Draft Freight PASS

User Guide

October 2023

BETA RELEASE

For consultation purposes only.

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Introduction

This user guide assists the use and interpretation of the Freight PASS (Productivity and Safety/Sustainability) tool.

Background

Consultation for the *Heavy Vehicle Productivity Plan 2020 - 2025* (HVPP) highlighted a varied understanding amongst road managers of heavy vehicle combinations and their associated productivity, safety and environmental performance. Recommendations were made for the NHVR to develop productivity tools to aid road managers with access decision making. These views were reinforced through recent consultation in 2022-2023 on the NHVR's PBS 2.0 Discussion Paper.

Freight PASS will enable road managers to understand the comparative performance of different freight vehicles for a nominated freight task, contributing to nationally consistent, evidence-based and efficient decision-making.

Freight PASS:

- Expands on the range of education and training material available to road managers.
- Supports advancement in technology that improve safety, environmental sustainability and productivity for heavy vehicles.
- Guides access decisions to consider and balance the long-term effects of road freight activity on safety, productivity and sustainability.

Please note that the NHVR may update Freight PASS from time-to-time (e.g. in response to new methods, new common combinations, or new data). It is therefore important for users to consider the release date and version of Freight PASS.

User guide structure

This user guide is divided into five (5) sections (Table 1).

Note: Please go to the 'Operational guide' section if you would like to prioritise how to operate Freight PASS.

Table 1. User guide structure

Section	Purpose
Limitations	Identifying the limitations and potential future enhancements of the Freight PASS.
Key features	Highlighting the unique attributes that enhance the user experience.
User interface	Explanation on the widgets, filters and manual inputs.
Operational guide	Step-by-step instructions on how to operate the Freight PASS.
Calculations and sources	Brief explanation on the calculations and sources used to develop the Freight PASS.

Limitations

Although the Freight PASS provides meaningful insights, these are to be considered in light of the limitations detailed below (Table 2) and results are to be interpreted accordingly.

Many of these known limitations will influence future product enhancements.

Table 2. Tool limitations

Section	Description
Access	There is no relationship between the vehicles and level of access; and the tool does not make recommendations on which vehicles should be granted access on the basis of their relative performance compared to other vehicles. While Freight PASS results may rank vehicles based on user inputs, it does not replace, for example, engineering judgement associated with route assessments.
Vehicle types	Freight PASS considers a total of 223 vehicles types, across all mass schemes and PBS levels, as described by NHVR's Common Heavy Freight Vehicle Configurations Chart and PBS Vehicle Configurations Chart. Freight PASS does not currently consider uncommon combinations not contained in these charts.
Vehicle equivalencies	Vehicle equivalencies were used to align the NHVR common configurations with different datasets, where the source material used different classifications and naming

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	conventions. The vehicle equivalencies are an NHVR 'best-fit' assumption to harmonise the datasets. The descriptions summary assist to better understand and standardise differences in vehicle descriptions across different data sources. For example, a 9-axle B-double is linked to vehicle classification 18b from the NTC Operator Cost Model (NHVR determined best-fit).
Commodity data	Data for road transport of different commodities has been sourced from CSIRO's Supply Chain Transport and Logistics Dashboard. The data is an average measure over the entire freight task for that commodity. In particular, Freight PASS uses the cost per tonne kilometre from CSIRO to calculate the transport costs associated with a commodity. This method is vehicle type agnostic. CSIRO data is representative and may not represent real world costs. The data relates to a point in time, and may be updated on occasion by CSIRO.
Speed	The scenarios assume a consistent average speed, as inputted by the user.
Fleet mass data	The NHVR has sourced tare mass data for component units from national registration data records. The tare mass for entire vehicles were built from the average registered tare mass of component units. The payload mass is the difference between GVM/GCM (dependent on the vehicle type and mass scheme), and the tare mass for the vehicle.

Freight PASS: Key features

Vehicle comparator

The Freight PASS allows up to four vehicles to be compared.

Two of the vehicles cannot be modified, allowing for a standardised comparison to a common as-of-right general access vehicle (GAV) and a common restricted access vehicle (RAV):

- Vehicle A: 6-axle semitrailer at GML
- Vehicle B: 9-axle B-Double at GML

The user is able to select the remaining two vehicles (Vehicles C and D) by determining the fleet type, vehicle type, mass scheme and PBS level (if applicable).

To change the vehicle, click on the *fleet filter, combination filter, mass scheme filter* and *PBS level filter* and select the desired option from the dropdown menu.

The dropdown filters are dependent and must be selected from left to right (Step I to Step IV). Only available options matching the NHVR's Common Heavy Freight Vehicle Configurations Chart and PBS Vehicle Configurations Chart will be listed.

Alternatively, select *no selection* from the *fleet filter*.

Fleet data

Freight PASS is linked to a comprehensive data set, based on information collected and calculated from National Transport Commission, the Australian Transport Assessment and Planning (ATAP) Guidelines, CSIRO and government-endorsed research sources.

Examples of the unique data sets include:

- Vehicle mass and dimensions
- Fuel consumption and emissions
- Vehicle operating costs
- Crash severity likelihood
- Impact to biodiversity, water and soil

The raw data set and sources can be found in the relevant sheets that form the back end of the tool (i.e. the tabs in the Microsoft Excel workbook).

Scenario-based evaluation

Freight PASS allows the user to evaluate different vehicles using a scenario based on trip length, total load and average speed.

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The scenario enables quantification of the performance of different vehicles in the context of a freight task.

To change the scenario settings, navigate to the *journey length*, *total payload* and *average speed* manual inputs and enter a number into the relevant field.

The scenario settings also allow the user to identify:

- The journey length where vehicle pollutants impacts biodiversity.
- The journey length where vehicle run-off impacts water and/or soil quality.

These inputs are optional, and must be equal to or less than the journey length.

