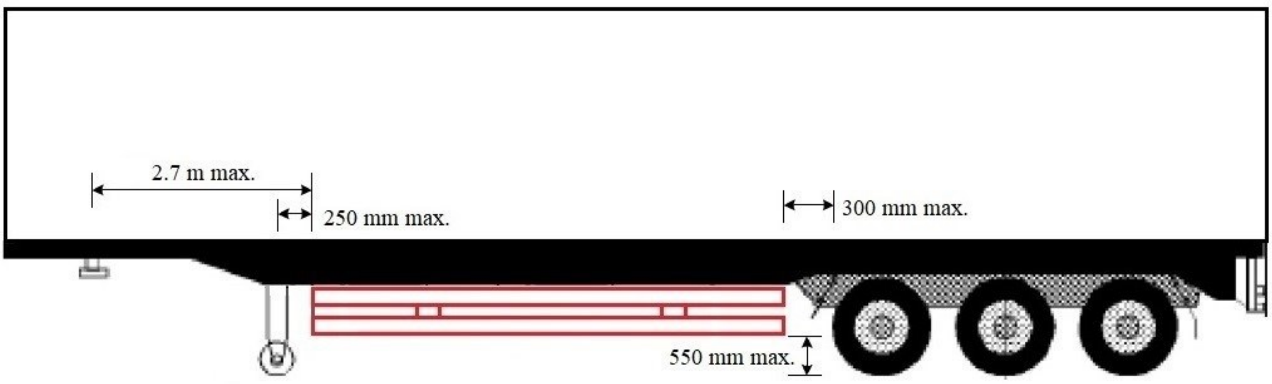

Figure 20: Illustration (side view only) of a semi-trailer fitted with horizontal rails/members as LPDs for side underrun protection, including key UN R73 dimensional limits

To meet UN R73, LPDs must be capable of withstanding a horizontal static force of 1 kN applied perpendicularly to any part of their external surface by the centre of a ram, the face of which is circular and flat, with a diameter of 220 mm ± 10 mm. The deflection of the LPD under load (measured at the centre of the ram) must not be more than 30 mm over the rearmost 250 mm of the LPD, and not more than 150 mm over the remainder of the LPD. This level of force has been set to ensure LPDs are sufficiently strong to be effective in collisions with vulnerable road users (in particular, pedestrians and bicyclists). LPDs may also provide some protection, for near parallel (i.e. sideswipe) collisions with light vehicles in adjacent lanes (e.g. during a lane departure), but this is not guaranteed. LPDs are not required to have sufficient structural strength to prevent the underrun of a passenger car in a side (i.e. lateral) impact crash.

UN R73 provides some exemptions/relaxations from the full requirements, for extendible trailers, tank vehicles (designed solely for the purpose of carrying fluids), vehicles fitted with extendible legs (for additional stability during loading/unloading), vehicles fitted with a crane, and in any case where the vehicle is designed/equipped that by their shape and characteristics the component parts together may be regarded as replacing the LPD. For example, extendible trailers need only comply with the full set of requirements when adjusted to the minimum length.

Appendix 11 – Conspicuity markings

Conspicuity markings can be fitted to heavy freight vehicles to make them easier for drivers of other vehicles to see at night (or in low light conditions), when viewed from the side or rear (or in the case of trailers, additionally from the front). Conspicuity markings include special material to reflect light emanating from the headlamps of another vehicle.

The UN Regulation No. 48 (R48) – Uniform provisions concerning the approval of vehicles with regard to the installation of lighting and light-signalling devices (UN, 2014c), is the recognised international standard for the fitment of conspicuity markings to road vehicles. The UN Regulation No. 104 (R104) – Uniform provisions concerning the approval of retroreflective markings for vehicles of categories M, N and O (UN, 2010), and the UN Regulation No. 150 (R150) – Uniform provisions concerning the approval of retro-reflective devices and markings for power-driven vehicles and their trailers (UN, 2020a), are the recognised international standards for the retroreflective material used for vehicle conspicuity markings.

Under UN R48 (UN, 2014c), conspicuity markings are categorised as either contour markings or line markings. Contour markings are used to indicate the horizontal and vertical dimensions (length, width and height) of a vehicle. Line markings are used to indicate the horizontal dimensions (length and width) of a vehicle by a continuous line. Contour markings are further categorised as either full contour markings or partial contour markings. Full contour markings indicate the outline of the vehicle by a continuous line. Partial contour markings indicate the horizontal dimension of the vehicle by a continuous line, and the vertical dimension by marking the upper corners. Conspicuity markings are considered continuous if the distance between adjacent elements is as small as possible and does not exceed 50% of the shortest adjacent element length.

To meet UN R48 (UN, 2014c), goods vehicles over 7.5 tonnes maximum mass and trailers over 3.5 tonnes maximum mass, which are more than 2.1 m in overall width, must be fitted with full contour markings to the rear (with the exception of chassis-cabs, incomplete vehicles and tractors for semi-trailers (i.e. prime movers)). Further, goods vehicles over 7.5 tonnes maximum mass and trailers over 3.5 tonnes maximum mass, which are more than 6 m in length (including any drawbar for trailers), must be fitted with either partial or full contour markings to the side (with the exception of chassis-cabs, incomplete vehicles and tractors for semi-trailers (i.e. prime movers)). A line marking may be installed in place of a prescribed contour marking if the shape, structure, design or operational requirements of the vehicle make it impossible to install a contour marking. Line markings may be applied to the front of trailers. Partial or full contour markings must not be fitted at the front of any goods vehicle. Conspicuity markings must be white to the front (applies for optional front-line markings on trailers only), white or yellow to the side, and red or yellow to the rear.

Under UN R48 (UN, 2014c), conspicuity markings must be fitted as close as practicable to horizontal and vertical, compatible with the shape, structure, design and operational requirements of the vehicle; or if this is not possible, the full or partial contour markings (when fitted), shall follow as close as practicable the contour of the outer shape of the vehicle. Further, the conspicuity markings must be spaced as evenly as possible over the horizontal dimensions of the vehicle, such that the total length and/or width of the vehicle can be identified. The conspicuity markings must reach as close as practicable to the front, side and rear edges (in width and length) of the vehicle, including within a prescribed limit of 600 mm of each end of the vehicle. Line and contour marking lower elements must be as low as practicable within the range, 250 mm to 1,500 mm above the ground level (unless approved to be higher (up to 2,500 mm) for practical reasons/limitations). Contour marking upper elements must be as high as practicable, but within 400 mm of the upper extremity of the vehicle.

Figure 21 shows an illustration of partial (yellow) contour markings on the side and full (red) contour markings on the rear of a semi-trailer. The Australian Trucking Association has published a Technical Advisory Procedure for heavy vehicle visibility, which includes further details and practical guidance, including examples/images for the application of conspicuity markings to a range of truck and trailer body configurations, including tankers, rubbish trucks, skip loaders, car carriers, and concrete agitators (ATA, 2016).

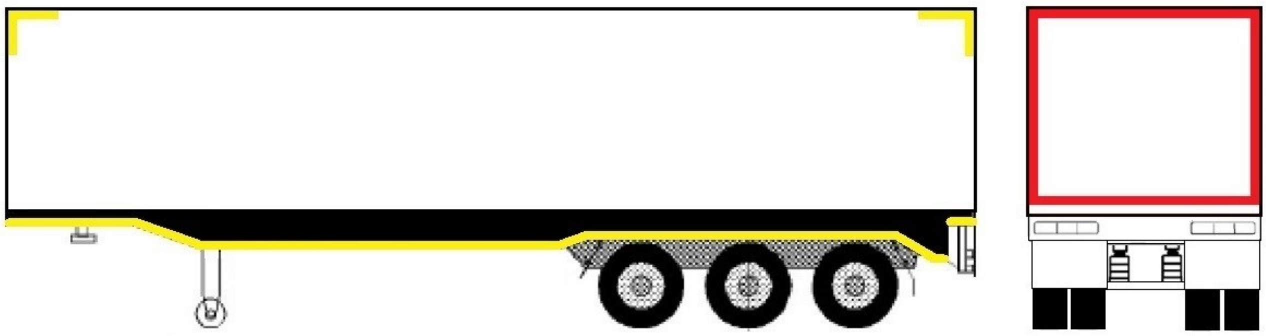

Figure 21: Illustration of partial (yellow) contour markings on the side and full (red) contour markings on the rear of a semi-trailer

Appendix 12 – Strategic Vehicle Safety and Environment Group

The prime purpose of the Strategic Vehicle Safety and Environment Group (SVSEG) is to consider how governments, industry and road user organisations will ensure that vehicles sold in Australia are both safe and environmentally friendly. SVSEG is an advisory body of ITSOC, which is primarily responsible for advising the Council on road safety matters of national concern. SVSEG will coordinate work on national vehicle issues on behalf of ITSOC and government representatives of SVSEG will serve as the Austroads Safety Task Force (ASTF) Safe Vehicles Theme Group (SVTG).

Organisation
Government Representatives Department of Infrastructure, Transport, Regional Development, Communications and the Arts Transport for NSW Department of Transport, VIC Department of Transport and Main Roads, QLD Department of Transport, WA Road Safety Commission, WA Department for Infrastructure and Transport, SA Department of State Growth, TAS Transport Canberra and City Services Directorate, ACT Department of Infrastructure, Planning and Logistics, NT New Zealand Transport Agency *Inter Governmental Representatives* National Heavy Vehicle Regulator National Transport Commission *Manufacturer Representatives* Bus Industry Confederation Commercial Vehicle Industry Association of Australia Federal Chamber of Automotive Industries Heavy Vehicle Industry Association Truck Industry Council *Consumer Representatives* Australian Automobile Association Australian Trucking Association

Appendix 13 – Technical Liaison Group

The Technical Liaison Group (TLG) has two principal roles: to advise the Strategic Vehicle Safety and Environment Group (SVSEG) on detailed technical issues relating to the implementation and development of the ADRs for vehicles, and to advise SVSEG on detailed technical issues relating to regulatory and non-regulatory approaches to improving vehicle safety and environmental performance.

Organisation
Government Representatives
Department of Infrastructure, Transport, Regional Development, Communications and the Arts
Transport for NSW
Department of Transport, VIC
Department of Transport and Main Roads, QLD
Department of Transport, WA
Department for Infrastructure and Transport, SA
Department of State Growth, TAS
Transport Canberra and City Services Directorate, ACT
Department of Infrastructure, Planning and Logistics, NT
New Zealand Transport Agency
Inter Governmental Representatives
National Heavy Vehicle Regulator
National Transport Commission
Manufacturer Representatives
Bus Industry Confederation
Caravan Industry Association of Australia Ltd
Commercial Vehicle Industry Association of Australia
Federal Chamber of Automotive Industries
Heavy Vehicle Industry Association
Truck Industry Council
Consumer Representatives
Australian Automobile Association
Australian Automotive Aftermarket Association
Australian Trucking Association
Registered Automotive Workshop Scheme Association
Australian Imported Motor Vehicle Industry Association

Appendix 14 – Public Comment, Safer Freight Vehicles Discussion Paper

A summary of the comments received and the department response are included in the Table 27 below. Comments submitted in confidence have not been tabled for publication but have been considered in refining and analysing the options. Comments submitted in regard to ADR requirements for vehicle axle configuration and/or retractable axle transition masses are not considered here, but would be considered as part of any future IA to analyse options for reforming those requirements.

Table 27: Summary of public comments

Correspondent	Summary of Comments	Department Response
Arrival	1. Broadly agrees with the direction outlined to more closely harmonise the ADRs with regulations in force in other markets, and to allow technologies that would improve the safety and efficiency of heavy vehicles. 2. Considers that the maximum allowable width should be increased to 2.55 m for all vehicle categories and should exclude protruding equipment such as exterior mirrors, cameras and lamps to align with global standards and preclude the need for Australia specific vehicle designs. 3. Notes for electric vehicles with a battery pack under the floor, additional width allows a greater battery capacity for the same length of vehicle without reducing the size of the structural supports on either side – reducing the width of the vehicle to localise for Australia could require either a reduction in driving range or the amount of structure provided to protect the battery pack.	1. Noted. 2. Noted. This is beyond the scope of the current IA, which has been aligned with Other Critical Action L of the NRSAP 2018-2020, to investigate the introduction of safer, cleaner heavy freight vehicles by minimising regulatory barriers. Increasing the width limit to 2.55 m (or 2.60 m) for other vehicle categories, including buses, could be considered as part of a future IA (subject to ADR development and review priorities). 3. Agreed.
Australasian College of Road Safety	1. Provides in-principle support for the proposed changes to heavy vehicle regulation. 2. Supports options including both goods vehicles and trailers to maximise the benefits from side-underrun protection and other safety features. 3. Believes safety should be the primary consideration, with cost a	1. Noted. 2. Noted. 3. Noted. However, the department will continue to follow government policy in relation to the assessment of regulatory proposals/options, including as per the Australian Government Guide to Regulatory Impact

	secondary consideration. 4. Notes it would be helpful for the discussion paper to address options for retrofitting technologies to existing vehicles. 5. Recommends the department outline a process, including a timeline, towards achieving the ultimate aim of the highest safety standards available being mandatory on all heavy vehicles. 6. Recommends consideration be given to evidence around the utility and effectiveness of each proposed safety technology, including human interaction, and interactions among the various technologies – suggests a IA may help with this.	Analysis (Commonwealth of Australia, 2020). This requires policy makers to consider both benefits and costs, and net benefits are the primary consideration in determining the best option. 4. Noted. However, this is unlikely to be viable for many of the technologies considered in this IA, including as it is generally much more expensive to retrofit safety systems to existing vehicles and there would be diminishing benefits for vehicles approaching the end of service life. Further, this is beyond the scope of the ADRs or the RVSA. 5. Disagree. Policy makers should consider the net benefits of a range of viable policy options, and mandating all of the highest safety standards available should not be the default option. 6. Noted – this is addressed through the completion of the benefit-cost analysis for the IA.
Australian Trucking Association (ATA)	1. Recommends the Australian Government increase the truck and trailer width limit to 2.60 m, with an exclusion for permanently fixed webbing assembly type devices – but if not, at least a 2.60 m hard limit (i.e. including permanently fixed webbing assembly type devices). 2. Considers an increase to truck and trailer widths would allow improved safety for people working on loading and unloading trucks by enabling increased use of fall arrest systems, load restraint and load covering systems – 2.60 m would provide the clearest load restraint and workplace health and safety benefits. 3. Notes increased width has specific benefits for refrigerated trucks and trailers, improving thermal efficiency without a significant loss of payload. 4. Notes that the ability to increase the thickness of refrigerated truck and trailer walls would make it easier to incorporate recessed load restraint into truck and trailer design, which would reduce loading and unloading damage and help ensure that load restraint equipment can be used in the safest possible way. 5. Considers a 2.60 m width limit would provide Australian operators with the greatest access to the latest international technology and zero	1. Noted. 2. Agreed. 3. Agreed. 4. Noted. 5. Agree a 2.60 m width limit would provide the greatest access to the latest international technology and zero emissions vehicles. However, a 2.55 m width limit would also substantially increase access to zero emissions vehicles, as this aligns with the EU limit and not all zero emissions vehicles made for the US market will be 2.60 m wide – many of these are also likely to be around 2.55 m in width. 6. Agreed. 7. Noted. 8. Noted. 9. Requiring wider freight vehicles to be fitted with a package of safety technologies (including side underrun) is a key part of the agreement with jurisdictions/in-service regulators and other stakeholders to pursue

	emission vehicles, which is essential to reduce costs and ensure that trucking operators have commercially viable options for reducing transport emissions. 6. Notes increased width can improve roll stability. 7. Recommends the Australian Government implement the safety technologies package for wider trucks and trailers and ensure the proposed ADRs continue to be developed (and subject to regular review) in close consultation with industry and with regard for Australian conditions. 8. Supports the proposed ADR amendment package for improving driver vision (exclusion of devices for indirect vision and blind spot information systems from vehicle width and length). 9. Recommends the Australian Government consider the best mechanism for implementing side underrun protection for wider vehicles, including consideration of; exempting regional, remote and off-road transport operations; and implementing the technology through in-service vehicle standards and not as an ADR. 10. Considers that side underrun is more likely to be damaged in harsher rural and remote operating conditions, so is likely to deliver reduced safety benefits at higher costs in these areas.	this reform – it is important to preserve this agreement. The proposed ADR already includes exemptions and/or relaxations for vehicles with particular design features, and further targeted exemptions could be included, if there is evidence to show this would be likely to have no more than a minor regulatory impact, or that an LPD would be incompatible with the vehicle design use. Agree provision needs to be made to allow side underrun to be fitted after first supply to market, including by a third party (e.g. body builder). The department proposes to resolve this issue by including a clause in the proposed ADR to exempt chassis-cab and partially complete vehicles, as well as prime movers from this ADR. To comply with the proposed ADR as completed vehicles in-service, chassis-cab and other partially completed vehicles would then need to be fitted with side underrun as part of the vehicle completion process. 10. Agreed.
Australian Tyre Industry Council	1. Supports increasing the maximum width for trucks to 2.55 m.	1. Noted.

Bicycle Network	1. Supports increasing the maximum width for goods vehicles and trailers over 4.5 tonnes to 2.55 m, to align with the width standards in the European Union, United Kingdom and New Zealand. 2. Support for 2.55 m maximum width is provided on the basis that the wider vehicles will be fitted with the proposed safety technologies. 3. Considers the marginal width increase [to 2.55 m] will provide additional space to better fit EU mandated safety technologies, such as those proposed, and environmental technologies, such as Euro VI emission control systems. 4. Supports the exclusions proposed for enhanced devices for indirect vision and monitoring devices to detect other road users from vehicle width and length measurements.	1. Noted. 2. Noted. 3. Noted. 4. Noted.
Crane Industry Council of Australia	1. Strongly supports the adoption of international standards regarding width, as this will provide greater opportunities for purpose-built vehicles, providing industry greater operational efficiency, productivity and flexibility. 2. Notes with the introduction of Euro V and VI and the limited amount of space on the vehicles' side, swing up stabilizer legs on Vehicle Loading Cranes (VLC) have become standard, and these designs require a little more space which causes the VLC to exceed 2.50 m. 3. Requests an exemption to be included in any regulation change to allow VLCs to be up to a width of 2.55 m – believe this exemption would align with the purpose of the review which is for regulatory change to facilitate the uptake of safer vehicles.	1. Noted. 2. Noted. 3. Noted. This is beyond the scope of this IA, but could be considered as part of the ongoing ADR review process, including in particular, through consultation with the TLG established for this purpose.

