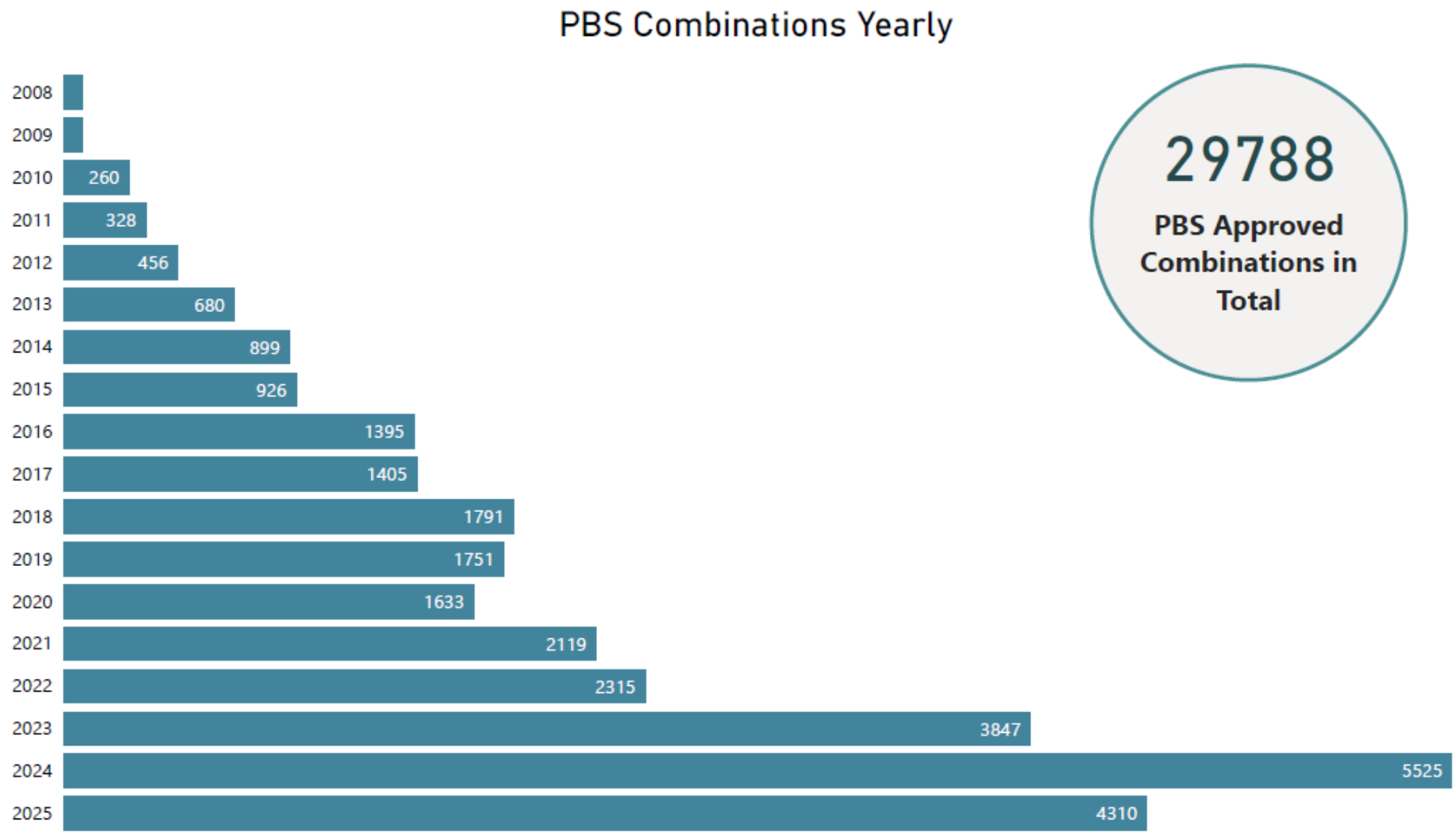
PBS Vehicles and their impacts on infrastructure