To change the sustainability settings, navigate to the *sustainability* manual inputs and enter a number into the relevant field.

Commodity calculator

The commodity calculator allows the user to select from 150 possible commodity types, and calculate the estimated cost to transport the commodity based on the scenario inputs[1]. The calculator also gives users the option to either reduce or increase the distance of the scenario, and calculate the estimated difference in transport cost. The cost is for the laden part of the trip only.

The Freight PASS also provides a commodity summary, highlighting national averages for the transportation of the commodity. This summary is useful for better understanding the commodity and adjusting the scenario inputs (e.g. average speed).

To change the commodity, click on the *commodity filter,* and select a commodity from the dropdown menu.

Ranking

Freight PASS ranks vehicles based on weighted criteria associated with productivity, safety and sustainability.

The ranking is based on the scenario outputs, identified in the productivity, safety and sustainability cards.

The weightings can be adjusted according to user preferences.

[1] The commodity cost data has been derived from the CSIRO Supply Chain Transport and Logistics Dashboard (2022).

To change the weightings, navigate to the *productivity, safety and sustainability and overall criteria* and enter the percentage weightings in the appropriate cell.

User interface

Freight PASS is a dashboard hosted in Microsoft Excel. It allows for self-service analytics, and provides the user with a transparent and consistent method to evaluate the comparative productivity, safety and sustainability performance of common freight vehicles.

Freight PASS is made up of a number of widgets, filters and manual inputs.

- A *widget* is a digital interface that presents information or provides a service.
- A *filter* is a manual intervention that sorts information by a defined category.
- A *manual input* is a manual intervention that requires the user to enter information.

The user interface is colour-coded:

- Light red with bold borders allow for user adjustment;
- Blue relates to *productivity*;
- Yellow relates to *safety*;
- Green relates to *sustainability*.
- Prompts and instructions messages are identified in red text as required.

Filters

Table 3. Filters

Filter name	Function
Fleet	Defines if the vehicles are conventional vehicles or PBS vehicles.
Combination	Defines the specific combination type for the vehicle. List is dependent on the fleet selection.
Mass scheme	Defines the mass scheme for the combination type. List is dependent on the combination selection.
PBS level	Defines the PBS level for the PBS Vehicle (does not apply to conventional vehicles). List is dependent on the mass scheme selection.

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Commodity selection	Determines the commodity for a specific scenario. This relates to the commodity calculator only.
Change in distance	Identifies whether the change in distance for the comparison scenario is increased or decreased. This relates to the commodity calculator only.

Manual inputs

Table 4. Manual inputs

Input name	Function
Productivity criteria	Determines the productivity rank on trips, time, kilometers and pavement wear.
Safety criteria	Determines the safety rank based on likelihood of fatal, hospitalisation, non-hospitalisation injuries and property damage only crashes.
Sustainability criteria	Determines the sustainability rank based on fuel consumption, CO2 emissions, air pollution cost, noise pollution cost, biodiversity cost and water and soil cost.
Overall criteria	Determines the overall criteria based on the ranking for productivity, safety and sustainability.
Journey length	Determines the journey length (kms) in terms of single trip (i.e. not return distance).
Total load	Determines the load (t) to be transported.
Average speed	Determines the average speed (km/h) for the entire journey.
Potential biodiversity impacts	Determines the journey length where vehicle pollutants impacts biodiversity (km) in terms of single trip (i.e. not return distance).
Potential vehicle run-off costs	Determines the journey length where vehicle run-off impacts water and/or soil quality (km) in terms of single trip (i.e. not return distance).
Change in distance (kms)	Identifies the change in distance (km) for the comparison scenario. This relates to the commodity calculator only.

Widgets

Table 5. Widgets

Widget name	Description
Vehicle classification	Presents the number of axles, configuration code and vehicle equivalencies from the Australian Transport and Planning Guidelines (ATAP), Austroads and the National Transport Commission.
Vehicle mass	Presents a breakdown of vehicle masses, including the GCM, load and tare mass.
Productivity rank	Presents the productivity rank based on user-nominated weighted criteria.
Safety rank	Presents the safety rank based on user-nominated weighted criteria.
Sustainability rank	Presents the sustainability rank based on user-nominated weighted criteria.
Overall rank	Presents the overall rank based on the productivity, safety and sustainability ranking.
Fewest return trips	Presents the vehicle with fewest trips based on the journey length, total load and average speed, along with a graph providing a comparison between vehicles. The calculation assumes 100% load delivery and 0% load return.
Quickest time	Presents the vehicle with quickest travel time based on the journey length, total load and average speed, along with a graph providing a comparison between vehicles. Calculation assumes consecutive non-stop return trips (e.g. excludes designated rest stops, loading and unloading) Calculation assumes that the speed is consistent.