Commercial Vehicle Industry Association of Australia (CVIA)	1. Supports increasing the maximum width for goods vehicles and trailers over 4.5 tonnes to 2.60 m. 2. Expresses some concerns regarding the proposed new mandatory safety systems required to achieve the additional width for heavy trailers, in particular side underrun protection and reversing lamps. 3. Notes side underrun protection is likely to complicate the design of side tippers, chassis tippers, gas tankers and other heavy vehicle trailers that are predominantly used in regional areas. 4. Notes side underrun protection devices are somewhat weak in design and construction and can be easily damaged when vehicles are used on unsealed roads – which is commonplace in regional and remote parts of Australia. 5. Questions benefits of reversing lamps on trailers, especially trailers used in multi-vehicle combinations – requests a IA to consider pros and cons of regulating reversing lamps on trailers. 6. Argues that industry could also be educated of safe reversing practices, including the operation of hazard lights when reversing – a commonpractice already used by many operators.	1. Noted. 2. See 3 and 4 below. 3. Agree that side underrun could complicate the design of some vehicles and trailers. UN R73 includes some derogations, and the exemptions and alternative procedures section of the proposed ADR will be able to be used to provide greater clarity, including in regard to derogations. These will also be able to be continuously reviewed in close consultation with industry and with regard for Australian conditions, including through the established ADR consultative forums (e.g. TLG). Minor amendments could be made to the ADR (after entry into force) if necessary to further clarify the interpretation and/or application of requirements, or to provide further targeted exemptions/ derogations, if there is evidence to show this would be likely to have no more than a minor regulatory impact, or that an LPD would be incompatible with the vehicle design use. 4. Agree side underrun protection devices can be of a lightweight design and construction and these could be more easily damaged in some remote and off-road operations. However, side underrun is only proposed as a mandatory requirement for wider vehicles, and the international standard (UN R73) allows for stronger and more sturdy designs to be used. 5. Noted. Reversing lamps are no longer proposed as a mandatory safety feature for wider trailers. Requirements for these are being considered as part of a broader review of lighting ADRs for all vehicle categories and dimensions. 6. Noted.
Department of Transport VIC	1. Supports increasing the maximum width for heavy vehicles (goods vehicles and trailers over 4.5 tonnes) to 2.55 m, as this is supported by research conducted by Austroads, and heavy vehicles that are 2.55 m wide, and wider, are successfully operating in Victoria on the PBS network.	1. Noted. 2. Noted. 3. Noted. Jurisdictions should work with Austroads to complete this work (also see recommendations in Chapter 7 above). Ideally this should have

	2. Not opposed to a further maximum width increase to 2.60 m for all heavy vehicles – however the impact of providing general access to vehicles of this width should be studied to ensure that 2.60 m wide heavy vehicles could safely operate on the road network and share the road with other road users, including cyclists and motorcyclists. 3. Encourages the Commonwealth to work with the Austroads and the NHVR to research the suitability of 2.60 m wide heavy vehicles across Australia. 4. Continues to be disappointed with the delayed introduction to regulations that will improve vehicle safety in Australia – notes many of the proposed safety features have been mandated in other jurisdictions for years, or even decades, yet they are only just being proposed to be optional for most heavy vehicles in Australia. 5. Urges the Commonwealth not to lose sight of further opportunities to improve heavy vehicle safety, and to adopt (i.e. mandate) safety standards in similar timeframes to Europe in alignment with the agreement of Transport Minister's at the 11th meeting of the Transport and Infrastructure Council. 6. Does not support any ADR exemptions for life saving safety features, including ESC, AEB and LDWS for vehicles with more than three axles. 7. Understands that the UN exemption for ESC, AEB and LDWS on vehicles with more than three axles was requested by the international representative body for vehicle manufacturers, due to four axle trucks being primarily used on construction sites and not on highways – does not support this exemption. 8. Encourages the Commonwealth to work with international bodies to enable the fitment of these technologies to trucks with more than three axles, and notes that vehicles used on construction sites are a key area of focus for safety improvements in Victoria.	been completed as part of the Austroads review in 2019. 4. Noted. However, with the proliferation of new vehicle technologies, it is vital that any mandating of technologies be based on a sound evidentiary basis. Otherwise vehicle costs could rise for little or no gain in safety (or environmental) performance. For new technologies, some time is needed to establish effectiveness and properly consider if there is a case for regulation. Regulation is not the default policy option. Understand that the reference to delays is for the most part a reference to the EU. However, mandatory implementation dates in the EU are usually around 2-4 years (and sometimes longer) after the establishment of new UN vehicle regulations. This allows manufacturers to start designing and testing vehicles to the new UN Regulations before they become mandatory. Entry into force of UN vehicle regulations should not be taken as the mandatory date in the EU or any other region or country. 5. Noted. 6. Disagree. The benefits of these technologies on trucks with four or more axles are likely to be small in relative terms, and would not justify the implementation of a unique Australian requirement. 7. Agree that differences in how these vehicles are used have been considered by the UN WP.29 and the European Commission in providing (or recommending) exemptions. The benefits of ESC, AEB and LDWS on heavy vehicles are all most likely to accrue through reductions in crashes on roads with speed limits of 80 km/h or more. A further factor to consider is the lower production volumes of these vehicles, which means development and test costs are then amortised over fewer sales. 8. Agree that the UN World Forum, the EU and other parties should review the ongoing need for exemptions for ESC, AEB and LDWS for trucks with four or more axles.

Department of Transport and Main Roads (TMR) QLD	1. Supports increasing the maximum width to 2.55 m for goods vehicles over 4.5 tonnes only, as a preference to 2.55 m for both goods vehicles and trailers. 2. Considers the safety enhancements proposed for heavy trailers are not substantial enough to warrant reform of trailer maximum width. 3. Does not support increasing the goods vehicle or trailer width limit to 2.60 m at this stage. 4. Notes wider vehicles may not have "as of right" access to all roads in Queensland – road managers in Queensland may have mechanisms in place to be able to restrict access to wider vehicles where they may be considered a risk to the public, other vehicles and road infrastructure – expects the same to be the case in other jurisdictions. 5. Welcomes and supports the exclusions proposed for enhanced devices for indirect vision and monitoring devices to detect other road users from vehicle width and length measurements. 6. Does not support exclusion of permanently fixed webbing-assembly-type devices (such as curtain-side devices) from the measurement of the vehicle width, as it is possible for them to be designed to fit in the specified width limit. 7. Would prefer safety features like enhanced devices for indirect vision, AEB, ESC, LDWS, and side underrun protection to be mandated regardless of overall vehicle width – otherwise some manufacturers may continue to supply vehicles without the enhanced safety features by remaining within the 2.50 m width. 8. Requests mandating of the UN ECE R 158 "Devices for means of rear visibility or detection" and UN ECE R 159 "Moving Off Information System (MOIS)" to be considered as part of the proposed regulatory changes, keeping in mind the implementation timeframe in EU countries.	1. Noted. 2. Disagree. There are still important productivity benefits, including as increasing the maximum trailer width to either 2.55 m or 2.60 m will provide more space to fit 1200 mm wide international pallet sizes, and more thickness for insulation for refrigerated vehicles. 3. Noted. 4. Noted. This would be no different in principal to how mass and height limits are currently set on specified roads. This is appropriate, provided there is a sound justification for each such restriction. 5. Noted. 6. Accepted that these devices can be designed into the vehicle, so no additional width relative to the current limit is required. The recommended option does not allow these devices to be any wider than 2.55 m. 7. AEB and ESC have since been mandated regardless of width through ADRs 97/00 and 35/07. Further, a separate IA has been prepared to consider the case to mandate LDWS regardless of width. These are all still included under each of the options in this IA as a means to ensure vehicles already in-service will also be required to be fitted with these safety systems, before they can be modified to be wider than 2.50 m. A broader mandate for the other safety systems and features could be considered in future, but may not be necessary if there is high take up of safer freight vehicles, as a result of this proposal. 8. Disagree. The road safety problems addressed by UN R158 and UN R159 are much less prevalent, and/or much less likely to be affected by a 50-100 mm increase in vehicle width, than those included as part of the proposed regulatory policy options in this IA. Further, the department has since prepared a separate IA and consulted on a proposal to mandate technical requirements from UN R158 (reversing technologies) for both light and heavy vehicles. The case for mandating the technical requirements of UN R159 could also be considered separately through the IA process (subject to available resources and other ADR development priorities).

Mushroom grower	1. Supports increasing the maximum width for goods vehicles and trailers over 4.5 tonnes to 2.60 m. 2. Notes wider refrigerated bodies would improve thermal efficiency as extra insulation thickness could be used while maintaining internal width for loading standard pallets – this would reduce fuel consumption and driver fatigue, as refrigeration units would be able to operate at lower speeds while drivers are sleeping in transit. 3. Strongly opposes the width increase being limited to 2.55 m with allowances of an extra 50 mm being made for webbing assembly type devices used on curtain-side devices, as a simple 2.60 m width limit would encourage trailers with better load restraint provisions and manual handling than early curtain side trailers – an example of this would be with trailers that can be specified with side walls that can hinge open to allow side loading as well as bulk loading for bulk items. 4. Considers a 2.60 m width limit would allow trailers with side walls that can hinge open to be used to carry fresh substrate to straw growers on outbound trips and straw to mushroom growers on return trips, instead of in two separate trips.	1. Noted. 2. Agreed. 3. Accepted that these devices can be designed into the vehicle, so no additional width relative to the current limit is required. The recommended option does not allow these devices to be any wider than the current 2.55 m. 4. Noted.

Electric Vehicle Council	1. Supports increasing the maximum width for goods vehicles and trailers over 4.5 tonnes to 2.60 m. 2. Notes width and mass restrictions have been highlighted by Electric Vehicle Council members as limiting the ability to import electric freight models to the Australian market. 3. Agrees with the department's assessment that it will be increasingly difficult to re-design trucks for the Australian market because of battery/hydrogen storage systems. 4. Believes equal consideration should be paid to the safety implications of particulate matter and noxious fumes from combustion engines and that the Government should bring forward the implementation date for the Euro VI heavy vehicle emissions standard.	1. Noted. 2. Agree the current 2.50 m width limit is the most substantial impediment in the ADRs to the supply of electric freight vehicles. Agree mass restrictions are also an impediment, however these are set under the HVNL and WA and NT law (with exception of retractable axle mass transition limits in the ADRs). Jurisdictions, together with the NHVR and the NTC need to consider the case for any changes to mass limits. 3. Noted. 4. Agreed. On 13 October 2022, the Minister announced a new ADR 80/04 based on the Euro VI (Stage C) requirements will be phased in for newly approved heavy vehicle models first supplied to Australia from 1 November 2024; and all heavy vehicles from 1 November 2025. The implementation of any of the proposed options in this IA will make it easier for manufacturers to supply Euro VI compliant heavy vehicles, so would facilitate greater take up of these vehicles (including prior to the mandatory applicability dates).
Gas Energy Australia	1. Supports increasing the maximum width for goods vehicles and trailers over 4.5 tonnes to 2.60 m. 2. Notes the gaseous fuels industry comes under a number of federal and state or territory regulations when it puts a heavy vehicle with a dangerous goods tank onto an Australian road. 3. Wants to ensure the multiple technical areas involved in the regulation of side underrun and conspicuity markings on dangerous goods vehicles, including industry and all tiers of government, have a single point of reference to understand and apply the rules. 4. Suggests the department consult on and publish guidance that provides a single point of reference to understanding and applying the side underrun and conspicuity rules for tank-vehicles.	1. Noted. 2. Noted. 3. Noted. 4. Noted. UN R73 includes some derogations, and the exemptions and alternative procedures section of the proposed ADR will be able to be used to provide greater clarity, including in regard to derogations. These will also be able to be continuously reviewed, together with the need for more general guidelines, in close consultation with industry and with specific regard for tank vehicles, including through the established ADR consultative forums (e.g. TLG). Minor amendments could also be made to the ADR (after entry into force) to provide further limited derogations or further clarify the interpretation and/or application of requirements, if necessary.

Heavy Vehicle Industry Association (HVIA)	1. Supports increasing the maximum width to 2.55 m for goods vehicles over 4.5 tonnes only. 2. Supports the exclusions proposed for enhanced devices for indirect vision and monitoring devices to detect other road users from vehicle width and length measurements. 3. Does not support increases to trailer widths because the cost of the retooling, transitional costs and potential loss of Australian manufacturing jobs, far exceed any safety or productivity benefits. 4. Considers most heavy combination vehicles are mass constrained, meaning the additional width of the trailers will not provide productivity benefits to outweigh the implementation costs to [Australian] industry and safety risks to the community. 5. Considers there are no width related barriers to fitting side under-run protection or conspicuity markings to trailers, so it is unlikely that a change to width would incentivise the uptake of these. 6. Does not believe an exemption to allow load restraint devices to go out to 2.60 m can be justified on either safety or productivity grounds. 7. Accepts that there may be specific sectors where the safety or productivity benefits may justify increased widths on specific categories of routes – for example, the refrigerated and freezer segment where additional width would allow these vehicles to increase their thermal efficiency and these vehicles do not travel on all routes in the network. 8. Believes specific sector circumstances can be addressed within the Performance Based Standards (PBS) system or that a specific IA or Productivity Commission report should evaluate the option for wider refrigerated trailers only. 9. If the government does decide to change trailer width, requests that manufacturers who would require retooling are compensated through a targeted assistance package to defray the costs of the transition. 10. Notes Australian businesses have invested heavily in tooling and systems based on existing ADRs – if this was to change, then many of	1. Noted. 2. Noted. 3. Noted. Consider the substantial market share (over 90% for heavy trailers) for domestic trailer manufacturers has been built on much more than just the width limit. Domestic manufacturers are able to build trailers specifically designed for and well suited to withstand Australian conditions, and can also avoid significant costs to ship large trailers to Australia. Have also not been provided with (or otherwise made aware) of any evidence of where the increase in the width limit for trailers to 2.55 m in NZ has resulted in a significant shift in where trailers are sourced from. 4. Agree most heavy combination vehicles are mass constrained. Consider any safety risks to be minimal and more than offset by the additional proposed safety requirements. 5. The benefit-cost analysis by the ARRB includes benefits and costs from a gradual increase in fitment of side underrun and conspicuity markings, as trailer manufacturers gradually transition to producing more wider trailers under Options 3.1a (2.55 m trucks and trailers) and 3.2a (2.60 m trucks and trailers), where the fitment is mandatory for these wider trailers. 6. Accepted that these devices can be designed into the vehicle, so no additional width relative to the current limit is required. The recommended option does not allow these devices to be any wider than the current 2.55 m. 7. Agreed. 8. From the benefit cost analysis by the ARRB the department estimated that increasing the width limit from 2.55 m to 2.60 m for refrigerated vehicles only would increase the net benefit (relative to Option 3.1a) by around $28 m. A similar scale increase in net benefit is likely for increasing the width limit for refrigerated trailers from 2.50 m to 2.55 m. 9. Further consultation is proposed before any decision to increase the

	these businesses will lose or have these investments compromised. 11. Seeks an undertaking from Government that no Australian manufacturer will be disadvantaged. 12. Challenges the Government to quantify the reasons (including the safety and productivity benefits) relied on in making any decision to increase the trailer width limit.	trailer width limit. 10. Further consultation is proposed before any decision to increase the trailer width limit. 11. Further consultation is proposed before any decision to increase the trailer width limit. 12. This IA has been developed to quantify the benefits and costs for each option. There are some study limitations which have been acknowledged in regard to productivity gains (including trip reductions) and infrastructure impacts. Further consultation is proposed before any decision to increase the trailer width limit.
Man Truck and Bus	1. Recommends adopting a 2.55 m width limit for vehicles and trailers in general analog to the EU (notes 2.60 m for refrigerated trucks and trailers are a special case). 2. Recommends decoupling the [additional] proposed safety requirements from vehicle width. 3. Argues it will be difficult to install all the [additional] proposed safety systems on tractors for semi-trailers, concrete mixers, crane trucks, road sweepers etc. 4. Recommends if the proposal is going to be adopted in its current form that requirements for the additional proposed safety systems be applied based on vehicle purpose. 5. Welcomes the proposal to exclude enhanced devices for indirect vision and monitoring devices to detect other road users from vehicle width and length measurements.	1. Noted. 2. Requiring wider freight vehicles to be fitted with a package of safety technologies covered by UN Regulations is a key part of the agreement with jurisdictions and other stakeholders to pursue this reform – it is important to preserve this agreement. 3. Agree some exemptions/relaxations are needed for particular vehicle types and/or variants. AEB, ESC, and LDWS would not be required for vehicles with four or more axles and vehicles designed for off-road use. LPDs for side underrun protection would not be required for tractors for semi-trailers (prime movers), and derogations would apply to allow additional gaps for the movement of cranes and/or extendible support legs, as well as other equipment fitted to special purpose vehicles (e.g. garbage bin loaders). 4. The ADRs do not usually set design requirements based on how a vehicle will be used in service. This would only be viable through the inclusion of specific exemptions and/or relaxations for vehicles with particular design features (e.g. extendible support legs) in the relevant standards, and should be limited to targeted cases for which such exemptions or relaxations would be likely to have no more than a minor regulatory impact, or that an LPD would be incompatible with the vehicle design use.

		5. Noted.
Maxitrans	1. Recommends that heavy tailers be excluded from the proposed width changes. 2. Considers the proposed changes to favour foreign producers entering the market, whilst introducing more complexity, cost, and uncertainty for domestic producers. 3. Is disappointed that the discussion paper does not reflect, or even mention, the potential implications that the proposed changes would introduce to the competitive environment, or the adverse impact on the Australian heavy trailer manufacturing industry. 4. Notes the total annual market of heavy trailers in Australia is less than the annual production of some individual companies in Europe, Asia, and North America. 5. Recognises that increasing "globalisation" is inevitable and strongly believes that government regulatory changes that open markets should be balanced with industry support to assist affected industries. 6. Believes addressing increased international competition will be a significant challenge to Australian heavy trailer manufacturers – having to adapt in a short time frame, in the face of foreign suppliers who either have comparatively low labour rates, and/or large home market volumes, has the potential to decimate heavy trailer manufacturing in Australia. 7. Argues that changing the widths of trailers is not a simple design and manufacturing change – claims the implementation costs will run into several million dollars in design changes, modelling, engineering, tooling, jigging, sourcing, and supplier costs. 8. Is concerned about the addition of further uncertainty and/or complexity into the regulatory environment, including the possibility of different new and used trailer widths, and that an increase to 2.55 m could be followed in a short period by an increase to 2.60 m.	1. The IA recommends that the Australian Government implement Option 3.1b (2.55 m wide goods vehicles only) at this stage. This approach will enable consultation to be undertaken on the benefit-cost analysis and IA, to ensure impacts are well understood, before any decision is made in regard to the width limit for trailers. 2. The proposed changes are not intended to favour either importers or domestic manufacturers. They are intended to achieve the best outcomes for the Australian community as a whole, and to ensure all ADR requirements align with the objects of the RVSA and the purposes for which a Minister may determine national road vehicles standards under the RVSA. 3. The discussion paper was focussed on the purposes for which a Minister may determine national road vehicle standards. As per subsection 12(1) of the RVSA, these include to make road vehicles safe to use, control emissions, secure vehicles against theft, and promote the saving of energy. ADRs are not determined to restrict market access or otherwise limit competition. 4. Agreed. 5. Further consultation is proposed before any decision to increase the trailer width limit. 6. Consider the substantial market share (over 90% for heavy trailers) for domestic trailer manufacturers has been built on much more than just the width limit. Domestic manufacturers are able to build trailers specifically designed for and well suited to withstand Australian conditions, and can also avoid significant costs to ship large trailers to Australia. Have also not been provided with (or otherwise made aware) of any evidence of where the increase in the width limit for trailers to 2.55 m in NZ has resulted in a significant shift in where trailers are sourced from. Nevertheless, further consultation is proposed before any decision to increase the trailer width limit.

	9. Notes businesses require some certainty to determine investment priorities and deliver outcomes – investment horizons extend over many years and need to assume some baseline in the environment, including the regulatory framework. 10. Believes that current PBS processes could be used to implement increased widths on heavy trailers, including refrigerated trailers – this path offers the opportunity to test assumptions around economic and operational benefit before irreversibly mandating an outcome. 11. Notes many trailer types are mass limited in operation and could not effectively utilise any volume increases – should there be an economic benefit in volumetric increases, through wider trailers, PBS solutions could already be utilised to deliver these outcomes. 12. Notes Australian logistics supply chains are built around current heavy trailer dimensioning – interfaces to load/unload facilities, container and pallet sizes, and load balancing and stability all need to be assessed and adapted to make use of any changes, which would require time and investment. 13. Considers the ADRs do not provide [full] coverage of heavy trailer minimum design, engineering, or manufacturing standards, and may not be sufficient to ensure acceptable foreign product quality and safety. 14. Recommends where ADRs are in place that sufficient resource is applied to audit and ensure compliance. 15. Considers the safety benefits of side underrun, conspicuity markings and reversing lamps, are not dependent on, or related to, trailer width – if these are deemed necessary, they can and should be implemented on all trailers. 16. Notes more consistent regulation and rules across state-based jurisdictions would reduce complexity and cost of producing and operating heavy trailers. 17. Believes improving the consistency, efficiency and effectiveness of PBS	7. Noted. The benefit-cost analysis undertaken by the ARRB has included industry investment costs of approx. $27.9M to $34.1M (net present values) associated with Australian manufacturers producing wider trailers. 8. Further consultation is proposed before any decision to increase the trailer width limit, including to avoid any two-step process. 9. Agreed. 10. PBS may be able to be used for this purpose. However, there would likely be increased costs, longer approval timeframes and more restrictive operating conditions than would apply under the options explored for wider trailers in this IA. 11. Agree many trailer types are mass limited in operation and could not effectively utilise any volume increases (see 10 above regarding PBS). 12. Agreed. 13. Disagree. 14. The department's Vehicle Safety Operations (VSO) branch takes a risk-based approach to the management of compliance with the RVSA, the Rules and the ADRs. This risk-based approach helps ensure that compliance activities are focussed on regulated areas and regulated entities that pose the greatest compliance risk, without impeding the regulated industry's ability to operate. A risk-based approach does not mean eliminating all risks, or taking a 'no-touch' approach to lower-risk regulated entities or behaviours. 15. Requiring wider freight vehicles to be fitted with a package of safety technologies (including side underrun) is a key part of the agreement with jurisdictions/in-service regulators and other stakeholders to pursue this reform – it is important to preserve this agreement. 16. Agreed. 17. Agreed.

	would assist in reducing costs and allow its more widespread use.	
Michelin Australia	1. Supports increasing the maximum width for goods vehicles and trailers over 4.5 tonnes to 2.60 m. 2. Does not support a two-step increase in the vehicle width limit – notes that increasing the width limit to 2.55 m may require a secondary increase to 2.60 m within a short timeframe. 3. Notes that significant resources from Michelin and other tyre manufacturers are dedicated to the development of 315/70 R22.5 size tyres, which is currently the most innovative and popular tyre size in Europe, but when fitted to Australian specification vehicles, results in a width exceeding the current 2.50 m limit. 4. Advises that the 315/70 R22.5 tyre specification increases the overall width across the tyres by a minimum of 40mm, compared to [Australian] standard 11R22.5 dual fitments. 5. Notes that the benefits of 315/70 R22.5 size tyres include reduced fuel consumption and carbon emissions, reduced rubber emissions from increased mileage, reduced waste, and increased stability due to wider track and footprint. 6. Considers an increase to the overall width of both trucks and trailers to be essential for the effective adoption of the 315/70 R22.5 tyre size in Australia, including to allow tyres to be re-treaded and reused multiple times, including on trailer axles, to increase the service life and thus reduce the disposal of the tyre casings. 7. Notes off-road mine-based vehicles with 315/70 R22.5 size tyres are currently being imported without compliance (i.e. as non-road vehicles), which means they are then required to be transported on trailers between sites, despite in most circumstances only being 5-10 mm over width.	1. Noted. 2. Noted. 3. Noted. 4. Noted. 5. Noted. 6. Agreed. 7. Noted.
National Heavy Vehicle Regulator	1. Supports increasing the maximum width for goods vehicles and trailers	1. Noted.

	over 4.5 tonnes to 2.60 m. 2. Supports the exclusions proposed for enhanced devices for indirect vision and monitoring devices to detect other road users from vehicle width and length measurements. 3. Recommends any 2.60 m width limit be inclusive of permanently fixed webbing-assembly-type devices. 4. Recommends a vehicle stability function and antilock brake system in accordance with ADR 38/05 be included as a safety requirement for wider trailers. 5. Recommends that wider vehicles which meet the additional proposed safety requirements are identified on the Register of Approved Vehicles or alternatively fitted with a label (or similar) by vehicle manufacturers – to help ensure compliance of vehicles in-service.	2. Noted. 3. Accepted that these devices can be designed into the vehicle, so no additional width relative to the current limit is required. The recommended option does not allow these devices to be any wider than 2.55 m. 4. Agreed – ADR 38/05 is included as a mandatory standard under Options 3.1a and 3.2a in this IA. 5. Agreed.
NSW Government – Transport for NSW	1. Supports increasing the maximum width for goods vehicles and trailers over 4.5 tonnes to 2.55 m, as this would present the fastest method to saturate the market with heavy vehicles and trailers with a range of best practice safety features, to ensure Australian road users would benefit from these crucial safety features. 2. Notes Transport for NSW is currently looking at measures to accommodate freight vehicles up to 2.60 m in width, however this requires further analysis and consideration of how to manage these vehicles on the road network. 3. Supports all the mandatory safety standards proposed for safer wider vehicles in the discussion paper. 4. To ensure the safest vehicles are being supplied to the market, the NSW Government also supports the additional standards proposed for wider vehicles being adopted for all heavy vehicles regardless of the width of the vehicle. 5. The NSW Government supports further standards for consideration, such as front and rear underrun protection devices that would further	1. Noted. 2. Noted. 3. Noted. 4. AEB and ESC have since been mandated regardless of width through ADRs 97/00 and 35/07. Further, a separate IA has been prepared to consider the case to mandate LDWS regardless of width. These are all still included under each of the options in this IA as a means to ensure vehicles already in-service will also be required to be fitted with these safety systems, before they can be modified to be wider than 2.50 m. A broader mandate for the other safety systems and features could be considered in future, but may not be necessary if there is high take up of safer freight vehicles, as a result of this proposal. 5. Disagree. Front underrun protection is already mandatory for ADR category NC vehicles (goods vehicles over 12 tonnes GVM). Any increase in the width of goods vehicles between 4.5 tonnes and 12 tonnes, the large majority of which are made in Japan, would most likely occur higher up on the vehicle body (not the cab or chassis) and so should not increase

	improve safety outcomes, and help mitigate risks associated with an increased risk of collisions with the front and rear of the heavy vehicles that is associated with a wider vehicle. 6. Supports the exclusions proposed for enhanced devices for indirect vision and monitoring devices to detect other road users from vehicle width and length measurements. 7. All the devices and systems that are proposed to be excluded from vehicle width and length measurements should continue to be subject to the existing ADR requirements for external projections.	(or decrease) the risk of front underrun. Rear underrun already has the least potential benefit of all underrun protection devices and benefits will only diminish further in future as the percentage of light vehicles in the fleet with AEB increases. 6. Noted. 7. Noted.
Off-road Trucks Australia	1. Supports the exclusion of advanced safety devices from the definitions of width and length – is not offering these features in Australia due to the width definition. 2. Supports the proposed total width protrusion limit of 100mm to harmonise with EU requirements. 3. Supports the proposed total front protrusion limit of 250mm to harmonise with EU requirements. 4. Notes all its Tatra vehicles currently meet UN R46/04 for devices for indirect vision. 5. Would oppose any proposal to mandate ESC, AEB, LDWS, and blind spot information systems on off-road vehicles. 6. Advises that Tatra vehicles currently have side underrun protection meeting EU regulations, but these are not offered in the Australian market to reduce mass and increase payload, because axle load limits, particularly on front axles, are significantly lower in Australia. 7. Would oppose mandatory side underrun protection for off-road vehicles unless there is an increase in axle loads to maintain current payloads.	1. Noted. 2. Noted. 3. Noted. 4. Noted. 5. It is not proposed to mandate ESC, AEB or LDWS for road vehicles ‘designed for off-road use’ (as per the definition in ADRs 35/07 and 97/00 of ‘designed for off-road use’), including for vehicles with an overall width exceeding 2.50 m. 6. Noted. Axle mass limits are a matter for the NTC, NHVR, and the jurisdictions to consider. Vehicles with side underrun protection are viable to operate within the existing limits. 7. Mandatory side underrun protection is only proposed for road vehicles exceeding 2.50 m in width, and will have no more than a minor impact on payloads. Further, the proposed requirements (from UN R73) do not require lateral protection to be fitted any less than 550 mm above the ground.

PACCAR Australia	1. Supports increasing the width limit to 2.55 m for goods vehicles over 4.5 tonnes only. 2. Notes the on-road safety benefits of improved technology apply primarily to goods carrying vehicles, as opposed to trailers. 3. Concerned timely decisions on wider and safer vehicles may be hampered if both trucks and trailers are considered simultaneously. 4. Would like to see wider and safer vehicles allowed on the road before 30 June 2022. 5. Considers mandating the requirements of UN R46 will eliminate the ability to fit flat glass to main rear-view mirrors. 6. Argues flat glass rear-view mirrors provide a clearer perception of depth. 7. Considers mandating the requirements of UN R46 will require significant testing of mirror and structure installation, which will involve significant time and cost for no safety benefit. 8. Recommends the proposed new ADR for devices for indirect vision be amended to allow existing main rear-view mirrors without the need for strength or performance testing, and be updated to require wide angle rear-view mirrors, close proximity view mirrors, and front-view mirrors or hood mounted mirrors/devices for viewing across the front of the truck. 9. Supports the then proposed new ADR 35/07 mandating ESC on heavy vehicles with less than 4 axles. 10. Supports the introduction UN R131 within the new ADR 97/00 for AEB on heavy vehicles, provided equivalent standards such as Commission Regulation (EU) No 347/2012*2015/562 are added as accepted alternative standards. 11. Supports the introduction of UN R130 within a new ADR for LDWS on heavy vehicles, provided equivalent standards such as Commission Regulation (EU) No 351/2012*351/2012 are added as accepted	1. Noted. 2. Agreed. There are more safety benefits for trucks. Trailer benefits are more productivity based. 3. Noted. 4. Noted. However, more time has been required to complete the IA (including to consider industry requests for exemptions and variations to the proposed UN regulation based ADRs) and further time will be required to update in-service vehicle laws, following any updates to the ADRs to allow for wider and safer freight vehicles. 5. Vehicles can be designed to meet UN R46 with flat glass fitted to main rear-view mirrors on the driver’s side. Agree it is unlikely to be possible to fit flat glass to main rear-view mirrors on the passenger side. This is because flat main rear-view mirrors typically provide a very limited field of view on the passenger side compared to the minimum required by UN R46. However, there are other solutions, including fitting a flat glass main rear-view mirror (on either side) in combination with a camera-monitor system meeting the full UN R46 field of vision requirements. 6. Agree that flat glass mirrors provide clearer depth perception. However, flat glass mirrors provide a narrower field of view (than convex mirrors), and can leave very large blind spots on the passenger side of trucks. 7. Disagree. The performance testing in UN R46 allows for a less design prescriptive (i.e. performance based) approach overall and underpins the approach taken by the EU in regard to the exclusion of these devices from width and length measurements. This testing is also minor relative to the benefits for truck manufacturers (and purchasers/operators) of an increased width limit. 8. Agree that the ADR should be updated to require wide angle rear-view mirrors, close proximity view mirrors, and front-view mirrors or cross-view mirrors. Disagree with the proposal to allow existing main rear-view mirrors without the need for strength or performance testing, including because the performance testing allows for a less design prescriptive (i.e. performance based) approach overall and is linked to

	alternative standards. 12. Would not like to see implementation of a new ADR for blind spot information systems until at least 24 months post implementation in Europe. 13. Does not support the proposed new ADR for side underrun protection as written – considers UN R73 which the proposed ADR adopts to be highly restrictive, beyond its safety improvement intent. 14. Is supportive of the Technical Advisory Procedure written by the ATA which provides for a more flexible interpretation of UN R73, whilst still achieving the safety intent of this regulation. 15. Understands the proposed new standard for side underrun protection is to apply to rigid body vehicles only. 16. Notes many trucks operating in Australia have significant body work completed post build, but prior to operation in service – enforcing side underrun protection as part of Type Approval would necessitate the installation and subsequent removal and disposal of compliant components on many vehicles, which would impose significant wasted cost on truck owners. 17. Would prefer any regulation for side underrun protection to be applied as an in-service requirement, as opposed to an ADR. 18. If an ADR for side underrun protection is applied instead of an in-service requirement, requests that Administrator's Circular (0-4-11) be modified to include side underrun protection, to allow manufacturers to supply vehicles to market without side underrun protection components installed. 19. Recommends the NHVR provide formal allowance for new vehicles to travel post build as part of the manufacture completion process to body builders etc before side underrun components are installed.	exclusions from width and length measurements. 9. Noted. 10. Noted. However, Commission Regulation (EU) No 347/2012*2015/562 has now been repealed. 11. Noted. However, Commission Regulation (EU) No 351/2012*351/2012 has now been repealed. 12. Noted. The proposed ADR applicability dates are 28 months post implementation for new models in Europe and 31 months post implementation for all new vehicles in Europe. 13. Noted. The exemptions and alternative procedures section of the proposed ADR will be able to be used to provide greater clarity, including in regard to derogations. These will also be able to continuously reviewed in close consultation with industry and with regard for Australian conditions, including through the established ADR consultative forums (e.g. TLG). Minor amendments could be made to the ADR (after entry into force) if necessary to further clarify the interpretation and/or application of requirements, or to provide further targeted exemptions/ derogations, if there is evidence to show this would be likely to have no more than a minor regulatory impact, or that an LPD would be incompatible with the vehicle design use. Such specifics (i.e. finer details) should not prevent the ADRs from being updated in the near term to allow for safer wider freight vehicles. 14. Noted. 15. Correct – under each of the proposed options, rigid trucks would be required to be fitted with side underrun protection, while prime movers would be exempt. 16. Agree provision needs to be made to allow side underrun to be fitted after first supply to market, including by a third party (e.g. body builder). The department proposes to resolve this issue by including a clause in the proposed ADR to exempt chassis-cab and partially complete vehicles, as well as prime movers from this ADR. To comply with the proposed ADR as completed vehicles in-service, chassis-cab and other partially completed

		vehicles would then need to be fitted with side underrun as part of the vehicle completion process. 17. Noted. However, an alternative solution has been found to resolve this issue (see above). 18. Noted. However, an alternative solution has been found to resolve this issue (see above). 19. Noted. While this is a matter for the NHVR, the approach proposed by the department is likely to avoid the need for any special formal allowances in regard to side underrun, including because such vehicles would not need to be fitted with side underrun protection while in the chassis-cab stage.
Toll Group	1. Supports increasing the maximum width for goods vehicles and trailers over 4.5 tonnes to 2.60 m. 2. Supports the exclusions proposed for enhanced devices for indirect vision and monitoring devices to detect other road users from vehicle width and length measurements.	1. Noted. 2. Noted.
Truck Industry Council (TIC)	1. Supports increasing the maximum width for goods vehicles and trailers over 4.5 tonnes to 2.60 m. 2. Notes with global markets actively pursuing a net zero emissions future in the transport (and other) sectors, that truck manufacturers are increasingly developing zero emission heavy trucks for global markets such as the European, North American and Japanese. 3. Further notes the majority of ultra-low and zero emission trucks are being developed at 2.55 m and 2.60 m maximum vehicle width, and increasing Australia's maximum truck width to 2.60 m would allow these models to be introduced into the Australian market. 4. Considers increased width will improve roll stability by 4% at 2.60 m and 2% at 2.55 m. 5. Notes increased width would allow the wall insulation thickness on	1. Noted. 2. Agreed. 3. Agree in-principle. However, it is not clear or substantiated that low and zero emission trucks developed for right hand drive markets such as Australia will require more than a 2.55 m width limit. In this respect, all markets with a 2.60 m width limit are left-hand drive markets. 4. Agree roll stability could be improved by up to these amounts, however, the actual improvement will be vehicle design specific and small compared to the benefits of ESC for trucks and RSC for trailers. 5. Agreed. 6. Agreed for the refrigeration units, not the truck and trailer combinations as a whole.

	refrigerated trucks and trailers to be increased to 90 mm for a 2.60 m limit and 65 mm for a 2.55 m limit. 6. Notes increased insulation thickness would provide refrigerated trucks and trailers with a greater than 25% reduction in fuel consumption and CO_2 emissions for a 2.60 m limit, and a greater than 15% reduction for a 2.55 m limit. 7. Does not support any proposal that would allow a trailer that has a maximum width of greater than 2.50 m being towed by a truck that does not comply to the suite of safety features supported in its submission – the basis for this is to ensure the expedient take-up of these advanced safety systems on trucks and to ensure the best possible safety outcomes for new truck/trailer combinations. 8. Recommends that the department develop an additional field in the Register of Approved Vehicles that will allow a type approval holder to upload the compliance status of each new vehicle, in respect of voluntary ADRs and new ADRs prior to the mandated implementation timing. 9. Considers the discussion paper clearly outlines that the maximum heavy vehicle safety benefits, for all road users, will be achieved from the uptake of the proposed truck based advanced safety systems – as such, the introduction of increased vehicle width for trucks, to at least 2.55 m, and preferably 2.60 m (including load restraint and curtain-side devices), fitted with advanced safety features, should be an immediate priority for Australian governments. 10. Recommends that the Federal, State and Territory governments, move to increase maximum vehicle width to at least 2.55 m, and preferably 2.60 m, for trucks fitted with the mandatory and voluntary advanced safety features, supported in its submission, by 1 January 2022. 11. Supports mandating a reversing lamp circuit for both truck and trailer electrical connections, and mandating reversing lamps for heavy trailers. 12. Supports mandatory requirements for side underrun protection and	7. This is beyond the scope of the ADRs under the RVSA and therefore not proposed as part of the options in this IA. The ADRs cover individual vehicles, not combinations of truck and trailer. This is a matter for in-service regulators. The department notes this approach would likely be very complex for both regulators and industry to manage. Since the original discussion paper, the department has added ADR 38/05 (including ABS and RSC) as a proposed requirement for the options with wider trailers, to prevent older trailers without these technologies from being modified to include wider bodywork and possibly then also being towed by trucks without the additional safety features that would be required for wider trucks. 8. The department intends to use an additional field in the RAV to capture if a vehicle meets the additional required safety ADRs for vehicles exceeding 2.50 m in width, if the vehicle was supplied as a chassis-cab, prime mover or complete vehicle, and the maximum width for which the vehicle has been certified to meet all applicable ADRs. 9. Noted. 10. Noted. However, more time has been required to complete the IA (including to consider industry requests for exemptions and variations to the proposed UN regulation based ADRs) and further time will be required to update in-service vehicle laws, following any updates to the ADRs to allow for wider and safer freight vehicles. 11. Noted. Reversing lamps are no longer proposed as a mandatory safety feature for wider trailers. Requirements for these are being considered as part of a broader review of lighting ADRs for all vehicle categories and dimensions. 12. Noted. 13. Noted. 14. See responses to comments 15 to 24 below. 15. Noted. 16. Agreed. Alternative clauses have been developed to allow for mirrors