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Fewest kilometers	Presents the vehicle with the fewest kilometers based on the journey length, total load and average speed, along with a graph providing a comparison between vehicles.
Lowest road space occupancy	Presents the length of road space occupied if the total number of vehicles to transport the freight task were positioned end-to-end, along with a graph providing a comparison between vehicles.
Likelihood of a fatal crash	Presents the vehicle with the lowest likelihood of a fatal crash based on the journey length, total load and average speed, along with a graph providing a comparison between vehicles.
Likelihood of a crash resulting in hospitalisation	Presents the vehicle with the lowest likelihood of a crash resulting in hospitalisation based on the journey length, total load and average speed, along with a graph providing a comparison between vehicles.
Likelihood of a crash resulting in a non-hospitalisation injury	Presents the vehicle with the lowest likelihood of a resulting in a non-hospitalisation injury based on the journey length, total load and average speed, along with a graph providing a comparison between vehicles.
Likelihood of a crash resulting in property damage only	Presents the vehicle with the lowest likelihood of a crash resulting in property damage only based on the journey length, total load and average speed, along with a graph providing a comparison between vehicles.
Lowest fuel consumption	Presents the vehicle with the lowest fuel consumption based on the journey length, total load and average speed for a specific scenario, along with a graph providing a comparison between vehicles. Calculation based on the ATAP fuel consumption formula. *Note: Coefficients and model inputs were selected based on data associated with conservative fuel consumption: IRI = 2; Rise and fall of road = 0%; and Road curvature (Straight) = 20◦/km. These inputs are for a relative straight road of good standard.*
Lowest CO2 emissions	Presents the vehicle with the lowest CO2 emissions based on the journey length, total load and average speed for a specific scenario, along with a graph providing a comparison between vehicles. Calculation based on emission conversion factor from the ATAP road parameter values.
Lowest air pollution impact cost	Presents the vehicle with the lowest air pollution impact cost based on the journey length, total load and average speed for a specific scenario, along with a graph providing a comparison between vehicles. Calculation based on the ATAP environmental parameter values.
Lowest noise pollution cost	Presents the vehicle with the lowest noise pollution cost based on the journey length, total load and average speed for a specific scenario, along with a graph providing a comparison between vehicles. Calculation based on the ATAP environmental parameter values.
Lowest biodiversity cost	Presents the vehicle with the lowest biodiversity cost based on the journey length where vehicle pollutants impacts biodiversity. Calculation based on the ATAP environmental parameter values.
Lowest water and soil cost	Presents the vehicle with the lowest water and soil impact cost based on journey length where vehicle run-off impacts water and/or soil quality.
Commodity calculator	Identifies the cost to transport a commodity based on the journey length and total load for a specific scenario and a comparison scenario. The calculation is based on CSIRO's cost per tonne kilometer. Cost to transport commodity includes transport costs (maintenance, fixed costs, fuel costs, driver costs, capital cost and appreciation) and logistics

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	costs (loading, unloading, decoupling, fatigue management).
Commodity summary	Identifies the following information for the respective commodity: • Average payload (t) • Average trip distance (km) • Average trip duration (h) • Average speed (km/h) • Cost per TKM ($) • Cost per payload tonne ($) • Annual trailers • Annual tonnes (t) Information is a national average and based on historic CSIRO data for the specific commodity. There is no relationship to the scenario or vehicles.

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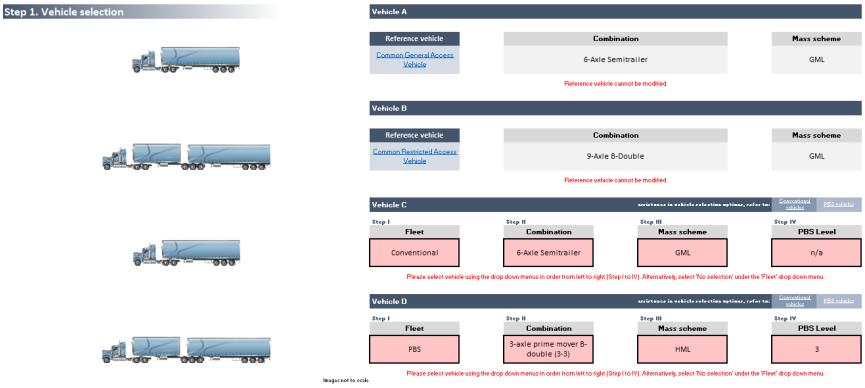
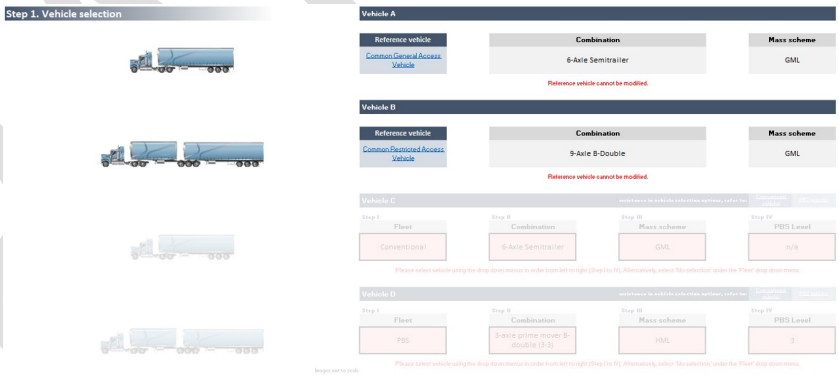
Operational guide

Below outlines the recommended order of actions when using the Freight PASS. Users need to click and select the desired option from the dropdown menu and/or enter relevant information into the cell(s) as appropriate.

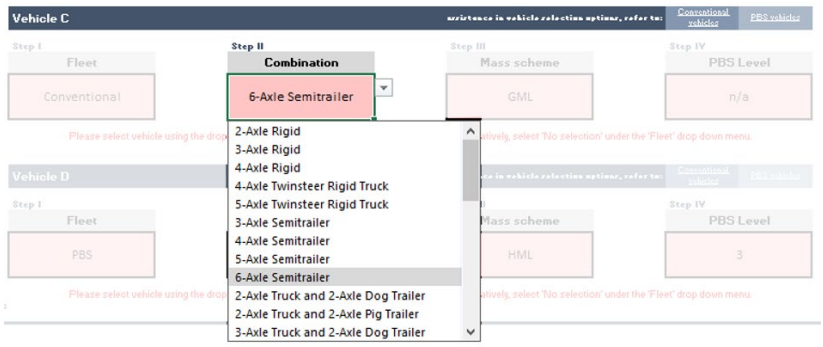
Step 1 – Vehicle selection

Table 6. Step 1. Vehicle selection

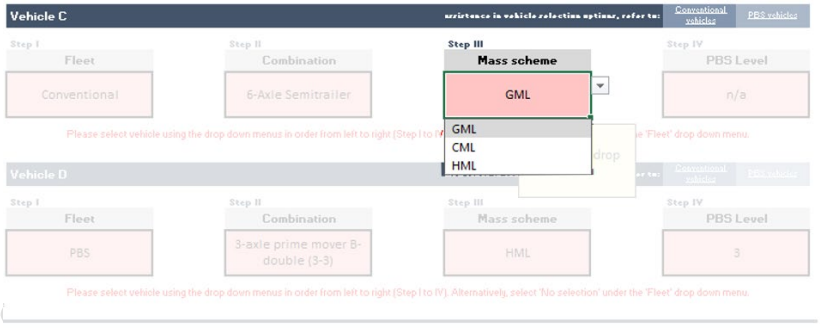
Instruction	
Navigate to Step 1. Vehicle selection	
Vehicles A and B cannot be modified. This allows for a standardised comparison to a common as-of-right general access vehicle (GAV) and a common restricted access vehicle (RAV): • Vehicle A: 6-axle semitrailer at GML • Vehicle B: 9-axle B-Double at GML	
For Vehicle C, click the ***fleet filter*** (Step I) and select the desired fleet type from the dropdown menu. Refer to the NHVR common configuration charts for vehicle selection options. Links supplied in the Vehicle C banner. Alternatively select *no selection if* user wants to reduce the number of vehicles. If the vehicle does not exist an error message will be	

displayed.

For Vehicle C, click the ***combination filter*** and select the desired combination type from the dropdown menu.



For Vehicle C, click the ***mass scheme filter*** and select the desired mass scheme from the dropdown menu.



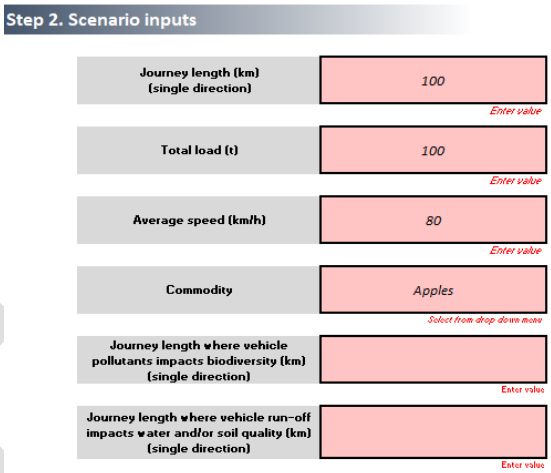
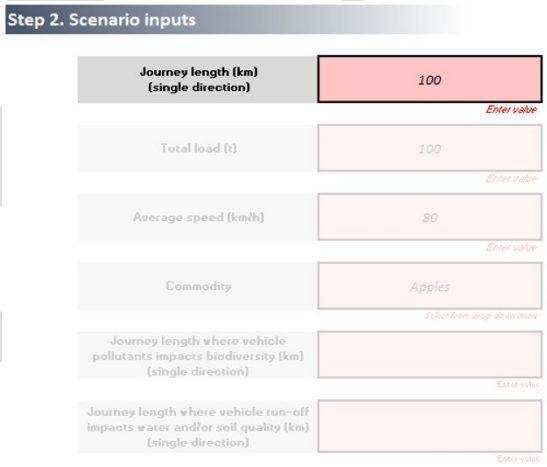
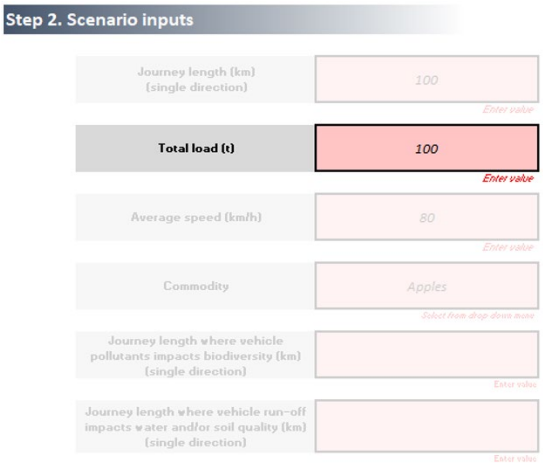
For Vehicle C, click the ***PBS level filter*** and select the desired PBS level from the dropdown menu.

If a conventional vehicle, select **n/a**.

Repeat steps 1 – 4 for Vehicle D if the user would like to compare another vehicle.

Step 2 – Scenario inputs

Table 7. Step 2. Scenario inputs

Instruction	
Navigate to Step 2. Scenario inputs	
Set the ***journey length*** in kilometres by typing in a value of interest. *Note – this is the distance of a one-way trip.*	
Set the ***total load*** in tonnes by typing in a value of interest. *Note – this is the total payload to be transported (e.g. 100t of apples).*	

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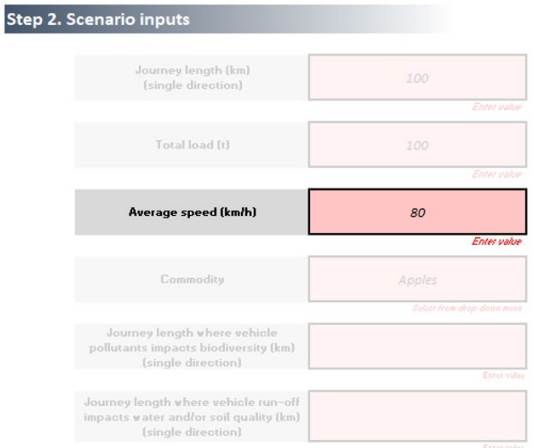
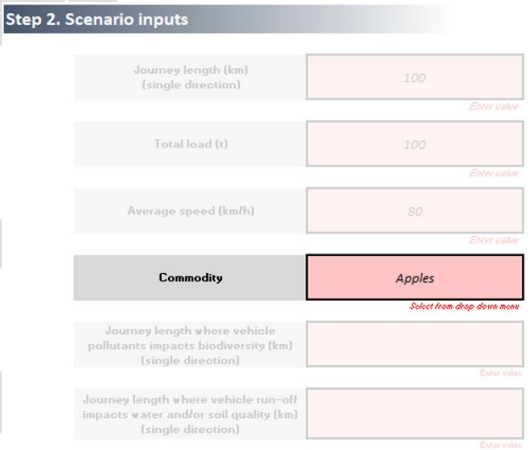
Set the ***average speed*** in km/h by typing in a value of interest.