	conspicuity markings on heavy trailers, while also noting that the department should ensure the proposed ADR requirements continue to be developed (and subject to regular review) in close consultation with industry and with regard for Australian conditions. 13. Supports the exclusions proposed for enhanced devices for indirect vision and monitoring devices to detect other road users from vehicle width and length measurements. 14. Supports improving the requirements for driver vision/visibility in heavy vehicles, but does not support sole adoption of UN R46, or the adoption of UN R46 as proposed in the draft new ADR 14/03 for devices for indirect vision. 15. Supports the department's proposed clauses to allow the USA style "cross-over" mirror for bonneted trucks, as an alternative to the UN front-view (Class VI) mirror. 16. Considers UN R46 does not allow for alternative mirror types and standards that effectively perform the same function (provide an equivalent level of driver visibility) as the mirror types specified in R46, particularly for conventional (bonneted) cab vehicles sold in the Australian market. 17. Further, considers flat main rear-view mirrors (LH and RH sides) are an essential requirement for many of Australia's long heavy vehicle combinations, because European specified convex main rear-view mirrors cannot provide a safe depth of view for a driver. 18. Acknowledges that the minimum performance requirements specified in Appendix C of the current ADR 14/02 (devices for indirect vision) may no longer be suitable and should be reviewed. 19. Recommends main-rear view mirrors (LH and RH sides) with flat glass be allowed as an alternative to UN R46 main rear-view (UN Class II and Class III) mirrors with convex glass. 20. Believes the minimum area specified in Appendix C of ADR 14/02 for rear-view mirrors is too small and that a minimum width should be	(e.g. crossover or cross-view mirrors) used to achieve a comparable field of view for bonneted trucks. These would be an alternative for bonneted trucks, and should provide similar benefits for similar fitment costs. 17. Agree that flat glass mirrors provide better depth perception. However, flat glass mirrors provide a narrower field of view (than convex mirrors), and where fitted on the passenger's side can leave a very large blind spot in comparison to the minimum field of view required by UN R46. 18. Agreed. 19. Agree flat glass mirrors have some benefits, including for depth perception, especially on longer combinations. However, there are alternative solutions to achieve a better field of view without reducing depth of view, including fitting a flat glass main rear-view mirror (especially on the passenger's side) in combination with a camera-monitor system meeting the full UN R46 field of view requirements. 20. Agreed. 21. Agreed. 22. Agreed. 23. Agree, but only where the impact test requirements in UN R46 are also applied to mirrors with any part less than 2 m above the ground (i.e. as per UN R46). Further, where the lower edge of a mirror is less than 2 m above the ground at GVM, the mirror should not be allowed to project more than 250 mm beyond the overall width of the vehicle measured without mirrors (as per UN R46). 24. Agree in part. Under each regulatory option, rear-view mirrors on wider vehicles will need to meet the UN R46 impact test requirements (which apply to mirrors with any part less than 2 m above the ground). The Australian specific 150 mm collapsible width requirement (from Appendix C of ADR 14/02) would no longer be an option for such vehicles on safer wider trucks. 25. Agree some exemptions and/or alternative procedures may be needed to

	specified for main rear-view mirrors. 21. Recommends LH and RH side wide angle rear-view mirrors (UN Class IV or equivalent) and passenger side close-proximity view mirrors (UN Class V or equivalent) be mandated for all trucks above 7.5 tonnes GVM. 22. Recommends front-view mirrors (UN Class VI or equivalent) be mandated for all cab-over trucks above 7.5 tonnes GVM, and USA style front mounted “cross-over” mirrors be mandated for conventional (bonneted) trucks over 7.5 tonnes GVM 23. Recommends the 230 mm maximum projection width (for rear-view mirrors) be deleted (as there is no requirement for this in UN R46). 24. Recommends the UN R46 impact test be offered (in a new Appendix C or similar) as an alternative to the 150 mm collapsed width requirement (in Appendix C of ADR 14/02). 25. Supports the future adoption of a blind spot information systems regulation, but does not support the adoption of the current UN R151 (blind spot information systems for the detection of bicyclists) proposed in the draft ADR. 26. Considers the UN R151 test procedure and approval process is very complex and cannot, at this point in time be undertaken in Australia, nor North America. 27. Further, considers the UN R151 test procedure is very Euro-centric, was developed for cab-over style trucks only, and as written cannot be applied to conventional (bonneted) trucks. 28. Recommends that the proposed ADR for blind spot information systems be removed from the department’s proposal for safer wider freight vehicles and that the department form a separate working group, with industry, to review UN R151 with a view to developing a blind spot information systems regulation that is suitable for Australian implementation, including testing and certification procedures. 29. Recommends that the review process for a blind spot information	clarify and implement the technical requirements of UN R151 through an ADR in Australia. 26. Noted. It is usual practice for the exemptions and alternative procedures section of an ADR to be used to address concerns such as this. This approach will be able to be taken in this case to clarify requirements and procedures. 27. Do not agree that the technical requirements cannot be applied to bonneted trucks, especially given the option to use the exemptions and alternative procedures section of an ADR to clarify requirements and procedures. Unlike some UN classes of devices for indirect vision, the feasibility of meeting the requirements should not be affected by the position of the driver (or the steering wheel) relative to the front of the vehicle. 28. Disagree. Requiring wider freight vehicles to be fitted with a package of safety technologies (including blind spot information systems) is a key part of the agreement with jurisdictions/in-service regulators and other stakeholders to pursue this reform – it is important to preserve this agreement. The exemptions and alternative procedures section of the ADR will be able to be used to clarify testing and certification procedures for implementation in Australia. 29. Noted. The proposed ADR applicability dates are now 28 months post implementation for new models in Europe and 31 months post implementation for all new vehicles in Europe.

	regulation include a realistic assessment of the introduction timing in Australia, recognising the unique mix of truck manufacturers and truck brands supplying new heavy vehicles in the Australian market.	
Volgren Australia	1. In general, supports all ADRs being reviewed and updated to reflect updates in technology. 2. Supports fitment of additional systems that improve the safety of vehicles, including in-principle support for the proposed new ADRs for devices for indirect vision, lane departure warning systems, and blind spot information systems. 3. Assumes there will be no change to the width limit for heavy buses, given the proposed changes to the ADRs in the discussion paper do not reference category ME vehicles. 4. If increases in the width limit for heavy buses were to be implemented, does not see the inclusion of additional safety features to 2.55 m buses could be safer than those systems applied to 2.50 m buses. 5. Notes a direct comparison with Europe of width alone would be flawed as they limit overall bus length to 12.0 m rather than the ADR limit of 12.5 m (when referring to rigid omnibuses), which achieves an equivalent swept path, but is not desirable because it can reduce occupant capacity and would require large changes for Australian bus manufacturers.	1. Noted. 2. Noted. 3. Correct. The earlier discussion paper and this IA do not consider changes to the width limit for buses. 4. Agreed. 5. Noted.
Woolworths Group	1. Supports changes to maximum vehicle width from 2.50 m to 2.55 m or 2.60 m, on the basis that this can be expected to have a positive impact on affordability and availability of new prime movers and more generally encourage adoption of safer vehicles. 2. Notes increased width will enable increased wall thickness, in turn improving insulation and refrigeration performance on temperature-controlled trailers – this will benefit maintenance of the cold chain, and reduce fuel consumption to maintain temperatures, enabling a sustainability benefit.	1. Noted. 2. Agreed. 3. Agreed. 4. A move to at least a 2.55 m overall width limit would provide this benefit, except for refrigerated freight which may require 2.60 m, as 1200 mm wide (international) pallets are used in Europe, where the width limit is 2.60 m for freight vehicles with refrigerated bodywork and 2.55 m for all other vehicles.

	3. Notes increased width also means greater freedom of design to enhance safety and stability along with greater options for load restraint and ease of loading. 4. Notes a move to a 2.60 m overall width would also enable compatibility with international pallet dimensions, which would open up opportunities to harmonise supply chains internationally, delivering further productivity benefits. 5. Prefers a 2.60 m width limit for both trucks and trailers, but is also supportive of a 2.55 m width limit for both trucks and trailers.	5. Noted.

ANNEX

arrb YOUR NATIONAL TRANSPORT RESEARCH ORGANISATION

Safer Freight Vehicles:

Benefit-Cost Analysis of Vehicle Widening Options

ARRB Project No.: 00656

Authors: Simon Xue and Ulysses Ai

Prepared for: Department of Infrastructure, Transport, Regional Development, Communications and the Arts

October 2022

Final Report

Version Control

Report version no.	Date	Released to client by	Nature of revision
1	21 June 2022	Ulysses Ai	Draft Report for Review
2	27 June 2022	Ulysses Ai	Draft report with comments addressed
3	28 June 2022	Ulysses Ai	Draft reformatted
4	30 June 2022	Ulysses Ai	Provisional Final Report
5	11 July 2022	Ulysses Ai	Revised Report 1
6	25 July 2022	Ulysses Ai	Revised Report 2
7	8 August 2022	Ulysses Ai	Revised Report 3
8	12 August 2022	Ulysses Ai	Revised Report 4 - Content Restructure
9	19 August 2022	Ulysses Ai	Revised Report 5
10	5 September 2022	Ulysses Ai	Final Report
11	27 September 2022	Ulysses Ai	Final Report with Dept. Analysis
12	25 October 2022	Ulysses Ai	Final Report with further adjustments

Summary

This project undertook an analysis of the costs and benefits of four proposed options for amendments to Australian Design Rules (ADR) allowing for wider freight vehicles (> 2.50 m) accompanied by the mandating of safety feature technologies for these wider models.

Principles adopted in this assessment follow the guidance provided in the following documents:

- *O7 Cost Benefit Analysis of Transport Regulatory Initiatives* – a guideline for economic evaluations of regulatory changes in the transport sector issued by the Australian Transport Assessment and Planning (ATAP) in October 2020.
- OBPR Guidelines (2020) in relation to broader principles of undertaking BCAs for the purposes of supporting Regulatory Impact Statements (RIS).

The BCA is based on the incremental changes in costs and benefits caused by the proposed ADR changes, which are described in two regulatory packages:

- **Regulatory Package 2** (Safer Freight Vehicles Amendment No 2, 2021) includes both new definitions and amendments to existing definitions related to determining vehicle dimensions when particular safety features that protrude from the body of the vehicle are installed. The effect of this regulatory package relevant to this analysis is to exclude these devices from the measurement of the vehicle width.
- **Regulatory Package 3** (Safer Freight Vehicles Amendment No. 3 2021) includes amendments to relax the current 2.50 m width requirement to 2.55 or 2.60 m for both heavy vehicles (> 4.5 tonnes tare weight) and heavy trailers (> 4.5 tonnes tare weight).
- The effect of both proposed regulatory packages is to allow heavy vehicles and trailers to increase from 2.50 m to 2.55 or 2.6 m if they are fitted with a set of mandatory safety features.

The options for the amendments are:

- **Option 1** Width limit of 2.55 m for goods vehicles and trailers over 4.5 tonnes
- **Option 2** Width limit of 2.55 m for goods vehicles over 4.5 tonnes only
- **Option 3** Width limit of 2.60 m for goods vehicles and trailers over 4.5 tonnes
- **Option 4** Width limit of 2.60 m for goods vehicles over 4.5 tonnes only.

These four BCA analyses are to include seven mandated safety features:

- **Devices for indirect vision** – Mirrors and/or camera systems designed to increase a driver's field of view.

Acknowledgements

ARRB would like to acknowledge the Truck Industry Council (TIC), the Australian Trucking Association (ATA), Heavy Vehicle Industry Australia (HVIA), and 3M for their assistance in providing data for this analysis.

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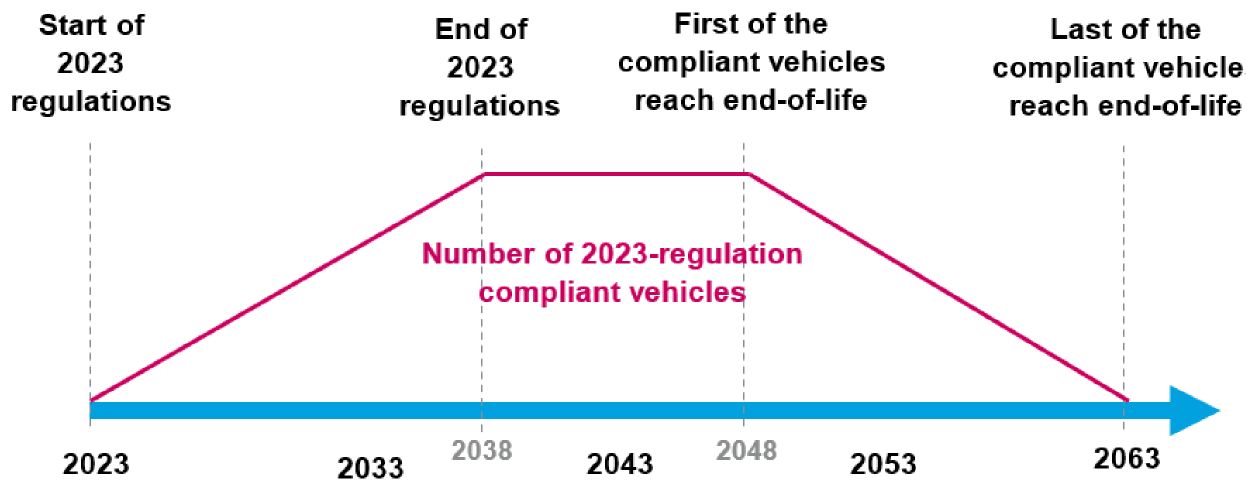
- **Commercial vehicle brake systems** – Automated systems to detect unsafe turning performance and apply braking.
- **Advanced emergency braking systems** – Automated systems to apply braking when risk of a forward collision is detected.
- **Lane departure warning systems** – Alert systems to inform a driver when the vehicle is drifting out of the marked lane.
- **Blind spot information systems** – Detection and alert systems for areas outside of the driver's field on view.
- **Side underrun protection** – Physical barriers to prevent motorcyclists/cyclists/pedestrians falling under the vehicle or trailer.
- **Conspicuity markings** – Reflective material designed to increase the visibility of the vehicle or trailer in low light conditions.

The analysis period in all cases was for 40 years beginning in 2023, with a 15-year regulatory period. Vehicle life was assumed to be 25 years.

Figure S.1 Analysis period showing the fleet of vehicles in the analysis



The key benefits of the analysis included:

- overseas manufacturers no longer needing to adapt 2.50 m models for the Australian market
- productivity benefits conferred by:
  - increased payload volume (where commodities are not already mass-limited)
  - ease of loading/unloading
  - thermal efficiency of refrigerated vehicles (leading to lower vehicle operating costs)
- reduced vehicle trips resulting in:
  - reduced crash risk
  - reduced greenhouse gas emissions
  - reduced pavement maintenance
- reduced crash risk due to mandated safety features.

Key costs included:

- regulatory costs
- modification costs for local manufacturing industry
- safety feature fitment and maintenance costs
- voluntary infrastructure updates to increase safety margins for wider vehicles at intersections.

The outcomes of the analysis showed a productivity benefit in all cases (Table S.1).

Table S.1: Vehicle widening options with mandated safety features

	Option 1 2.55 m Vehicle and trailer	Option 2 2.55 m Vehicle only	Option 3 2.60 m Vehicle and trailer	Option 4 2.60 m Vehicle only
BCR	3.0	3.0	4.2	4.4
NPV	$654 M	$588 M	$1,038 M	$931 M
PV of costs	$334 M	$289 M	$321 M	$275 M
PV of benefits	$988 M	$877 M	$1,360 M	$1,206 M

The results of the main analysis show a positive outcome for the proposed options.

The sensitivity analysis identified no threats to viability of the proposed changes to ADRs to allow wider vehicles with mandated safety features. However, the following factors demonstrated greater sensitivity:

- discount rate
- cost of safety features
- effectiveness of safety features
- trip reductions.

This analysis shows that any barriers or concerns surrounding the widening of goods vehicles on Australian roads do not come from questions about high-level productivity or safety. The increased productivity that comes from larger vehicles is well-demonstrated, and current and emerging safety technologies continue to make these vehicles safer to operate on Australian roads.

As the analysis conducted here was necessarily high-level, the following related issues bear further investigation:

- Assessments are required of the risks and benefits related to different designs of trailers, which are built to purpose and may present different issues.
- Many other road users already have a poor understanding of the size and manoeuvrability of heavy vehicles, and there may be an increase in the impact of poor decisions made by other road users interacting with wider vehicles.
- While it was beyond the scope of this project to undertake a detailed infrastructure analysis, developing an assessment of infrastructure requirements – primarily at intersections – for wider vehicles will assist road managers to ensure the productivity benefits of these vehicles can be achieved safely.
- The design of the road pavement infrastructure is based on the utilisation of the lane by a known axle width, if this distribution changes there will be impacts on the pavement engineering calculations required for road structures.
- There are likely to be community concerns about wider goods vehicles on the roads, despite the safety features. Ongoing research into clearances along the road corridor, especially in urban areas, would provide a basis for both informing decision makers about heavy vehicle access and investment, as well as allaying community concerns.

Contents

Tables

Figures

1. Introduction

1.1 Overview of the Analysis

This project undertook an analysis of the costs and benefits of proposed changes to the Australian Design Rules (ADRs) based on two regulatory packages involving allowing wider freight vehicles (> 2.50 m) and the mandating of safety feature technologies.

This involved benefit-cost analyses (BCA) of four proposed options:

- **Option 1** Width limit of 2.55 m for goods vehicles and trailers over 4.5 tonnes
- **Option 2** Width limit of 2.55 m for goods vehicles over 4.5 tonnes only
- **Option 3** Width limit of 2.60 m for goods vehicles and trailers over 4.5 tonnes
- **Option 4** Width limit of 2.60 m for goods vehicles over 4.5 tonnes only.

The four BCA analyses included seven mandated safety features:

- devices for indirect vision (DIV)
- commercial vehicle brake systems (CVB)
- advanced emergency braking systems (AEB)
- lane departure warning systems (LDW)
- blind spot information systems (BSI)
- side underrun protection (SUP)
- conspicuity markings (CP).

Descriptions of these safety technologies are provided in Section 1.4.

1.2 Comparison of Base Case and Option Cases

To assess the economic impacts of individual option cases, it was necessary to first define the base case or business-as-usual (BAU) case to represent the future scenario in which the proposed options cases are absent.

For this analysis, the BAU case was defined as a future in which the current vehicle width limits for goods vehicles and trailers remained unchanged at 2.50 m. In this future, heavy vehicles and trailers will continue to comply with all current ADR standards and the seven mandated safety features are adopted on a voluntary basis.

In the option cases, eligible vehicles (and trailers in Options 1 and 3) will increase vehicle width to comply with the higher width limit on a voluntary basis but comply with the mandated safety feature requirements once they do so.

1.3 Reference Material

Assessment principles adopted in this assessment follow the guidance provided in the following documents:

- *O7 Cost Benefit Analysis of Transport Regulatory Initiatives* – a guideline for economic evaluations of regulatory changes in the transport sector issued by the Australian Transport Assessment and Planning (ATAP) in October 2020.
- OBPR Guidelines (2020) in relation to broader principles of undertaking BCAs for the purposes of supporting regulatory impact statements (RIS).

The ATAP principles were applied to complement assessment assumptions and parameters that have been stipulated by the Department.

This analysis also built on previous analysis conducted for a 2021 issues paper on wider freight vehicle access conducted by ARRB for Transport for New South Wales (TfNSW).

1.4 Requirements of the Proposed Regulatory Changes

The BCA was based on the incremental changes in costs and benefits caused by the proposed ADR changes, which are described in two regulatory packages:

1. **Regulatory Package 2** (Safer Freight Vehicles Amendment No 2, 2021) includes both new definitions and amendments to existing definitions related to determining vehicle dimensions when particular safety features that protrude from the body of the vehicle are installed. The effect of this regulatory package relevant to this analysis is to exclude these devices from the measurement of the vehicle width.
2. **Regulatory Package 3** (Safer Freight Vehicles Amendment No. 3 2021) includes amendments to relax the current 2.50 m width requirement to 2.55 or 2.60 m for both heavy vehicles (> 4.5 tonnes tare weight) and heavy trailers (> 4.5 tonnes tare weight).

The effect of both proposed regulatory packages is to allow heavy vehicles and trailers to increase from 2.50 m to 2.55 or 2.6 m if they are fitted with a set of mandatory safety features.