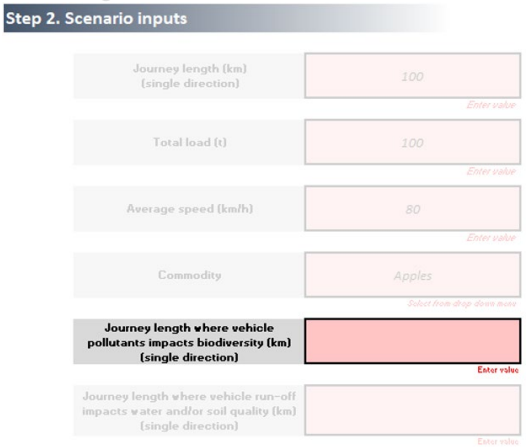


Click on the ***commodity filter,*** and select a commodity from the dropdown menu.



Set the ***length of journey impacting biodiversity*** in km by typing in a value of interest.

Note – this is the distance of a one-way trip.



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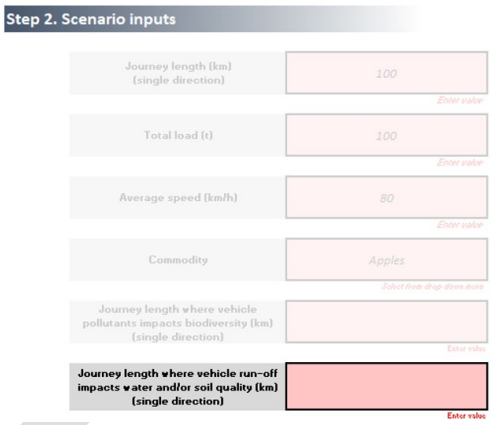
Set the ***length of journey impacted by vehicle run-off*** in km by typing in a value of interest.

Note – this is the distance of a one-way trip.



Step 3 – Commodity calculator (optional)

Table 8. Step 3. Commodity calculator (optional)

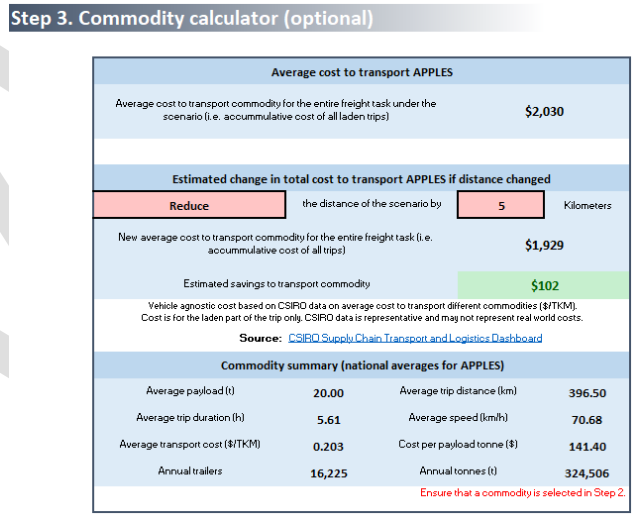
Instruction

Navigate to Step 3. Commodity calculator. This step is optional and is used to measure changes in cost to transport different commodities if the distance of the trip was modified.

Cost is for the laden part of the trip only.

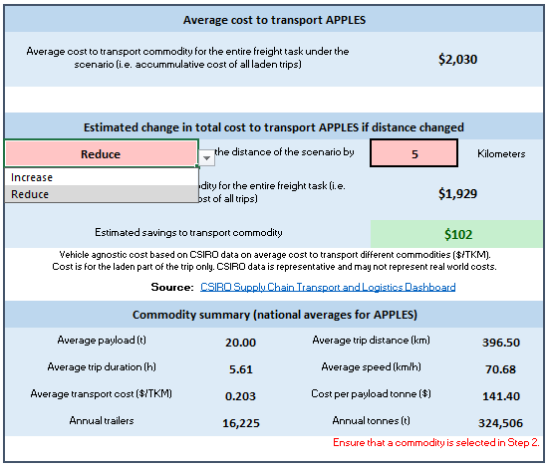
CSIRO data is representative based on average cost per tonne km for the commodity, is vehicle agnostic and may not represent real world costs.

This step relates to the commodity selected in Step 2.



Using the drop down menu, select whether the distance of the trip will increase or reduce compared to the trip distance identified in Step 2.

In the second box, identify, by typing a number, the kilometers the distance is changing by.



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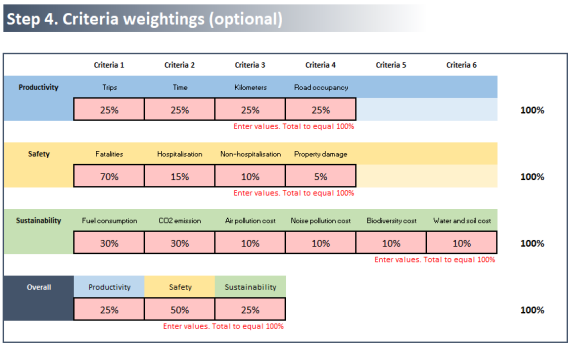
Step 4 – Criteria weightings (optional)

Table 9. Step 4. Criteria weightings (Optional)

Instruction	
Navigate to Step 4. Criteria weightings. This step is optional. To change the weightings of the respective criteria, enter a percentage in the respective fields. The user can determine the weightings with the productivity, safety and sustainability fields, in addition to an overall weighting.	