For all goods vehicles (rigid trucks and prime movers) that exceed the current 2.50 m width limit, the following safety features will be required:

- **Devices for indirect vision** (DIV) – ADR 14/03 – this new ADR provides requirements for a number of mirror and/or camera systems designed to increase a driver's field of view on all sides of the vehicle. These include:
  - main rear-view devices on both sides of the vehicle
  - wide-angle view device on both sides of the vehicle
  - a view of close proximity of the passenger side (driver's side optional)
  - front-view device (of the area immediately in front of the vehicle) for vehicles over 7.5 tonnes.
- **Commercial vehicle brake systems** (CVB) – ADR 35/07 – this new ADR is based on requirements for existing electronic stability control systems designed to monitor the vehicle via a number of sensors as it makes a turn and slowing the vehicle when it detects slipping or potential rollover.
- **Advanced emergency braking systems** (AEB) – ADR 97/00 – this new ADR provides requirements for electronic systems designed to automatically provide braking when a forward-facing camera or radar system detects an obstacle, avoiding or mitigating the severity of a rear-end impact.
- **Lane departure warning systems** (LDW) – ADR 99/00 – this new ADR provides requirements for systems that monitor road markings and activates an escalating series of driver alerts such as lights, sounds and vibrations when an unintentional movement out of a lane is detected (i.e. drifting out of the lane without the indicator being activated).
- **Blind spot information systems** (BSI) – ADR 105/00 – this new ADR provides requirements for a camera/radar-based information system that alerts drivers when a vehicle, bicycle or pedestrian is detected in any of a vehicle's blind spots (i.e. areas not covered by indirect vision devices).
- **Side underrun protection** (SUP) – ADR 106/00 – this new ADR provides requirements for lateral protection devices, smooth, longitudinal barriers over gaps between wheels and other body fixtures designed to reduce the risk of pedestrians, cyclists or motorcyclists falling under the chassis and wheels of the vehicle.

- **Conspicuity markings** (CP) – ADR 13/00 (for Vehicles over 7.5 t) – this amended ADR provides requirements for reflective markings designed to make the presence and in some cases the outline of the heavy vehicle or trailer more visible in low-light conditions.

For all heavy trailers that exceed the current 2.50 m width limit under each regulation option, the following safety features from the definitions above would be required:

- side underrun protection (SUP) – ADR 106/00
- conspicuity markings and reversing lamps (CP) - ADR 13/00
- trailer brake systems via existing ADR 38/05.

2. Benefit-Cost Analysis Setup

2.1 Identification of the Base Case

The base case in this analysis is the status quo which can be defined as:

- The width limit for all heavy vehicles is 2.50 m.
- Regulatory Package 2 (which provides new and revised definitions for safety features) is assumed to apply to the base case. This means that in the base case there will be a voluntary uptake of vehicles with protruding safety features that were previously not allowed; AND a further uptake when wider vehicles are purchased.

Proposed regulation options will only affect new vehicles and trailers in Australia, and where relevant, trailers that are modified (i.e. widened and with required safety features installed). As all proposed changes to the width limit represent a loosening of restrictions by the ADR, it is expected that the shift in fleet share among new vehicles to the wider vehicle allowance may be voluntary and gradual.

The mandated safety features have separate costs and benefits that have been assessed in addition to those assessed based on the increases to the vehicle width limit. It is also assumed that there will be additional exclusions for devices for indirect vision and blind spot information systems from vehicle width and length measurements and that this will increase the rate of fitment of these systems to all new goods vehicles, including vehicles not exceeding 2.50 m in width (in both the base case and regulated options).

Two of the seven safety features, CVB and AEB, are being mandated by separate ADRs for heavy vehicles within the scope of the current assessment. Specifically, relevant ADRs are:

- ADR 97/00 – Mandatory AEB systems for all heavy goods vehicles included in this assessment.
- ADR 35/07 – Mandatory CVB Systems for all heavy goods vehicles included in this assessment.

These two ADRs have commenced at the time of preparing this assessment but their compliance by new vehicles will not be required until 1 February 2025. This assessment will therefore allow for the impact of these ADRs on the take-up of AEB and CVB systems in the base case to accurately assess the incremental impacts of the SFV ADR.

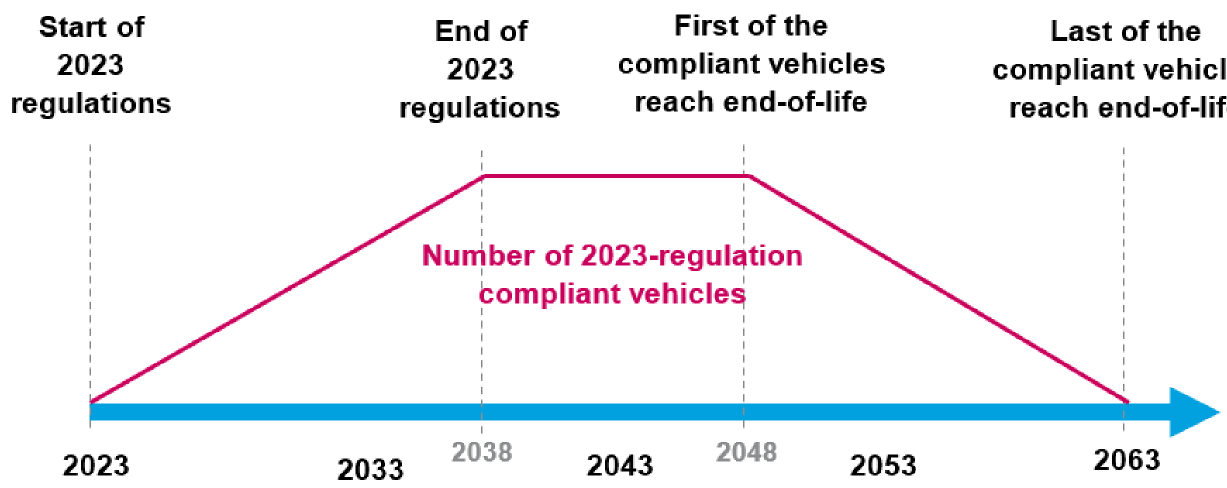
2.2 Establishing the Assessment Period

The assessment period for this analysis commences from 2023 which is based on the proposed policy commencement date of 1 July 2023.

The total assessment period is 40 years, including 15 years of the proposed regulation plus 25 years vehicle life for the last of the compliant vehicles and trailers (including modified in-service trailers) entering the market.

The fleet of compliant vehicles begins close to zero at the beginning of the analysis, and peaks at 15 years and remains constant as new vehicles after this time may be subject to new regulations. The numbers of vehicles in the analysis remain constant until the first new vehicles under the -proposed regulations reach end of life after 25 years, the numbers thereafter start to decline, reaching zero in year 40 of the analysis. The change in the number of regulation-compliant vehicles is illustrated in Figure 2.1.

Figure 2.1: Number of vehicles compliant with 2023 regulation over the assessment period



Costs related to the establishment and maintenance of the regulation apply during the 15-year regulatory period. After this time (in an unknown regulatory environment), ongoing costs are related to any investment and maintenance based on already existing vehicles and road infrastructure that exists because of the regulatory change in the first 15 years (e.g. maintenance costs associated with safety features, and ongoing investment and maintenance of the road network in response to the presence of wider vehicles).

Benefits are proportional to the number of new compliant vehicles considered in the analysis, i.e. increasing with adoption over the 15-year regulatory period, remaining constant for an additional ten years, and then declining as the compliant vehicles age out of the fleet.

2.3 Modelling of the Fleet

Vehicle (rigid truck and prime mover) and trailer kilometres travelled (VKT) was modelled for each year of the analysis. The model treats vehicles and trailers as units, attributing averaged costs and benefits to each, and does not consider individual configurations.

For both vehicles and trailers, the model uses a representative vehicle and a representative trailer based on averages in terms of operating costs, environmental costs, asset preservation, safety feature costs, productivity, crash exposure, and safety feature efficacy.

The representative operating costs for vehicles and trailers (called VOCs for convenience, even when applying to trailers) are calculated based on parameters provided in the ATAP PV2 Guidelines (2016). These are shown in Table 2.1.

Table 2.1: Representative vehicle and trailer operating costs

Average vehicle VOC	Average trailer VOC
74 cents per km	60 cents per km

The basis for these average VOCs is explained in Appendix A

These VOCs are the basis for wider 2.55 and 2.60 m vehicles and trailers, and refrigerated vehicles and trailers when calculating:

- VOC, discussed in Section 5.4
- environmental benefits, discussed in Section 5.5.

Changes in operating, environment and asset preservation costs were calculated for rigid trucks and trailers only (as it was assumed there would be no change in VKT for wider prime movers). Safety feature costs and benefits were modelled for rigid trucks, prime movers and trailers, based on the modelled fitment of mandatory safety features to vehicles in the fleet.

3. Costs

3.1 Government Costs

It was assumed there would be an estimated annual cost of $50,000 per annum for the Department to create, implement and maintain each of the proposed changes. This includes the initial development cost, as well as ongoing standards maintenance and interpretation advice. The value of this cost has been used in other BCA assessments by the Department such as for assessing the ADR for lane-departure warning systems for light vehicles (Department of Infrastructure, Transport, Regional Development and Communications 2021).

3.2 Modification Costs

Modification costs represent the costs to heavy vehicle and trailer manufacturers for the design, production line floor area allocation, and other overheads, in order to increase the width of vehicles and trailers from 2.50 m to the higher width limits of 2.55 m or 2.6 m in the option cases.

3.2.1 Modification Cost for Heavy Vehicles (Options 1, 2, 3, and 4)

For heavy vehicles, an aggregate-level modification cost of negative $23.75 million per annum was assumed if 100% of the eligible new heavy vehicles were to adopt the higher width limit. This value represents annual cost savings to heavy vehicle manufacturers and it is based on the mid-value of a range estimate (15–30 million 2018 AUD) for this cost provided by the Truck Industry Council (Department of Infrastructure, Transport, Regional Development and Communications 2021) and adjusted to 2022 AUD. Advice was received that there may be greater savings for allowing 2.6 m wide vehicles compared to 2.55 m vehicles – in the absence of any specific data, the average above was adjusted by ±10% to provide this distinction.

This cost saving is said to be due to the avoidance of redesigning heavy vehicles currently manufactured overseas based on US and European models which already have the wider width. However, it is anticipated that the new width limit will not be adopted by the entire fleet of heavy vehicles at once but rather will be adopted gradually over time. To reflect this anticipation, the annual value of this cost in each assessable year was adjusted to be proportional to the projected share of new heavy vehicles that increase their width in that year. Corresponding assumptions on the yearly adoption rates of new vehicle width is documented in Section 4.3.

3.2.2 Modification Cost for Heavy Trailers (Options 1 and 3)

For trailers, modification cost will comprise of a once-off retooling cost of the current production line for domestically produced trailers to be able to be produced at 2.55 or 2.6 m width. The full retooling cost was advised by the Heavy Vehicle Industry Australia (HVIA) to be $31 million. For consistency with the vehicle analysis, a distinction between unspecified costs for manufacturing 2.55 or 2.60 m wide trailers was created by varying the full retooling cost by ±10% (i.e. $27.9 million for 2.55 m, and 34.1 million for 2.60 m wide trailers).

The yearly value of modification costs for trailer manufacturers assumes the full retooling process (or setup of new local businesses entering the sector) will be completed by the Australian trailer industry over a 40-year period which equates to $697,500 per year for 2.55 m, and $852,500 per year for 2.6 m.

Imported 2.55 or 2.6 m trailers are assumed to be readily available to enter the Australian market once the current width limit is relaxed.

3.3 Safety Feature Fitment Costs

The safety feature fitment cost represents the average incremental wholesale cost of fitting a safety feature. In this analysis, incremental fitment cost of one or more of the seven safety features will be incurred if a heavy vehicle or trailer will increase its width and would have not otherwise taken up the mandated safety feature on a voluntary basis.

The incremental safety feature fitment cost in a particular assessment year will therefore depend on the incremental demand for individual safety features in a particular year and the unit fitment cost of each safety feature. Unit fitment costs for safety features are presented in Table 3.1. The information needed to determine the incremental demand of safety features including total new vehicles to be sold in an assessment year, the share of new vehicles that take up the new width in that year, and the share of new vehicles that will voluntarily take up individual safety features are presented in Section 4.2.

Table 3.1: Unit fitment cost of safety features

Safety feature	Unit cost per rigid truck	Unit cost per prime mover	Unit cost per trailer	Source [1]
DIV	$1,300	$1,300	–	Review of market prices
CVB	$1,444	$1,444	–	ATA (2016)
AEB	$1,804	$1,804	–	Prime Mover Magazine (2020)
LDW	$2,560	$2,560	–	US DOT (2012)
BSI	$500	$500	–	US DOT (2013)
SUP	$1,000	–	$2,000	Review of market prices
CP	$700	–	$1,000	Provided by 3M

All sourced costs converted and indexed to 2022 AUD.

Costs for CVB and AEB are largely provided here for reference. As these technologies are mandated from 2025 onwards in the base case, the costs do not appear within the analysis cases after 2025.

3.4 Safety Feature Maintenance and Repair Costs

Once safety features are fitted to a heavy vehicle or trailers, there is additional cost associated with maintenance such as replacement and repairs to ensure they will continue to operate as expected. The maintenance and operating cost of safety features was assumed to be recurring annually at a rate of 1% of their initial fitment cost.

3.5 Infrastructure Update Costs

In this analysis, no calculation has been made on the impacts for pavement engineering outcomes for two key reasons:

1. Initial research and analysis indicate that wider vehicles will not have a dramatic effect on infrastructure and will only impact existing infrastructure issues that already need to be addressed for 2.50 m-wide heavy vehicles
2. The extent of any required treatments is likely to be very small and are expected to lie within the range of existing treatments, meaning that calculations of any additional costs would require a more significant study and detailed analysis.

A brief discussion of three of the most prominent potential impacts related to widening over the longer term are in Appendix B.

However, it was deemed reasonable to include a small amount of infrastructure investment in response to wider vehicles. Over the 40-year analysis period road managers can reasonably be expected to take some actions in some circumstances. This has been included in the analysis as follows:

- The annual infrastructure update cost is $10 per wider heavy vehicle entering the network. The $10 per additional vehicle is based on typical annualised lifecycle sealing costs and annualised maintenance costs from Holtrop (2000) adjusted to 2022 AUD.
- A sensitivity analysis of ±20% is applied to this value.

This applies to both 2.55 and 2.60 m wide vehicles due to the insignificance of the 0.05 m margin compared to the efficiency requirements of infrastructure upgrades (i.e. both the decision to upgrade and the scale of the upgrade will not be affected by the slight vehicle width difference between these scenarios).

3.6 Summary of Costs

Table 3.2 provides a summary of the costs associated with implementing the option cases.

Table 3.2: Summary of costs associated with the analysis

Cost related to	Value	Applicability	Impact
Regulation implementation and maintenance	$50,000	Per year	Government
Widening vehicles (2.55 m)	−$213,750	For every 1% of total HVs per year	Business
Widening vehicles (2.60 m)	−$261,250	For every 1% of total HVs per year	Business
Widening trailers (2.55 m)	$697,500	Per year	Business
Widening trailers (2.60 m)	$852,500	Per year	Business
Safety feature fitment	Refer to Table 3.1	Per vehicle	Business
Safety feature maintenance and repair	1% of fitment cost	Per vehicle per year	Business
Updating road infrastructure to support wider HV fleet	$10	Per vehicle per year	Government

4. Demand Forecasts

4.1 Key Assumption

Demand forecasts are the projected number of vehicles and trailers that will adopt the wider widths in the option cases.

To account for the impact of proposed ADR changes on the uptake of new vehicle width and safety features, projected total vehicle numbers were established first which was used as the basis for differentiating fleet share by vehicle width and safety features for each option case.

A key assumption for projected vehicle numbers under all ADR options was that the total fleet size is same as the base case. All projections were made for new vehicles.

4.2 Projected Total Fleet Size

In this analysis, the total fleet of heavy vehicles is projected to grow at 2% per annum and the total fleet of trailers at 3.3% per annum. As the policy effective year is only assumed to be 15 years, new heavy vehicles and trailers that will have entered into the fleet after 2038 were not included for analysis. From 2048, new vehicles that entered the fleet at the start of the assessment (2023) will begin exiting the assessable fleet as they reach the end of their assumed 25-year life. The initial total heavy vehicle fleet size in 2023 was calculated based on historical heavy vehicle sales data provided directly by the Truck Industry Council. The initial trailer fleet size in 2023 was calculated based on historical trailer registration data sourced from Australian Bureau of Statistics (2021).

In addition to new vehicles and trailers that may choose to adopt new widths, some existing trailers (10%) may also choose to adopt a higher width in the option case. Figure 4.1 presents the projected fleet of heavy vehicles and trailers that may respond to the new width included in the options cases. The incremental costs and benefits associated with each option case are based only on the fleet size shown in this Figure.

Figure 4.1: Projected total fleet size over the analysis period

4.3 Projected Uptake of new Width Vehicles

A key driver of the impact of regulation changes proposed in this analysis is the number of heavy vehicles and trailers adopting a higher width under the new width limits. To simplify the analysis, it was assumed that width increases under each option case will be for the full allowable width, rather than a variety of intermediate widths.

Further, in the BAU, 1 and 2 option cases, there is between 0.5% and 1% of the fleet that will exceed the width limit due to the either non-compliance or exemptions. In the BAU case, 99% of the total fleet was assumed to have a 2.50 m width throughout the assessment period with the remaining 1% of the total fleet split in half at 2.55 m and 2.6 m.

In the option cases, the adoption rate of new width is assumed to depend on the country of origin of heavy vehicles and trailers. This is because the higher width limit represents a concessional regulatory change and the adoption of new widths in response by manufacturers will therefore be voluntary on a profit-maximising basis.

Fully imported models, or base chassis from Europe and the US will cease to be offered at 2.50 m as overseas manufacturers elect to forego the expense of the modifications or alternative production lines. This is expected to occur over a very short time frame, for which 2 years has been selected.

Japanese and South Korean manufacturers will continue to provide 2.50 m wide vehicles and chassis as the Australian market is only a fraction of their customer base and there will still be a demand in Australia for 2.50 m wide vehicles. Over the 40-year analysis period there will be a modest move by these manufacturers towards offering some wider models.

Australian manufacturers (body builders, etc.) will increasingly adapt to wider vehicles due to:

- European and US chassis quickly becoming available only at the wider limit while there will still be a demand for these popular vehicle makes (i.e. cannot switch over entirely to Japanese and South Korean chassis)

- The significant benefits of widening to refrigerated vehicles will ensure an immediate and sustained demand for wider vehicles, with more modest benefits to other vehicle types.

Trailer fleet growth rate by importation status was taken as:

- Imported: 4% (from a current market share of 7.5%)
- Domestic: 3% (from a current market share of 92.5%).

This is due to supply of wider trailers via import being more readily available from the outset of the analysis period than from local trailer manufacturers. The result is a shift in the market share towards imported trailers; however, it is assumed that this will not be dramatic because:

- Overseas manufacturers are already capable of bringing cheaper 2.50 m wide trailers to the Australian market, but this has not resulted in a dominant market share.
- As domestic manufacture adapts over time to have the capability to produce (or modify) wider trailers, the current local market demand for quality, customised trailers produced locally will reassert itself.

As an illustration of this approach, Figure 4.2 to Figure 4.4 present the projected distribution of width for heavy vehicles manufactured in USA/Europe, Japan/South Korea, and Australia respectively for Option 1. Similarly, Figure 4.5 and Figure 4.6 present the projected distribution of width of imported and domestically manufactured trailers due to Option 1. In all these charts, the assumed trends were applied for the 15-year regulatory period only and held to be constant thereafter for the remainder of the analysis period to capture the impact of the currently proposed ADR changes. The same approach is used for Options 2, 3, and 4.

Figure 4.2: Adoption rate of new width by heavy vehicles manufactured in USA and Europe in Option 1

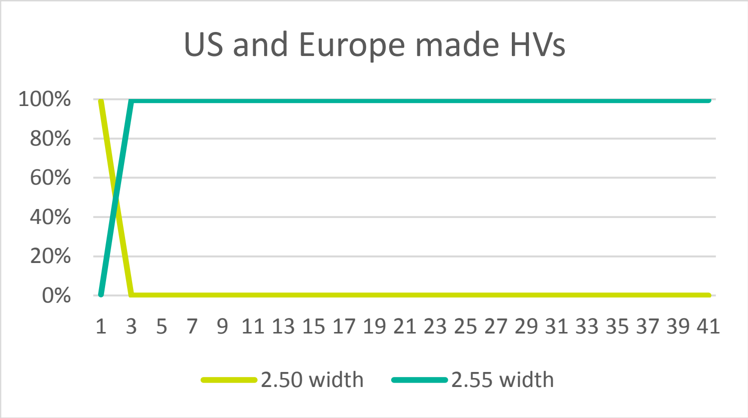
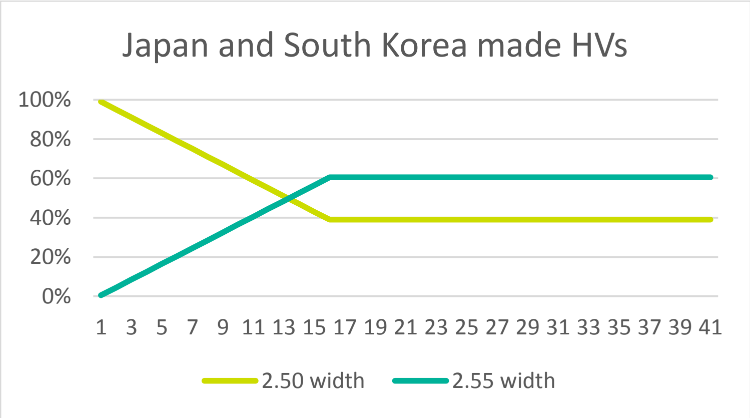


Figure 4.3: Adoption rate of new width by heavy vehicles manufactured in Japan and South Korea in Option 1



Appendix A Note: The analysis assumes 100% adaption of 2.55 m imported models from Japan and South Korea over 25 years. Therefore there is a 60% increase during the 15-year regulatory period, held constant thereafter due to the unknown regulatory environment (i.e. beyond the impact of the currently proposed ADRs).

Figure 4.4: Adoption rate of new width by heavy vehicles manufactured in Australia in Option 1

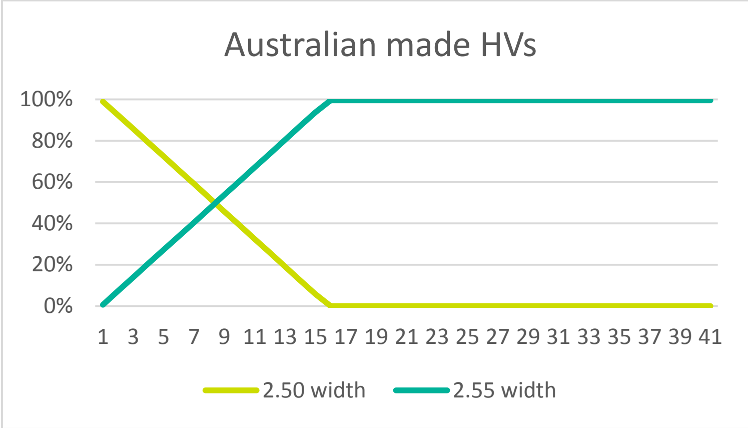


Figure 4.5: Adoption rate of new width by imported trailers in Option 1

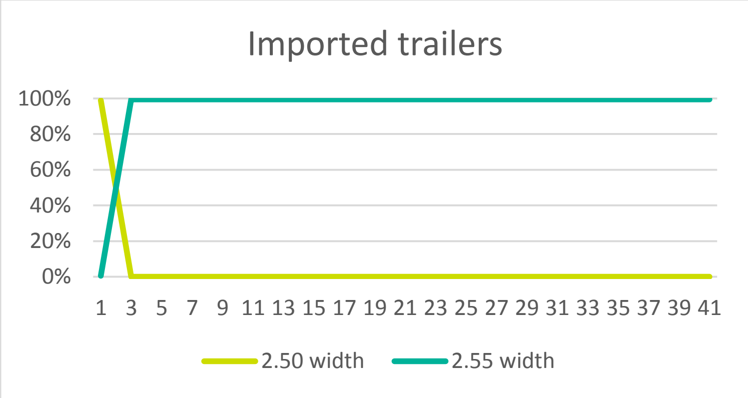
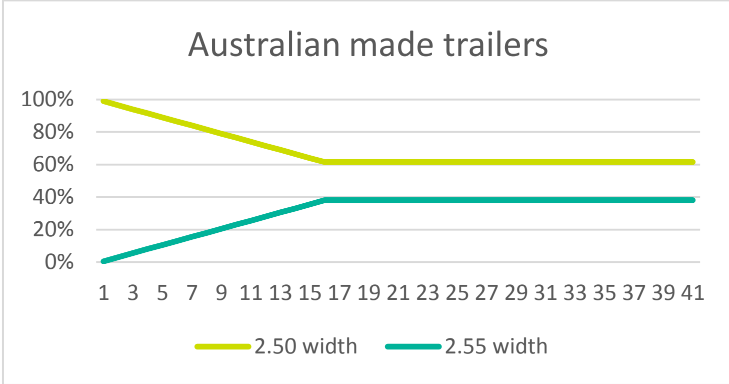


Figure 4.6: Adoption rate of new width by heavy trailer manufacturers in Australia in Option 1



Appendix B Note: The analysis assumes 100% adaption of 2.55 m locally,manufactured over 40 years. Therefore there is a 38% increase during the 15-year regulatory period, held constant thereafter due to the unknown regulatory environment (i.e. beyond the impact of the currently proposed ADRs).

Finally, the market shares by country of origin in Table 4.1 are used to the estimate fleet size. Together with projected new width uptake rates for each country of origin and project total fleet size, projected fleet size by width can then be aggregated across the countries of origin with the same width in each year.

Table 4.1: Market share of vehicles and trailers by country of origin

Type	Countries of origin	Market share
Heavy vehicles	USA and Europe	27.5%
	Japan and Korea	37.4%
	Australia	35.1%
Trailers	Imported	7.5%
	Australia	92.5%

Source: Department of Infrastructure, Transport, Regional Development and Communications (2021).

5. Benefits

5.1 Included Benefits

The type and scale of the benefits depend on the exact change in each ADR option and the level of compliance or take-up of the proposed ADR change.

With the introduction of a higher width limit, the following benefits are expected:

- Safety – crash reduction due to mandatory fitment of safety features for HVs and trailers that adopt the new width AND lower probability of crashes due to reduced need for travel as a result of more productive vehicle configurations.
- Asset preservation – reduction in pavement maintenance cost due to less road use as a result of more productive (wider) vehicles.
- Environment – reduction in environmental pollution due to more productive and more efficient vehicle configurations.
- Vehicle operating cost (VOC) – reduction in the cost to maintain and fuel freight movements due to more productive vehicle configurations.

5.2 Safety Benefits

Crash cost refers to the fatality and injury costs associated with traffic accidents that involve heavy vehicles and trailers. The expected crash cost of a single heavy vehicle or trailer in a year can be estimated by multiplying the average crash rate of a particular type of crash (number of crashes per distance travelled) by the total distance travelled by a vehicle or trailer in a year. The expected crash cost of one vehicle in a year can then be estimated by multiplying the average cost per crash by the expected number of crashes per vehicle per year. Finally, the total crash cost of the entire fleet in a year can be estimated by multiplying the crash cost of a single vehicle to the fleet size in a year.

Compared to the BAU case, the adoption of new widths by some vehicles in the assessable fleet can affect the safety outcome in two ways. First, wider vehicles could mean more productive freight movement or carrying more freight per trip, and this would translate to a lower distance of travel made by a widened vehicle per year assuming the total moveable freight task is fixed in both scenarios. Second, the proposed regulation requires the fitment of seven safety features on a widened vehicle. This will generate additional benefit if the mandated safety features have not been adopted voluntarily by the widened vehicles prior.

5.2.1 Trip Reduction (Crash Exposure and Productivity)

To assess the first channel of safety impact, average yearly travel for a vehicle before and after widening is required. The calculations to determine these are shown in Appendix C, and the results presented in Table 5.1.

Table 5.1: Average annual km travelled per vehicle type in the analysis

	Base case	Option 1	Option 2	Option 3	Option 4
Refrigerated HV (> 4.5 t)	64,357	64,357	64,357	64,357	64,357
Non-refrigerated HV (> 4.5 t)	64,357	63,823	63,095	63,309	61,882
Refrigerated trailers (> 4.5 t)	86,000	86,000		86,000	
Non-refrigerated trailers (> 4.5 t)	86,000	85,286		84,600	

Since trip reduction is an important factor in the analysis, this has been included in the sensitivity analysis.

5.2.2 Crash Rates for Wider Vehicles

An increase in crashes due to wider vehicles has not been demonstrated (e.g. in NZ 2.55 m wide heavy vehicles have operated since 2017 without any reported increase in accident rates). However, it was decided to provide a sensitivity analysis for crash rates in wider vehicles based on:

- a possible increase in crash rates due to vehicles being wider due to driver misjudgement and increased errors by other motorists
- a possible reduction in some crash types, particularly roll overs due to the greater stability in wider vehicles and potential lowering of the centre of gravity through some design changes.

Both of these possibilities lack data to quantify their impact, but an estimate was conducted to determine the potential magnitude of each effect and a result of ±0.05% to the crash rate for the 2.50 m fleet of 9.17 fatalities per billion VKT (BITRE 2020) was estimated. As these effects are opposed they cancel each other out.

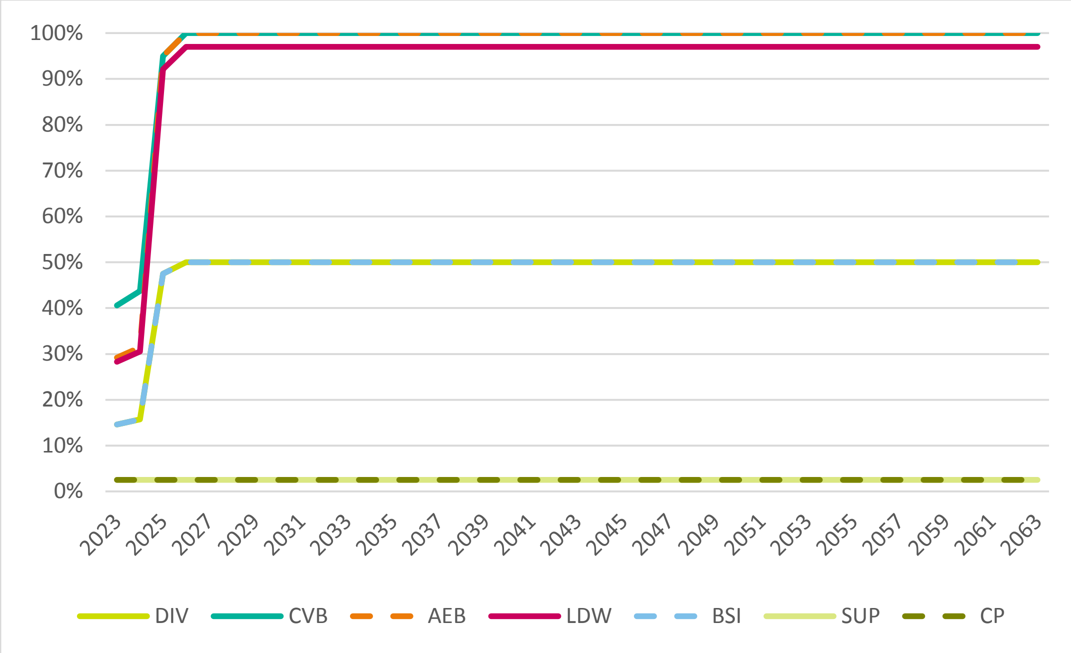
Appendix D describes how the ±0.5% impact was determined.

5.2.3 Crash Modification Factors

To account for the impact of safety features, it is necessary to first estimate the BAU adoption rate of each of the safety features in order to establish the incremental impact of mandating them as a condition for adopting the new width. The BAU safety feature adoption rates are derived from a variety of sources including the Truck Industry Council for the adoption rates of CVB, AEB, and LDW. The BAU adoption rate of CP is based on private correspondence with a large CP provider (3M). However there is a lack of data that can be used for establishing the BAU adoption rates of DIV. BSI and SUP. To move forward, it was assumed that DIV and BSI will be adopted at 50% of the rate of AEB and SUP will be adopted at the same rate as CP.

Figure 5.1 presents the BAU adoption rates of the seven safety features within the assessment period. The adoption rates for CVB and AEB in this Figure account for the fact that they will become mandatory in their separate ADRs from 2023 (new models) and 2025 (for new vehicles).

Figure 5.1: BAU adoption rate of safety features by heavy vehicles and trailers



Due to the mandatory nature of their fitment in the option cases for vehicles that adopt the new widths, the projected adoption rates of safety features under each option case are not shown here as they will mirror the adoption rates of new widths discussed in Section 4.3.

Once the incremental change in freight movement fitted with the safety features between the BAU and options cases are established, the incremental crash risk reduction due to safety features can then be calculated with the crash modification factor (CMF) of individual safety features. CMF are the expected impact a safety feature is expected to have on crash risk. It is expressed as a percentage of total unmitigated crash risk which is measured as 100%. A CMF of 95% means that the crash risk is reduced by 5% by a safety feature.

The CMFs for each safety feature are determined by sourcing the efficacy (crash reduction factor – CRF) of each technology in reducing specific types of crashes. These CRFs were multiplied by the proportions of the crashes that they were considered to affect, as shown in Table 5.2.

Table 5.2: Crash risks mitigated by safety features

Safety feature	Crash risk mitigated
Devices for indirect vision	Near side collision with pedestrian Side swipe with traffic travelling in the same direction Play/work collisions with pedestrians in road area
Commercial vehicle brake systems	Run off road (loss of control, or rollover)
Advanced emergency braking systems	Rear end collisions after failing to slow/stop
Lane departure warning	Run off road (fatigue, inattention) Head-on collision after drifting into opposing lane Side swipe with traffic travelling in the same direction
Blindspot information systems	Side swipe with traffic travelling in the same direction
Side underrun protection	Near side collision with pedestrian Right near turning into traffic/cyclist Play/work collisions with pedestrians in road area
Conspicuity markings (in low light/visibility conditions)	Right near turning into traffic/cyclist Cross traffic collision Right through when turning across opposing traffic stream.

A discussion of the calculations for associating the crash types and sub-groups with the safety features is included in Appendix E.

Table 5.3 presents the CMF of safety features for these crashes involving heavy vehicles based on the CRF weighted by the proportion of affected crash types. As crashes are considered to occur for whole combinations, trailers are treated as benefiting from safety features fitted to the leading vehicle.

Table 5.3: Crash modification factors of safety features

Safety feature	Heavy vehicles and trailers	
	Fatality	Serious injury
Devices for indirect vision (1)	99.4%	99.4%
Commercial vehicle brake systems (2)	93.6%	93.6%
Advanced emergency braking systems (2)	93.6%	93.6%
Lane departure warning (3)	95.6%	95.6%
Blindspot information systems (1)	99.4%	99.4%
Side underrun protection – pedestrians and cyclists (4)	98.6%	99.9%
Conspicuity markings (5,6)	97.8%	97.8%

Sources:

1. IIHS-HLDI (2020)
2. Department of Infrastructure, Transport, Regional Development and Communications (2018)
3. Department of Infrastructure, Transport, Regional Development and Communications (2022)
4. Badgley et al (2020)
5. Blackman and Haworth (2015) Desktop Review of Conspicuity Markings for heavy vehicles.
6. Morgan (2001). Finally, incremental safety benefits will need to be monetised with unit crash costs for fatal and serious injury crashes which are presented in Table 5.4.

Table 5.4: Unit crash cost at 2023-dollar values

Fatal crashes ($ per crash)	Serious injury crashes ($ per crash)
$8,978,147	$333,144

Note: Both fatal and serious injury crash cost rates are based on willingness-to-pay.

Source: Weighted average based on urban and rural unit crash cost rate sourced from Australian Transport Assessment and Planning Steering Committee (2016) and urban-rural freight task share sourced from BITRE (2019)..

In this assessment, the safety benefits of individual safety features were assessed first in each assessment year and then weighted and summed together to represent the aggregate safety benefits of the use of multiple safety features adopted by the entire fleet. The safety benefit in a particular year is assessed as the incremental reduction in the residual risk between the BAU case and an option case. The residual risk is the difference between unmitigated crash risk and the reduction in risk after the adoption of a safety feature. This approach is adopted because safety features are expected to be adopted both in the BAU case and the option case but at different rates.

5.3 Asset Preservation Benefits

Asset preservation benefits stem from the productivity benefits of wider vehicles as they will demand less road usage to deliver the same freight task. Incremental changes in asset preservation cost are calculated based on the incremental change in freight movement between the BAU and the option cases and the unit asset preservation cost per VKT. Incremental changes in freight movement are assessed using the same approach as for assessing safety benefits.

The unit asset preservation cost is estimated at approximately $0.004 per VKT per annum. This is based on maintenance costs of $3,850 per lane-km, based on 4.0+ MESA/lane/year (Holtrop 2000, indexed to 2022).

5.4 VOC Benefits

Vehicle operating cost (VOC) benefits are due to the productivity impact of wider vehicles and trailers through two effects:

1. greater payload volume for vehicles and combinations that are not already mass-limited resulting in less vehicles needed to deliver the freight task
2. increased thermal insulation of refrigerated vehicles resulting in less fuel consumed to run the refrigeration units of wider vehicles compared to existing 2.50 m wide refrigerated vehicles.

The VOCs of heavy vehicles and trailers are based on parameter values published by Australian Transport Assessment and Planning Steering Committee (2016) in the PV2 Road Parameter Guidelines, which provide VOCs for 20 standard vehicle types and configurations. These VOCs are based on the underlying consumption of fuel, oil and tyres, and maintenance and repair costs; expressed in $ per vehicle km.

The included vehicle types and configurations in PV2 are 2.50 m wide and non-refrigerated. The rationale for the calculations of these additional VOCs are in the second section of Appendix A.

Table 5.5 presents the VOC parameter values for calculating the operating cost of refrigerated and non-refrigerated freight tasks before and after widening.

Table 5.5: VOC parameter values

VOC parameter	HV ($ per VKT)	Trailer ($ per VKT)
2.50 m non-refrigerated freight tasks	$0.744	$0.599
2.55 m non-refrigerated freight tasks	$0.748	$0.602
2.60 m non-refrigerated freight tasks	$0.752	$0.605
2.50 m refrigerated freight tasks	$0.856	$0.711
2.55 m refrigerated freight tasks	$0.838	$0.692
2.60 m refrigerated freight tasks	$0.827	$0.680

5.5 Environmental Benefits

Environmental benefits are also a result of the productivity benefits of wider vehicles and trailers. Environmental cost of freight movements by heavy vehicles and trailers can be estimated by multiplying the incremental change in freight movement between BAU and option cases with the environmental parameter values published by Australian Transport Assessment and Planning Steering Committee (2020).

A further benefit of higher width limits is available for refrigerated heavy vehicles and trailers. The increase in vehicle width allows them to increase the thickness of their insulation layers in their containers and this change is likely to result in lower environmental impact due to lowered energy needed to maintain low refrigeration temperatures. This is brought into the calculation through the VOCs calculated in Section 5.4.

Table 5.6 presents the environmental parameter values for calculating the environmental cost of refrigerated and non-refrigerated freight tasks before and after widening.

Table 5.6: Environmental parameter values

Freight task by	HV ($ per VKT)	Trailer ($ per VKT)
2.50 m non-refrigerated freight tasks	$0.385	$0.310
2.55 m non-refrigerated freight tasks	$0.387	$0.311
2.60 m non-refrigerated freight tasks	$0.389	$0.313
2.50 m refrigerated freight tasks	$0.443	$0.356
2.55 m refrigerated freight tasks	$0.433	$0.347
2.60 m refrigerated freight tasks	$0.428	$0.341

5.6 Discounting and Other Modelling Assumptions

For each analysis, gross benefits, gross costs and net benefits are reported as discounted present values on their policy commencement date of 1 July 2023.

The BCA is based on a primary analysis and a set of sensitivity analyses to accommodate uncertainties surrounding input parameters, including benefits, costs and discount rates.