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Results

Note: Outputs identified in this section are for illustrative purposes only.

Table 10. Freight PASS outputs

Results	
Completion of Step 1 (refer to operational guide), will result in the identification of vehicle classifications for vehicles A to D. This presents the number of axles, configuration code and vehicle equivalencies from the ATAP Guidelines, Austroads and the National Transport Commission.	**Vehicle classification** **Axles** / **Config.** / **ATAP** / **Austroads** / **NTC** 6 / A123 / Artic 6 Axle / Class 9 / 16b **Axles** / **Config.** / **ATAP** / **Austroads** / **NTC** 9 / B1233 / B-Double / Class 10 / 18b **Axles** / **Config.** / **ATAP** / **Austroads** / **NTC** 6 / A123 / Artic 6 Axle / Class 9 / 16b **Axles** / **Config.** / **ATAP** / **Austroads** / **NTC** 9 / B1233 / B-Double / Class 10 / 18b

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Completion of Step 1 (refer to operational guide), will result in the identification of vehicle masses for vehicles A to D.

This presents a breakdown of vehicle masses, including the GCM, load and tare mass.

Vehicle mass		
GCM (t)	Load (t)	Tare (t)
42.50	24.47	18.03

GCM (t)	Load (t)	Tare (t)
62.50	37.28	25.22

GCM (t)	Load (t)	Tare (t)
42.50	24.47	18.03

GCM (t)	Load (t)	Tare (t)
68.50	43.28	25.22

Completion of Steps 1 and 2 (refer to operational guide), will result in the score cards across productivity (blue), safety (yellow) and sustainability (green) criteria.

Each score card will identify the best vehicle for the respective criteria. Beneath the card includes a graph illustrating the results in context. A to D in the X-axis of the graph refers to vehicles A to D.

Note:

a) Externality costs have been escalated to present year $.

b) Where a PBS vehicle and conventional vehicle perform the same for a specific criterion, the PBS vehicle will be recognised in the score card. Where two vehicles of the same fleet perform the same, the score card will recognise the first vehicle in the order identified in the vehicle selection. The graph provides the performance of all vehicles in context, ensuring transparency.

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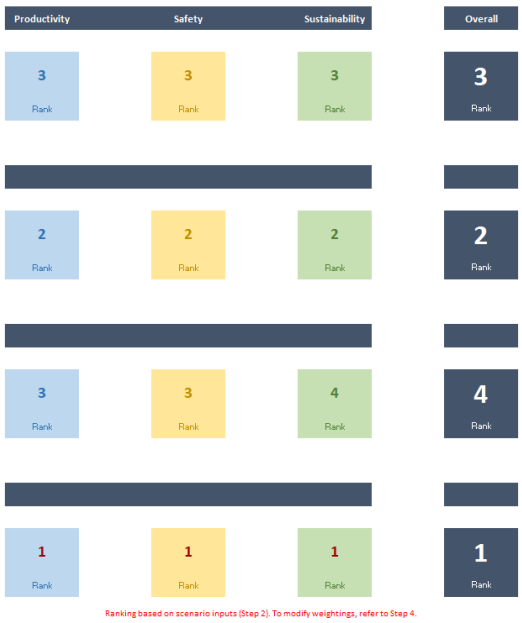
Completion of Steps 1, 2 and optional Step 4 (refer to operational guide), will result in the rankings across productivity (blue), safety (yellow) and sustainability (green), along with an overall rank (dark blue).



Completion of Steps 1, 2 and optional Step 3 (refer to operational guide), will identify the change in cost to transport a commodity based on the journey length and total load for a specific scenario and a comparison scenario.

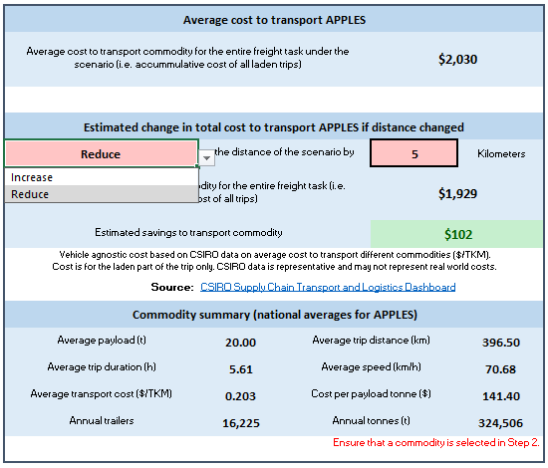
Calculation is based on CSIRO's cost per tonne kilometer.

Cost to transport commodity includes transport costs (maintenance, fixed costs, fuel costs, driver costs, capital cost and appreciation) and logistics costs (loading, unloading, decoupling, fatigue management).

The commodity calculator will also identify the following information for the respective commodity:

- Average payload (t)
- Average trip distance (km)
- Average trip duration (h)
- Average speed (km/h)
- Cost per TKM ($)
- Cost per payload tonne ($)
- Annual trailers
- Annual tonnes (t)

Information is a national average and based on historic CSIRO data for the specific commodity. There is no relationship to the scenario or vehicles.