Parameter variations for the BCA primary and sensitivity analyses are summarised in Table 5.7.

Table 5.7: Parameter variations in primary and sensitivity analysis

Modelling parameter	Primary analysis	Sensitivity analysis
Discount rate	7%	3% and 10%
Infrastructure update cost	100%	80%, 120%
Cost of safety features	100%	80%, 120%
Projected total vehicle fleet annual growth rate	2%	1%, 3%
Projected total trailer fleet annual growth rate	3.3%	2.6%, 4%
Change in efficacy of safety features	100%	80%, 120%
Voluntary uptake of new widths in new vehicle fleet share	HV by country of origin EU/US: fleet share with new width reaching 100% in 2 years after policy commencement AUS: fleet share with new width reaching 100% in 15 years after policy commencement Japan/S. Korea: fleet share with new width reaching 100% in 25 years after policy commencement Trailer by importation status: Imported: fleet share with new width reaching 100% in 2 years after policy commencement Domestic: fleet share with new width reaching 100% in 40 years after policy commencement	HV by country of origin EU/US: ±1 year AUS: ±10 years Japan/S. Korea: ±10 years Trailer by importation status: Imported: ±1 year Domestic: ±20 years
Change in crash rates for wider vehicles	0%	±0.5%
% of freight task laden km that is refrigerated	2%	1%, 3%
Trip reduction due to widening	2.55 m: 0.83% 2.60 m: 1.62%	2.55 m: 0.66%, 1% 2.60 m: 1.3%, 1.94%

6. Analysis Outcomes

6.1 BCA Results

The outcomes of the Department-modified analysis are shown in Table 6.1, rounded to the nearest million.

Table 6.1: Vehicle widening options with mandated safety features

	Option 1 2.55 m Vehicle and trailer	Option 2 2.55 m Vehicle only	Option 3 2.60 m Vehicle and trailer	Option 4 2.60 m Vehicle only
BCR	3.0	3.0	4.2	4.4
NPV	$654 M	$588 M	$1,038 M	$931 M
PV of costs	$334 M	$289 M	$321 M	$275 M
PV of benefits	$988 M	$877 M	$1,360 M	$1,206 M

All analysis options show a favourable outcome with benefits outweighing costs. The ratio of benefits to costs seems to be tied to the amount of widening rather than whether trailers are included or not, but the Net Present Value is approximately 11% greater in Options 1 and 3 where trailers are included.

The key drivers of benefit are the safety impact of wider vehicles due to reduced trips (i.e. crash exposure) and their adoption of mandatory safety features (i.e. crash reduction).

6.2 Sensitivity Analysis

The following sensitivity analysis provides insight into some of the aspects of the analysis where there is a lack of data for the parameters included in the main analysis, as well as indicating how sensitive the results are to variations of key parameters.

For each of the sensitivity tests undertaken below, the parameter values are increased or decreased relative to the main analysis. No value judgement is made as to whether a higher or lower result is a better outcome.

Table 6.2 shows the sensitivity of the results to the discount rate, which varies from 10% to 3 %, around the main analysis value of 7%.

Table 6.2: Sensitivity in discount rate for vehicle widening options

Option	Increased to 10%		Main analysis 7%		Decreased to 3%	
	NPV	BCR	NPV	BCR	NPV	BCR
1	$372 M	2.5	$654 M	3.0	$1,497 M	3.9
2	$338 M	2.6	$588 M	3.0	$1,330 M	4.0
3	$611 M	3.5	$1,038 M	4.2	$2298 M	5.6
4	$553 M	3.7	$931 M	4.4	$2039 M	5.8

This test shows that all the widening options remain economically viable across this range of discount rates.

Table 6.3 shows the sensitivity of the results to the infrastructure update cost based on the minimal, voluntary response from road managers, which varies from $12 to $8 around the main analysis value of $10 (±20%).

Table 6.3: Sensitivity in infrastructure update cost for vehicle widening options

Option	Increased to $12		Main analysis $10		Decreased to $8	
	NPV	BCR	NPV	BCR	NPV	BCR
1	$650 M	2.9	$654 M	3.0	$657 M	3.0
2	$585 M	3.0	$588 M	3.0	$591 M	3.1
3	$1,035 M	4.2	$1,038 M	4.2	$1,042 M	4.3
4	$928 M	4.3	$931 M	4.4	$934 M	4.4

This test shows that all the widening options remain economically viable across this range of infrastructure update costs.

Table 6.4 shows the sensitivity of the results to the safety feature costs, which varies from 120% to 80%, around the main analysis value of 100% (±20%).

Table 6.4: Sensitivity in the cost of safety features for vehicle widening options

Option	Increased to 120%		Main analysis 100%		Decreased to 80%	
	NPV	BCR	NPV	BCR	NPV	BCR
1	$579 M	2.4	$654 M	3.0	$728 M	3.8
2	$521 M	2.5	$588 M	3.0	$655 M	4.0
3	$964 M	3.4	$1,038 M	4.2	$1,113 M	5.5
4	$864 M	3.5	$931 M	4.4	$998 M	5.8

This test shows that all the widening options remain economically viable across this range of safety feature costs.

Table 6.5 shows the sensitivity of the results to the vehicle and trailer growth rates, which vary from 3% and 4% respectively, to 1% and 2.6%, around the main analysis value of 2% and 3.3% (±20%).

Table 6.5: Sensitivity in projected total fleet annual growth rates for vehicle and trailer widening options

Option	Increased to 3%, 4%		Main analysis 2%, 3.3%		Decreased to 1%, 2.6%	
	NPV	BCR	NPV	BCR	NPV	BCR
1	$708 M	2.9	$654 M	3.0	$605 M	3.0
2	$638 M	3.0	$588 M	3.0	$544 M	3.1
3	$1,131 M	4.1	$1,038 M	4.2	$954 M	4.3
4	$1,016 M	4.3	$931 M	4.4	$854 M	4.5

This test shows that all the widening options remain economically viable across this range of growth rates.

Table 6.6 shows the sensitivity of the results to the efficacy of the safety features as expressed through the crash reduction factors, each value of which are varied by ±20%.

Table 6.6: Sensitivity in change in crash reduction factors (effectiveness of safety features)

Option	Increased to 120%		Main analysis 100%		Decreased to 80%	
	NPV	BCR	NPV	BCR	NPV	BCR
1	$762 M	3.3	$654 M	3.0	$545 M	2.6
2	$686 M	3.4	$588 M	3.0	$491 M	2.7
3	$1,144 M	4.6	$1,038 M	4.2	$933 M	3.9
4	$1,026 M	4.7	$931 M	4.4	$836 M	4.0

This test shows that all the widening options remain economically viable across this range of safety feature efficacy.

Table 6.7 shows the sensitivity of the results to an increased or decreased crash risk for wider vehicles, included as -0.5 % and +0.5% respectively (see Appendix D for explanation of these quantities).

Table 6.7: Sensitivity in Change in Crash Risk for wider vehicles

Option	Decreased by-0.5%		Main Analysis 0%		Increased by 0.5%	
	NPV	BCR	NPV	BCR	NPV	BCR
1	$721 M	3.2	$654 M	3.0	$586 M	2.8
2	$647 M	3.2	$588 M	3.0	$530 M	2.8
3	$1,106 M	4.4	$1,038 M	4.2	$971 M	4.0
4	$989 M	4.6	$931 M	4.4	$873 M	4.2

This test shows that all the widening options remain economically viable even when there is a variation in crash risk for wider vehiicles.

Table 6.8 shows the sensitivity of the results to the supply of wider vehicles to the Australian market from Europe and the USA. These manufacturers are expected to quickly stop producing 2.50 m width models and only supply 2.55 and 2.60 m wide models (or chassis) over 1 to 3 years, around the main analysis value of 2 years.

Table 6.8: Sensitivity in voluntary uptake (years to reach 100%) – vehicles from Europe/USA for vehicle widening options

Option	Increased to 3 years		Main analysis 2 years		Decreased to 1 year	
	NPV	BCR	NPV	BCR	NPV	BCR
1	$639 M	3.0	$654 M	3.0	$665 M	2.9
2	$573 M	3.0	$588 M	3.0	$599 M	3.0
3	$1,015 M	4.2	$1,038 M	4.2	$1,058 M	4.2
4	$908 M	4.4	$931 M	4.4	$950 M	4.3

This test shows that all the options remain economically viable without much variation due to the short time frame.

Table 6.9 shows the sensitivity of the results to the supply of wider vehicles to the Australian market from Japan and South Korea. These manufacturers provide 2.50 m wide vehicles and chassis to their own and other international markets and are therefore expected to gradually provide wider models (or chassis). The sensitivity numbers are 15 and 35 years, around the main analysis value of 25 years.

Table 6.9: Sensitivity in voluntary uptake (years to reach 100%) – vehicles from Japan/South Korea for vehicle widening options

Option	Increased to 35 years		Main analysis 25 years		Decreased to 15 years	
	NPV	BCR	NPV	BCR	NPV	BCR
1	$622 M	3.0	$654 M	3.0	$729 M	3.0
2	$556 M	3.0	$588 M	3.0	$663 M	3.0
3	$987 M	4.2	$1,038 M	4.2	$1,158 M	4.2
4	$879 M	4.4	$931 M	4.4	$1,051 M	4.4

This test shows that all the options remain economically viable without much variation over the 20-year variation.

Table 6.10 shows the sensitivity of the results to the supply of wider vehicles from local body manufacturers. The sensitivity numbers are 5 and 25 years, around the main analysis value of 15 years.

Table 6.10: Sensitivity in voluntary uptake (years to reach 100%) – Australian vehicle body builders for vehicle widening options

Option	Increased to 25 years		Main analysis 15 years		Decreased to 5 years	
	NPV	BCR	NPV	BCR	NPV	BCR
1	$584 M	3.0	$654 M	3.0	$797 M	3.0
2	$518 M	3.0	$588 M	3.0	$732 M	3.1
3	$926 M	4.2	$1,038 M	4.2	$1,261 M	4.3
4	$818 M	4.4	$931 M	4.4	$1,154 M	4.5

This test shows that all the options remain economically viable without much variation over the 20-year variation.

Table 6.11 shows the sensitivity of the results to the supply of wider trailers from overseas manufacturers. The sensitivity numbers are 1 and 3 years, around the main analysis value of 2 years, reflecting the ability of these manufacturers to readily bring wider trailers to the Australian market.

Table 6.11: Sensitivity in voluntary uptake (years to reach 100%) – imported trailers for vehicle widening options

Option	Increased to 3 years		Main analysis 2 years		Decreased to 1 year	
	NPV	BCR	NPV	BCR	NPV	BCR
1	$653 M	3.0	$654 M	3.0	$655 M	3.0
3	$1,037 M	4.2	$1,038 M	4.2	$1,040 M	4.2

This test shows that all the options remain economically viable without much variation over the 3-year variation, due to the short time frame and the initial very low market share.

Table 6.12 shows the sensitivity of the results to the supply of wider trailers from local manufacturers. The sensitivity numbers are 20 and 60 years, around the main analysis value of 40 years. This is a very large range to reflect the uncertainty in how quickly the local industry can respond.

Table 6.12: Sensitivity in voluntary uptake (years to reach 100%) – locally manufactured trailers for vehicle widening options

Option	Increased to 60 years		Main analysis 40 years		Decreased to 20 years	
	NPV	BCR	NPV	BCR	NPV	BCR
1	$639 M	3.0	$654 M	3.0	$698 M	2.9
3	$1,014 M	4.3	$1,038 M	4.2	$1,111 M	4.1

This test shows that all the options remain economically viable without much variation over the 40-year variation, due to the dominant market share, which despite decreasing is modelled as remaining in the majority.

Table 6.13 shows the sensitivity of the results to variation in the freight task share of refrigerated vehicles. While refrigerated vehicles are considered to be a driver of immediate uptake of wider vehicles, they form a small part of the freight task in terms of laden km travelled (2% in the main analysis), varied from 1% to 3%.

Table 6.13: Sensitivity in change of refrigerated freight task

Option	Increased to 3%		Main analysis 2%		Decreased to 1%	
	NPV	BCR	NPV	BCR	NPV	BCR
1	$674 M	3.0	$654 M	3.0	$634 M	2.9
2	$605 M	3.1	$588 M	3.0	$571 M	3.0
3	$1,069 M	4.3	$1,038 M	4.2	$1,008 M	4.1
4	$957 M	4.5	$931 M	4.4	$905 M	4.3

This test shows that all the options remain economically viable without much variation despite the change in the fleet share of refrigerated vehicles.

Table 6.14 shows the sensitivity of the results to variation in trip reduction due to widening. The size of this effect in the main analysis is approximately 1% or 2% for 2.55 m and 2.60 m vehicles and trailers respectively. These have been varied by ±20% in the analysis below.

Table 6.14: Sensitivity in trip reduction due to widening

Option	Increased to 1%, 1.9%		Main analysis 0.8%, 1.6%		Decreased to 0.7%, 1.3%	
	NPV	BCR	NPV	BCR	NPV	BCR
1	$823 M	3.5	$654 M	3.0	$485 M	2.5
2	$737 M	3.6	$588 M	3.0	$439 M	2.5
3	$1,369 M	5.3	$1,038 M	4.2	$708 M	3.2
4	$1,223 M	5.5	$931 M	4.4	$639 M	3.3

This test shows that all the options remain economically viable over this range of variation but does demonstrate a significant amount of sensitivity.

6.3 Findings

The results of the main analysis show a positive outcome for each of the proposed options.

The sensitivity analysis identified no threats to viability of the proposed changes to ADRs to allow wider vehicles with mandated safety features. However, the following factors demonstrated greater sensitivity:

- discount rate
- cost of safety features
- effectiveness of safety features
- trip reduction.

This analysis shows that any barriers or concerns to the widening of good vehicles on Australian roads do not come from questions about high-level productivity or safety. The increased productivity that comes from larger vehicles is well-demonstrated, and current and emerging safety technologies continue to make these vehicles safer to operate on Australian roads.

As the analysis conducted here was necessarily high-level, the following related issues bear further investigation:

- Assessments are desirable of the risks and benefits related to different designs of trailers, which are built for purpose and may present different issues.
- Many other road users already have a poor understanding of the size and manoeuvrability of heavy vehicles, and there may be an increase in the impact of misjudgements made by other road users interacting with wider vehicles.

- While it was beyond the scope of this project to undertake a detailed infrastructure analysis, developing an assessment of infrastructure requirements – primarily at intersections – for wider vehicles will assist road managers to ensure the productivity benefits of these vehicles can be achieved safely.
- The design of the road pavement infrastructure is based on the utilisation of the lane by a known axle width. If this distribution changes there will be impacts on the pavement engineering calculations required for road structures.
- There are likely to be community concerns about wider goods vehicles on the roads, despite the safety features. Ongoing research into clearances of the road corridor, especially in urban areas, would provide a basis for both informing decision makers about current and future heavy vehicle access and investment, as well as allaying community concerns.

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Appendix A. Average Vehicle Operating Costs

VOCs for Non-refrigerated 2.50 m Wide Vehicles and Trailers

The vehicle operating costs used in this analysis are sourced from ATAP PV2 Road Parameter Values. The average VOC used for vehicles is the average of medium and heavy rigid trucks taken from this source as shown in Table A.1.

Table A.1: Representative (rigid) vehicle operating costs

	Included vehicles	Parameter values (cents per km)
VOCs	07. Medium rigid	65.80
	08. Heavy rigid	83.09
Average:		74.45

To determine the average operating cost of trailers in the analysis, a standard three-axle semitrailer was used. Data from two sources suggested that semi-trailers comprise about two-thirds of all in-service trailers, and therefore an even greater percentage of goods trailers. These are shown in Table A.2.

Table A.2: Trailer type share in the trailer fleet

Trailer type	In-service fleet	Percentage	In-service fleet	Percentage
Semi-trailers	148,000	65%	> 150,000	64%
Lead trailers	21,000	9%	> 22,000	9%
Dog trailers	18,000	8%	18,691	8%
Pig trailers	12,000	5%	< 43,568	19%
Dolly trailers	22,000	10%		
Other (e.g. specialty)	6,000	3%		
TOTAL	227,000		234,259	
Sources:	Hart (2014)		Power Torque (2022)	

The VOC parameters for the vehicle combinations in ATAP PV2 were analysed to isolate an average cost of a semi-trailer as shown in Table A.3.

Table A.3: Representative trailer operating costs

	Included vehicle parameters	Parameter values (cents per km)
Included combinations	12. Articulated 6 axle (semi-trailer)	135.41
	14. B-double	161.48
	16. A-double	195.11
	17. B-triple	224.15
	19: A-triple	252.42
Isolation of trailer operating costs	A-double minus articulated 6-axle	60
	B-triple minus B-double	63
	A-triple minus A-double	57
Average:		60

VOCs for Refrigerated Vehicles and Trailers and Wider Options

Estimates of the VOCs needed in this analysis were calculated as follows.

Vehicle VOCs

- 2.50 m non-refrigerated heavy goods vehicles VOC are the average of vehicle type/configuration VOCs 07 and 08 (medium and heavy rigids) as shown in Table 2.1.
- 2.55 m and 2.6 m wide non-refrigerated vehicles are assumed to have increased VOCs of +0.5% and 1% of the 2.50 m average non-refrigerated heavy vehicle VOC.
- 2.50 m refrigerated vehicles are estimated to be 115% of the non-refrigerated counterpart to reflect the higher fuel, oil, and maintenance usage, based on a review of fuel consumption in refrigerated vehicles and containers.
- 2.55 m and 2.60 m refrigerated vehicles are calculated to have a respective VOC of 113% and 111% of the non-refrigerated 2.50 m counterpart (which includes the 0.5% and 1% increase for the wider options) based on thermal efficiency data from ATA (2021).

Trailer VOCs

- 2.50 m non-refrigerated heavy trailer VOC was calculated by analysing the VOCs of combination parts to isolate heavy trailers.
- The VOCs of 2.55 m and 2.60 m non-refrigerated heavy trailers are assumed to have increased VOCs of +0.5% and 1% of the 2.50 m average non-refrigerated heavy trailer VOC.
- The VOCs for refrigerated and non-refrigerated heavy vehicles were compared to isolate the operating costs of the refrigeration for 2.50 m, 2.55 m, and 2,60 m trailers.
- The VOCs of refrigerated trailers for 2.5m 2.55 m and 2.6 m widths were calculated by adding the non-refrigerated VOC to the refrigeration unit operating cost for each width.

Table A.4 presents the VOC parameter values for calculating the operating cost of refrigerated and non-refrigerated freight tasks before and after widening.

Table A.4: VOC parameter values

VOC Parameter	HV ($ per VKT)	Trailer ($ per VKT)
2.50 m non-refrigerated freight tasks	$0.744	$0.599
2.55 m non-refrigerated freight tasks	$0.748	$0.602
2.60 m non-refrigerated freight tasks	$0.752	$0.605
2.50 m refrigerated freight tasks	$0.856	$0.711
2.55 m refrigerated freight tasks	$0.838	$0.692
2.60 m refrigerated freight tasks	$0.827	$0.680

Appendix B. Discussion of Infrastructure Impact

The following discussion presents three potential issues related to infrastructure impacts that may be experienced over the longer term.

Consideration of Geometry

Assessments undertaken for TfNSW (ARRB 2021) indicated that with the inclusion of a 20% factor of safety, minimum lane widths for 2.50 m vehicles would need to be increased by:

- 60 mm for a 2.55 m wide vehicle
- 120 mm for a 2.6 m wide vehicle.

This includes both high speed tracking and swept paths.

However, road managers are extremely unlikely to widen lanes by such small amounts due to escalating costs per m^2 for widths narrower than 2 m of lane length. Furthermore, this widening would only be required on roads that are already well below the recommended 3.5 m lane widths in Australia. While narrower lanes than this exist, these are less likely to be freight routes.

It is anticipated that any issues arising from wider vehicles on specific routes would be managed on a voluntary basis by road managers considering localised industry and community concerns through means such as:

- restricting access
- repainting line markings (where room is available on shoulders or painted out traffic islands).

It is therefore assumed in the analysis that there will be no mandatory lane widening in response to wider vehicles. Estimating the nature and scale of voluntary responses and their impacts is beyond the scope of the current analysis.

Infrastructure upgrades are anticipated to occur on some intersections where clearance issues are real or perceived with wider vehicles. Although swept-path simulations have concluded that the swept path wide for a wider vehicle is increased only by the amount of greater vehicle width, it is unreasonable to assume that no upgrades to account for wider vehicles would take place over 40 years.

It is anticipated that road managers will experience some industry or community pressure to undertake voluntary updates at intersections to improve real or perceived margins of safety but will resist this until the number of wider vehicles on the network provides sufficient productivity justification for the expenditure from their existing budgets. Therefore, to acknowledge a voluntary response by road managers in aggregate to the presence of wider vehicles in the fleet, it is assumed that:

- Infrastructure upgrades follow the adoption rate of wider vehicles with a two-year delay.
- Construction of expanded pavement and the change to relevant roadside infrastructure is estimated at a rate of \$100 per m^2 (estimated by ARRB pavement practitioners from a \$65 to \$135 per m^2 range).
- The minimum amount of investment is for 100 m^2. The 100 m^2 represents widening each intersecting road by 2 m for a length of 25 m to provide greater clearances for right turns through an intersection.
- This investment is triggered by every 1,000 wider vehicles entering the fleet nationwide. This value represents an increment to the number of wider vehicles on the network sufficient to prompt the upgrade of a single intersection across Australia.
- The average infrastructure update cost is therefore approximately \$10 per wider heavy vehicle. The \$10 per additional vehicle is based on typical annualised lifecycle sealing costs and annualised maintenance costs from Holtrop (2000) adjusted to 2022 AUD.

- A sensitivity analysis of ±20% has been applied to this value.

This applies to both 2.55 and 2.60 m wide vehicles due to the insignificance of the 0.05 m margin compared to the efficiency requirements of infrastructure upgrades (i.e. both the decision to upgrade, and the scale of the upgrade, will not be affected by the slight vehicle width difference between these scenarios).

Consideration of Channelisation

The performance of road pavements subjected to trafficking is dependent on the number and magnitude of loads applied by heavy vehicles. Light vehicles, such as passenger vehicles, are not considered to result in any significant wear of pavement structures in both Australian pavement design procedures and asset deterioration predictive models.

Any increase in the width of a heavy vehicle will have no significant effect on pavement performance unless the gross mass of the vehicle and payload is dramatically increased because of the extra width. However, widening many vehicles will affect the lateral locations at which those loads are applied across the width of pavements. It is well-established that the lateral position of vehicles travelling within a lane will vary from vehicle to vehicle (Buiter et al. 1989; Miller & Stewart 1982). Selected studies have demonstrated that the distribution of lateral positions trafficked by large traffic volumes is dependent upon road width and the lane width (Buiter et al. 1989; Miller & Stewart 1982,).

It is expected that any increase in the width of heavy goods vehicles would have some decreasing effect on the width of the distribution of lateral positions within a lane, as wider vehicles would have less scope to wander within a lane than narrower vehicles, and therefore a narrower distribution would occur. Large-scale narrowing of the loading distribution (e.g. narrowing of the distribution edge-to-edge of the order of 500 mm) is known to increase pavement deterioration (Jameson et al. 1992); however the distribution widths that could result from the vehicle widths being considered here are an order of magnitude lower.

Australian road pavement design procedures implicitly assume ‘normal transverse load distribution’ (Austroads 2017) and note that standard deviations of traffic wander of 200 to 230 mm have been reported in various studies. The procedures do not relate different levels of pavement wear to different lane widths (Austroads 2017). A 50–100 mm vehicle width increase is considerably lower than the range of lane widths over which the pavement design procedures assume no change in wearing to occur. These procedures are based on empirical observations of vehicles up to 2.50 m wide. As the proportion of vehicles wider than this increases there may come a point in the future where these long-standing empirical relationships may no longer be adequate.

Road pavements deteriorate under long-term trafficking, with the gradual accumulation of damage resulting from the cumulative passage of many millions of heavy vehicle axles (Austroads 2017). Any impact on pavement damage caused by the introduction of wider heavy goods vehicle will not be immediate, and may only develop, if at all, over the passage of time, since:

1. adoption of wider vehicles is expected to be a gradual process
2. accumulation of any additional pavement wear would take place over a significantly extended period.

Whilst limited studies have examined the effect of vehicle width on the lateral distribution of tyre loads, a variety of studies (as referenced above)have examined the effect of lane width on load distributions. By considering the narrowing of a lane to be analogous to the widening of a vehicle, these studies may provide some initial insight into the potential magnitude of the change in traffic wander.

Roadside Infrastructure

The analysis for TfNSW (ARRB 2021) found that the likelihood of wider vehicles colliding with roadside infrastructure was low but would present a cost. In this analysis this is assumed to be managed by:

- road managers restricting access to wider vehicles where there are obvious risks (e.g. power poles at immediate roadside, etc.)
- replacement costs of damaged roadside infrastructure being bundled under the more general ‘infrastructure update’ costs for the upgrade of intersections where turning issues have been encountered (such as collisions with roadside infrastructure).

A more detailed estimate would require an inventory assessment of roadside furniture on top of the geometry analysis of intersections discussed above.

Appendix C. Calculation of Average VKT

To assess safety impact due to reduced crash exposure, average yearly travel for a vehicle before and after widening is required. This was based on the average annual km for different vehicle types from Australian Transport Assessment and Planning Steering Committee (2016) PV2, adjusted using the distribution of rigids by weight from the ABS Motor Vehicle Census (2021). This is shown in Table C.1.

Table C.1: Annual km for vehicles and trailers

Vehicle type	GMC (t)	Annual km	Proportion of rigids by weight (2012-2021)	Adjusted annual km
07. Medium rigid	10.4	40,000	47%	64,357
08. Heavy rigid	22.5	86,000	53%	
10. – 20. Articulated combinations	31.5 to 119	86,000	-	86,000
Sources:	ATAP PV2, 5.2, Table 24		ABS Motor Vehicle Census 2021	

The reduction in VKT for vehicles and trailers based on their width was calculated through an analysis of freight task by load and vehicle type using data from the Australian Bureau of Statistics report on Road Freight Movements (2014).

The volume of freight by type was first considered, as shown in Table C.2, where the tonnes and percentages of each freight type are shown. Solid and liquid bulk freight is mass-limited and gains no benefit from wider vehicles or trailers. Containerised freight uses containers that comply with international standards and practices and likewise gain no benefit from wider vehicles and trailers. This leaves 42% of 'Other' freight which may benefit from greater volume.

Table C.2: Type of freight transported across Australia

Type of freight	Tonnes carried (tonnes) ('000)	Percentage of total tonnes carried
Solid bulk	869,188	41%
Liquid bulk	207,528	10%
Containerised	152,449	7%
Other	902,539	42%
Total	2,131,704	100%

The heavy vehicle fleet was also considered by type in terms of freight task, and the mass of 'other' freight allocated by vehicle type as shown in Table C.3, with this mass converted to volume based on the average density of 53 commodities with a 1.25 multiplier (or an average of 80% of available volume used) to account for packing space, the full height of the load space not being used, palleted freight, and empty runs (ARRB 2021).

Table C.3: Estimated mass and volume transported by vehicle type

Vehicle type	Percentage of total freight task	Mass of 'Other' freight ('000)	Volume of 'Other' freight (m^3) ('000)	Adjusted volume of 'Other' freight (m^3)
Rigid truck	32%	294,456	354,208	354,208,397
Truck and dog	17%	155,232	186,732	186,732,245
Semi-single trailer	26%	234,923	282,598	282,598,051
B-double	13%	114,918	138,238	138,237,790
B-triple	0.2%	1,836	2,209	2,208,947
Road train with two trailers	8%	72,198	86,849	86,848,947
Road train with three trailers	3%	28,972	34,852	34,851,557
Total	100%	902,539	1,085,686	1,085,685,933

By calculating the interior volume of each vehicle type (including trailers) for 2.5, 2.55 and 2.6 m widths, an equivalent number of trips was able to be calculated for the transport of 'other' freight. This allowed the percentage reduction in trip numbers to be determined for these combinations (assuming 80% volume usage).

The VKT values in Table C.4 were determined by using the calculated 64,357 total VKT for goods vehicles taken from ATAP PV2 and multiplying it by the 42% for freight types that allow a greater load in wider vehicles. The percentage reductions were then applied to determine the reduction in VKT due to wider vehicles (based on an averaged VKT per trip).

Table C.4: Simplified estimated trip reduction if vehicles achieve 80% volume usage

Vehicle width	Total trips required for 'Other' freight task	Trip reduction for 'other freight' compared to 2.50 m wide vehicle	Percentage reduction in trips (all freight) compared to 2.50 m wide vehicle	Equivalent km
2.50 m	7,869,442	N/A	N/A	64,357
2.55 m	7,715,139	−154,303	0.83%	63,823
2.60 m	7,566,771	−302,671	1.63%	63,309

As refrigerated vehicles are expected to use all additional width for increasing insulation, there is no volume benefit for wider refrigerated vehicles (average annual km per refrigerated vehicle = 64,357).

The VKT for trailers was calculated in the same way (see Table C.5). The numbers for the trailers captured a greater productivity benefit than for vehicles through having greater volume, greater annual kms, greater trip reduction – even through the percentage reductions between trailer widening options are the same as for vehicles.

Table C.5: Simplified estimated trip reduction if trailers achieve 80% volume usage

Trailer width	Total trips required for 'Other' freight task	Trip reduction for 'other freight' compared to 2.50 m wide trailer	Percentage reduction in trips (all freight) compared to 2.50 m wide trailer	Equivalent km
2.50 m	8,572,420	N/A	N/A	86,000
2.55 m	8,404,333	-168,087	0.83%	85,268
2.60 m	8,242,711	-329,708	1.63%	84,600

As refrigerated trailers are expected to use all additional width for increasing insulation, there is no volume benefit for wider refrigerated trailers (average annual km per refrigerated trailer = 86,000).

Appendix D. Estimated Crash Rates of Wider Vehicles

Crash Rate Increase in Wider Vehicles

To be conservative and acknowledge potential differences in roads and vehicle operations that can occur between different countries, a small but significant increase in the crash rate has been calculated based on the proportion of crashes that may be increased with wider vehicles on the road. To be clear, this is not an estimate of the number of crashes that are expected to occur involving wider vehicles, it is the maximum number of crashes possible based on an analysis that considers current crash rates for heavy vehicles and crash types where widening could be a factor. Therefore, the increased crash rate for wider vehicles used in this analysis will be in excess of the true number that would occur if vehicle widening does increase crash rates.

The following process was undertaken to determine a +0.5% crash rate for wider vehicles and combinations.

Data and analysis on crash rates (NTARC 2021) was used to determine a crash rate of 16.4 per 100 million km in higher productivity vehicles, which may be more representative of wider vehicles than the general heavy vehicle fleet.

The average annual km for a heavy vehicle or combination in this analysis is 76,736 km (see Table C.1); or 1,303 average vehicles accounting for 100 million km in a 12-month period. This provides an average annualised expression of this crash rate: for every 1,303 average vehicles in each year there will be 16.4 crashes (assuming no more than one crash per vehicle in any year) or 1.3% of these vehicles and combinations experiencing a crash in any year.

The other factor that needs to be considered is the risk associated with wider vehicles as not all crash types are potentially impacted by vehicle width. Data from BITRE (2020, 2021) was used to determine the number of fatalities and serious injuries associated with different crash types. Where there were subgroups for each crash type, the assigned proportion of fatalities and serious injuries was divided evenly between sub-groups. These are shown in Table D.1.

Table D.1: Fatalities and serious injuries by crash type involving heavy vehicles

Main crash type	Sub-group	Fatalities		Serious injuries	
Run off road	All (straight and curve)	28	16%	260	16%
Opposing directions	Head on	32	18%	293	18%
	Right through	32	18%	293	18%
Same direction	Rear end	14	8%	132	8%
	Side swipe	14	8%	132	8%
Adjacent direction	Right near	9	5%	84	5%
	Cross traffic	9	5%	84	5%
Pedestrian	Near side	8	5%	77	5%
	Play/work	8	5%	77	5%
Other	All (single and multiple veh.)	25	14%	228	14%

Source: BITRE (2020, 2021). Fatality numbers are the 3-year average from 2018–2020, serious injury numbers are 3-year average 2016–2018.

Increased vehicle width is assumed to only have an effect on:

- head on crashes – where increased width may result in greater encroachment of an opposing lane
- side swipe crashes – where increased width may result in contact with other vehicles travelling in the same direction.

These two crash types account for 26% or approximately one-quarter of all fatalities. Multiplying this by the 1.3% of heavy vehicles or combinations expected to experience a crash each year, the result is 0.32%, which has been rounded up to 0.5%. This value is used as the maximum increase in crash rates due to wider vehicles (both 2.55 and 2.60 m). Again, this percentage is well in excess of any expected increase in crashes due to wider vehicles.

Crash Rate Decrease in Wider Vehicles

Estimates from the ATA and TIC suggest a 2% and 4% improvement in stability for 2.55 m and 2.60 m vehicles and trailers respectively. With an estimate of 10% of all heavy vehicle crashes being rollovers, a 4% improvement represents 0.4% reduction in the crash rate. This was rounded up to 0.5% to mirror the estimate of the crash increase due to widening and should therefore be taken as representing the best-case scenario.

Appendix E. Crash Types and Crash Modification Factors

The following data was used to determine the number of fatalities and serious injuries caused by different crash types involving heavy vehicles in order to apply the crash reduction effect of different safety features applicable to those crash types.

The source of the data shown in Table E.1 and the first three columns of Table E.2 and Table E.3 was the *Road Trauma Involving Heavy Vehicles – 2020 Statistical Summary* from the Bureau of Infrastructure and Transport Research Economics (BITRE 2020).

Table E.1: Deaths by crash type 2018–2020

	Year	Multiple vehicle	Single vehicle	All
Articulated truck involved	2018	76	13	89
	2019	80	19	99
	2020	89	15	104
	3-year average	82	16	97
Heavy rigid truck involved	2018	72	11	83
	2019	74	20	94
	2020	66	9	75
	3-year average	71	13	84
Total HV (Sum)	3-year average	152	29	181

Appendix C Source Table 1.4, Page 5 of BITRE (2020).

Table E.2: Single heavy vehicle crash statistics

Main crash type	Percentage of crashes involving a heavy vehicle	Sub-group	Assumed subgroup ratio	Assumed crash %	Number of fatalities
Non-collision (curve)	52%	Off left	0.5	26%	8
	52%	Off right	0.5	26%	8
Non-collision (straight)	46%	Off left	0.5	23%	7
	46%	Off right	0.5	23%	7
Other	2%*	–	1	2%	1

Source for columns 1-3: Figure 1.7, Page 11 of BITRE (2020).

*The Source lists this value (2%) as 6%, which seems to be an error.

Table E.3: Multiple vehicle crash statistics

Main crash type	Percentage of crashes involving a heavy vehicle	Sub-group	Assumed subgroup ratio	Assumed crash %	Number of fatalities
Opposing directions	42%	Head on	0.5	21%	32
	42%	Right through	0.5	21%	32
Same direction	19%	Rear end	0.5	10%	14
	19%	Side swipe	0.5	10%	14
Adjacent direction	12%	Right near	0.5	6%	9
	12%	Cross traffic	0.5	6%	9
Pedestrian	11%	Near side	0.5	6%	8
	11%	Play/work	0.5	6%	8
Other	16%	–	1	16%	24

Source for columns 1-3: Figure 1.7, Page 10 (BITRE 2020).

The above data, numbers of fatalities and the proportions of fatalities by crash type, were used to determine fatality proportions by crash type across single and multiple vehicle crashes involving heavy vehicles, as shown in Table E.4.

Table E.4: Total heavy vehicle crashes by type

Main crash type	Sub-group	Fatalities	
Run off road	All (straight and curve)	28	16%
Opposing directions	Head on	32	18%
	Right through	32	18%
Same direction	Rear end	14	8%
	Side swipe	14	8%
Adjacent direction	Right near	9	5%
	Cross traffic	9	5%
Pedestrian	Near side	8	5%
	Play/work	8	5%
Other	All (single and multiple vehicles.)	25	14%

The efficacy of safety features, as determined by a review of the literature relating these to specific crash types is shown in Table E.5. Where the crash reduction factors (CRF) are identified as applying to a specific crash sub-group, these CRFs are applied in full. If the sub-types are not mentioned, the CRF for the crash type is divided evenly between the crash sub-groups. It should be noted that these CRFs are for the specific crash types listed, not all crashes.

Table E.5: Crash reduction factors applied to crash type sub-groups

Safety feature	Mitigated crash types	Crash reduction		Average CRF	Note
		Min.	Max.		
Lane departure warning	Run off road	23%	53%	38%	CRF by crash type
	Head on	24%	50%	37%	CRF by crash type
	Side swipe	24%	50%	37%	CRF by crash type
Autonomous emergency braking system	Rear end	20%	50%	35%	CRF by crash type
Commercial braking systems (ESC, RSC, ABS)	Run off road	14%	40%	27%	CRF by crash type
Devices for indirect vision	Near side	0%	7%	3%	Overall CRF split
	Side swipe	0%	7%	3%	Overall CRF split
	Play/work	0%	7%	3%	Overall CRF split
Blind spot information systems	Side swipe	2%	14%	8%	CRF by crash type
Side underrun protection	Near side	7%	12%	9%	Overall CRF split
	Right near	7%	12%	9%	Overall CRF split
	Play/work	7%	12%	9%	Overall CRF split
Conspicuity markings	Right near	1%	15%	8%	Overall CRF split
	Cross traffic	1%	15%	8%	Overall CRF split
	Right through	1%	15%	8%	Overall CRF split

To apply the above crash reduction factors to all crashes, they are weighed by the proportion of the crash types they apply to as listed in Table E.4. The results are shown in Table E.6 to determine crash modification factors (CMF = 1- CRF).

Table E.6: Literature-based crash modification factors

Safety feature	CRF	CMF
Lane departure warning	15.44%	84.6%
Autonomous emergency braking system	2.79%	97.2%
Commercial braking systems (ESC, RSC, ABS)	4.23%	95.8%
Devices for indirect vision	0.57%	99.4%
Blind spot information systems	0.64%	99.4%
Side underrun protection	0.43%	99.6%
Conspicuity markings	2.17%	97.8%

Some of these (LDW, AEB and CBS) were modified for the analysis to align with CMFs used by the Department in previous regulatory impact statements. The final CMFs used in the analysis are listed in Table E.7.

Table E.7: Conservative crash modification factors used in the analysis

Safety feature	Heavy vehicles and trailers	
	Fatality	Serious injury
Lane departure warning	95.6%	95.6%
Advanced emergency braking systems	93.6%	93.6%
Commercial vehicle brake systems	93.6%	93.6%
Devices for indirect vision	99.4%	99.4%
Blindspot information systems	99.4%	99.4%
Side underrun protection	98.6%	99.9%
Conspicuity markings	97.8%	97.8%

Appendix F. BCA Model Data Sources

The additional references listed below were used in the modelling supporting the analysis.

ATA 2016, 'Stability control the key to improving truck safety', media release, 22 September 2016, Australian Trucking Association, accessed 27 June 2022, <https://www.truck.net.au/media/media-releases/stability-control-key-improving-truck-safety/>.

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NHVR 2022, *National roadworthiness baseline survey*, National Heavy Vehicle Regulator website, Newstead, Qld, accessed 29 June 2022, <https://www.nhvr.gov.au/safety-accreditation-compliance/vehicle-standards-and-modifications/roadworthiness-program/national-roadworthiness-baseline-survey>.

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