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Red text prompts

Table 11. Red text prompts

Location	Prompt	Explanation / resolution
Step 1. Vehicle selection – Vehicle A and Vehicle B	Reference vehicle cannot be modified.	Two of the vehicles cannot be modified, allowing for a standardised comparison to a common as-of-right vehicle (GAV) and a common restricted access vehicle (RAV): • Vehicle A: 6-axle semitrailer at GML • Vehicle B: 9-axle B-Double at GML
Step 1. Vehicle selection – Vehicle C and Vehicle D	Please select vehicle using the drop down menus in order from left to right (Step I to IV). Alternatively, select 'No selection' under the 'Fleet' drop down menu.	Default message providing direction to the user.
Step 1. Vehicle selection – Vehicle C and Vehicle D	Vehicle does not exist in the NHVR common configuration charts. To select a vehicle, please use the drop down menus from left to right (Step I to IV). Refer to the NHVR common configuration charts for vehicle selection options.	Recommence the vehicle selection using the drop down menus from left to right. Note: Each of the drop down menus in the vehicle selection is dependent on the previous selection. A selection out of order will cause this error message.
Step 1. Vehicle selection – Vehicle C and Vehicle D	'No selection' has been identified. To select a vehicle, please use the drop down menus from left to right (Step I to IV)	Message confirming that no vehicle has been selected.
Step 2. Scenario inputs	ERROR. Please ensure all vehicles in Step 1 are aligned with the NHVR common configuration charts. Please follow the instructions and prompts in Step 1.	This error message will occur if one or more of the vehicles selected do not align with the NHVR common configuration charts. Return to Step 1 and follow the instructions to determine Vehicles C and D.
Step 2. Scenario inputs – Environmental inputs	Value must be less than journey length	The environmental inputs relate to a proportion of the journey length; therefore these values must be less than the journey length.
Step 4. Criteria weightings	Exceeds 100%. Review weightings. Or Under 100%. Review weightings.	The weightings must equal to 100% for each respective row (e.g. all of the productivity weights must equal 100% and all of the overall weightings must equal 100%). This error message occurs if the total is greater than or less than 100%.

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Calculations and sources

Fleet and combination identification

Conventional fleet refers to non-PBS freight vehicles.

Conventional fleet vehicles are sourced from the NHVR: Common Heavy Freight Vehicle Configurations Chart.

PBS fleet refers to vehicles that allow heavy vehicle operators to use innovation to optimise vehicle designs, to achieve greater productivity and improved safety, while making the least possible impact on the environment and road infrastructure.

PBS vehicles are designed to perform their tasks as productively and safely as possible, and to operate on networks that are appropriate for their level of performance. PBS vehicles are tested against 16 stringent safety standards and 4 infrastructure standards to ensure they can safely operate on roads. The basic principle of PBS is matching the right vehicles to the right network (i.e. a performance based approach to access).

It is a voluntary scheme that sits alongside the long-standing conventional regulatory system for heavy vehicles.

PBS Fleet vehicles are sourced from the NHVR: PBS Vehicle Configurations Chart.

Summary information on PBS vehicles and the PBS scheme can be found at Performance Based Standards – A guide for road managers. More detailed information can be found at the NHVR website.

Mass schemes

General Mass Limits (GML) is the allowable mass for all types of heavy vehicles under the HVNL Regulations.

More information on GML can be found at https://www.nhvr.gov.au/road-access/mass-dimension-and-loading/general-mass-and-dimension-limits

Concessional Mass Limits (CML) allows mass limits above GML provided the operator is accredited under the National Heavy Vehicle Accreditation Scheme (NHVAS).

More information on CML can be found at https://www.nhvr.gov.au/road-access/mass-dimension-and-loading/concessional-mass-limits

Higher Mass Limits (HML) allow particular heavy vehicles to access additional mass entitlements above CML providing:

- operators of vehicles or combinations running HML on tri-axle groups are accredited under the Mass Management Module of the National Heavy Vehicle Accreditation Scheme (NHVAS), with an accreditation label fitted to the hauling unit
- vehicles are fitted with certified road friendly suspension
- vehicles are on an authorised HML route.

More information on HML can be found at https://www.nhvr.gov.au/road-access/mass-dimension-and-loading/higher-mass-limits

Masses for specific combinations were sourced from the NHVR: Common Heavy Freight Vehicle Configurations Chart and PBS Vehicle Configurations Chart.

PBS level

Based on on-road performance, PBS vehicles are classified into one of four levels in accordance with the Standards and Vehicle Assessment Rules.

Network levels are based on geometric requirements — that is, how much road space is required for safe vehicle operation.

For more information refer to Performance Based Standards – A guide for road managers.

Axle groups

Axle group means one or more shafts positioned in a line across a vehicle, on which one or more wheels intended to support the vehicle turn. Axle groups include single axle group, tandem axle group, twinsteer axle group, tri-axle group or quad-axle group.

For each axle, there may be a single (1) tyre or dual (2) tyres.

Configuration code

The configuration code is consistent with the Australian Trucking Association's (ATA) configuration code. For more information refer to the Description of Truck Configurations Technical Advisory Procedure.

A – Articulated unit

R – Rigid unit

T – Trailer unit

B – B trailer

N – Numbers refer to the number of axles in each axle group

For example:

R22T12 describes a 7-axle truck and dog. It is a rigid unit with twin steer, tandem drive, pulling a 3-axle dog trailer.

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B1244 describes a 11-axle B-double. It is an articulated unit, single steer, tandem drive prime mover pulling two quad-axle trailers in a B configuration.

A122T22 describes a 9-axle A-double. It is an articulated unit with a single steer axle, tandem drive prime mover pulling a tandem axle trailer, plus a tandem axle dolly and tandem axle trailer.

Vehicle classifications and equivalencies

Vehicle equivalencies were used to align the NHVR common configurations with different datasets, where the source material used different classifications and naming conventions.

The vehicle equivalencies are an NHVR 'best-fit' assumption to harmonise the datasets. The descriptions summary assist to better understand and standardise differences in vehicle descriptions across different data sources.

For example, a 9-axle B-double is linked to vehicle classification 18b from the NTC Operator Cost Model (NHVR determined best-fit).

Gross Combination Mass (GCM)

GCM means the total maximum loaded mass of a vehicle and any vehicles it may lawfully tow at any given time.

GCM is sourced from the NHVR: Common Heavy Freight Vehicle Configurations Chart and PBS Vehicle Configurations Chart.

Load

Load means:

- all the goods, passengers, drivers and other persons in the vehicle; and
- all fuel, water, lubricants and readily removable equipment carried in the vehicle and required for its normal use; and
- personal items used by the vehicle's driver or someone else necessary for the normal use of the vehicle; and
- anything that is normally removed from the vehicle when not in use.

Load = GCM – Tare Mass

Tare Mass

Tare mass means the total mass of the vehicle or combination with no load.

Tare Mass = GCM – Load

There was insufficient information from available data sources to determine tare mass across all vehicle types.

To be consistent, the NHVR has sourced tare mass data for component units from national registration data.

The tare mass for entire vehicles were built from the average registered tare mass of component units.

Road space occupancy

Road space occupancy is the length of road space occupied if the total number of vehicles to transport the freight task were positioned end-to-end.

Road space occupancy = Number of return trips * length of vehicle

Likelihood of a crash

The likelihood of a crash is dependent on:

- The total distance travelled.
- Crash rates per 1 million kilometres, sourced from The National Heavy Vehicle Drive Competency Framework Consultation RIS (2022). Applied to all vehicle combinations.
- PBS crash factors, derived from the Review of Major Crash Rates for Australian Higher Productivity Vehicles: 2015-2019. Applied to PBS vehicle combinations only.

Table 12. Crash rate by severity

Crash type	Crash rate per 1 million kilometres
Fatal	0.0091
Hospitalisation	0.0878
Non-hospitalisation	0.1209
Property damage only	0.7055

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Table 13. PBS Crash factor

	Conventional Fleet Crashes per 100 million kms	PBS Fleet Crashes per 100 million kms	PBS Crash factor
Rigid trucks	16.7	8.8	0.5269
Articulated trucks	17.6	5.4	0.3068

For the conventional fleet:

Likelihood of a crash = (Crash severity rate / 1,000,000) * total kilometres travelled

For the PBS fleet:

Likelihood of a crash = ((Crash severity rate / 1,000,000) * Kilometres) * PBS crash factor) * total kilometres travelled

Fuel consumption

Nominal fuel consumption at 50% load allows a uniform comparison between vehicles. 50% load is considered an average load, assuming trips are at 100% load with the return at 0% load (i.e. tare mass).

Nominal fuel consumption formulae, inclusive of coefficients and assumptions, was sourced from the ATAP Guidelines – Road Parameter Values, Emission conversion factors for uninterrupted flow fuel consumption.

The nominal fuel consumption is based on the ATAP vehicle equivalent, manually assigned to the NHVR conventional and PBS fleets.

Fuel consumption (litres/km) = Base Fuel * (k1 + k2/V + k3*V2 + k4*IRI + k5*GCM at 50% load) * Fuel Cost CPI

Where K = model coefficients, V = vehicle speed as determined by the user, IRI = road roughness index.

Note: Coefficients and model inputs were selected based on data associated with conservative fuel consumption: IRI = 2; Rise and fall of road = 0%; and Road curvature (Straight) = 20°/km. These inputs are for a relative straight road of good standard.

CO2 emissions

CO2 emissions is based on the nominal fuel rate at 50% load and the diesel to CO2 conversion rate.

The conversion rate from Diesel (L) to CO2 (kg) of 2.6712 was sourced from the ATAP Guidelines – Road Parameter Values, Emission conversion factors.

CO2 emissions = Fuel consumption * Diesel to CO2 Conversion rate

Air pollution impact cost

Air pollution impact cost is dependent on kilometers travelled and the air pollution impact externality cost (rural) for freight vehicles.

Rural values were selected to ensure conservative calculations.

The unit cost of air pollution is $6.99 AUD per 1000 vkt (vehicle kilometers travelled) or $0.00699 per kilometer.

This is sourced from the ATAP Guidelines – environmental parameter values.

CPI was used to inflate the value to present day dollars.

= (unit cost of air pollution per kilometer * CPI inflation to 2022) * total kilometers

Noise pollution cost

Noise pollution cost is determined based on kilometers travelled and the noise externality cost (rural) for heavy combination vehicles.

Rural values were selected to ensure conservative calculations.

The unit cost of noise pollution is $0.44 AUD per 1000 vkt or $0.00044 per kilometer.

This is sourced from the ATAP Guidelines – environmental parameter values.

CPI was used to inflate the value to present day dollars.

= (unit cost of noise pollution per kilometer * CPI inflation to 2022) * total kilometers

Biodiversity cost

Biodiversity cost is determined based on the proportion of journey potentially impacting biodiversity, number of return trips and the biodiversity externality cost (rural) for heavy combination vehicles for heavy combination vehicles.

Rural values were selected to ensure conservative calculations.

The freight transport biodiversity cost is $31.5 AUD per vkt or $0.0315 per kilometer.

This is sourced from the ATAP Guidelines – environmental parameter values.

CPI was used to inflate the value to present day dollars.

= Proportion of journey potentially impacting biodiversity * number of return trips * Biodiversity externality cost (rural) for heavy combination vehicles

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for heavy combination vehicles ($/vkt) * CPI inflation to 2022

Water and vehicle run-off costs

Water and soil cost is determined based on the proportion of journey potentially impacted by vehicle run-off, number of return trips and the soil and water externality cost (rural) for heavy combination vehicles.

Rural values were selected to ensure conservative calculations.

The freight transport soil and water cost is $10.83 AUD per VKT or $0.01083 per kilometer.

This is sourced from the ATAP Guidelines – environmental parameter values.

CPI was used to inflate the value to present day dollars.

= Proportion of journey potentially impacted by vehicle run-off * number of return trips * soil and water externality cost (rural) for heavy combination vehicles ($/vkt) * CPI inflation to 2022

Commodity calculator

The commodity calculator calculates the cost of transporting the commodity for the specific scenario. This is determined based on total load, journey length and cost of the commodity per tonne kilometer.

= (Journey length (kms) (single direction) * Total load (t)) * Cost per tonne kilometre ($)

Users have the option of increasing or reducing the trip distance, to determine the increase or decrease in transport cost.

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