IRTENZ 19th International Conference 2025

Les Bruzsa, Chief Engineer – National Heavy Vehicle Regulator

PBS statistics

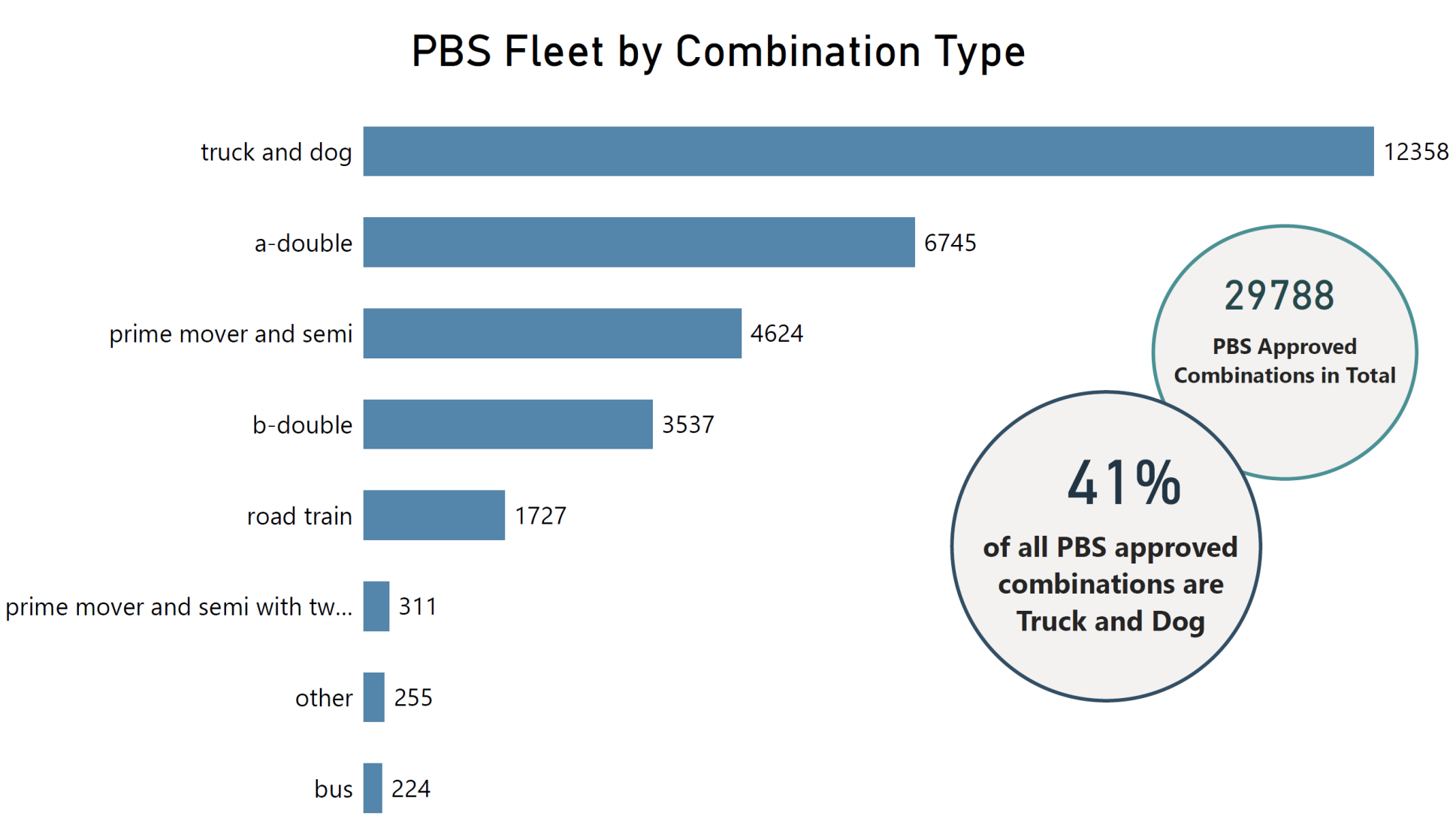
PBS Statistics



29788

PBS Approved Combinations in Total

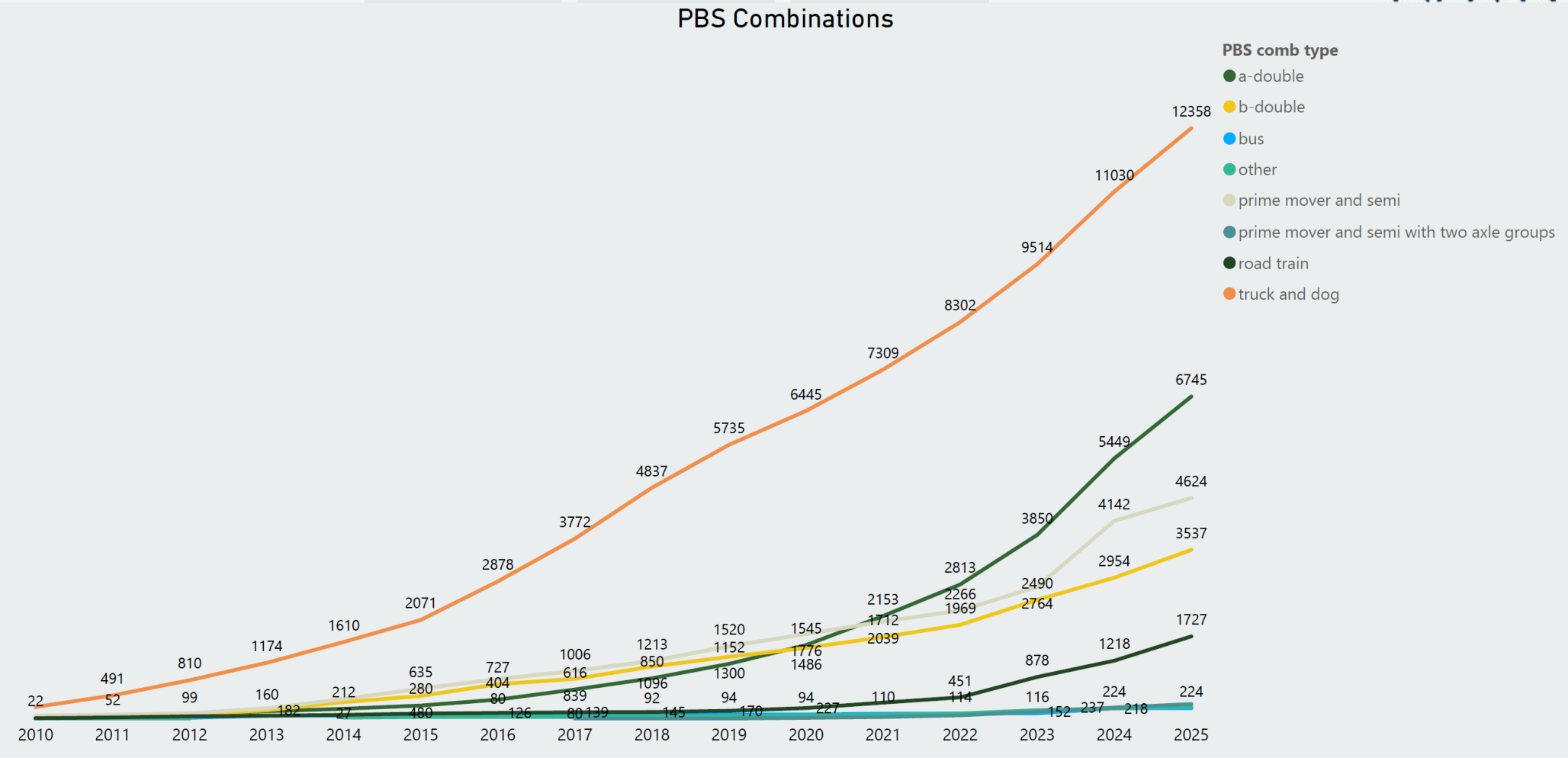
PBS Statistics



PBS Statistics

PBS Fleet

PBS Comb Count	Total VIN Count	Unique VIN Count
29788	155710	71517



Reforms can take time (Oct 12 2012)

NTC AUSTRALIA

Other Challenges

- Bridge and Route assessments
- Consistency in access conditions
- Resources and funding
- Education and community perception
- PBS Level 3 & 4 Review
- Braking standards – deemed to comply provisions
- Vehicle Width
- Jurisdictional flavours

NHVR

Historic benefits (2008 – 2025)

28,000+
PBS vehicles

Australia's safest, cleanest and most productive heavy vehicle fleet

8,900
Fewer trucks to transport the same freight task

5.4b km
Less distance travelled

7,290 years
Less travel time
84.8km/h travel speed

209
Deaths avoided

186
Fatal crashes prevented

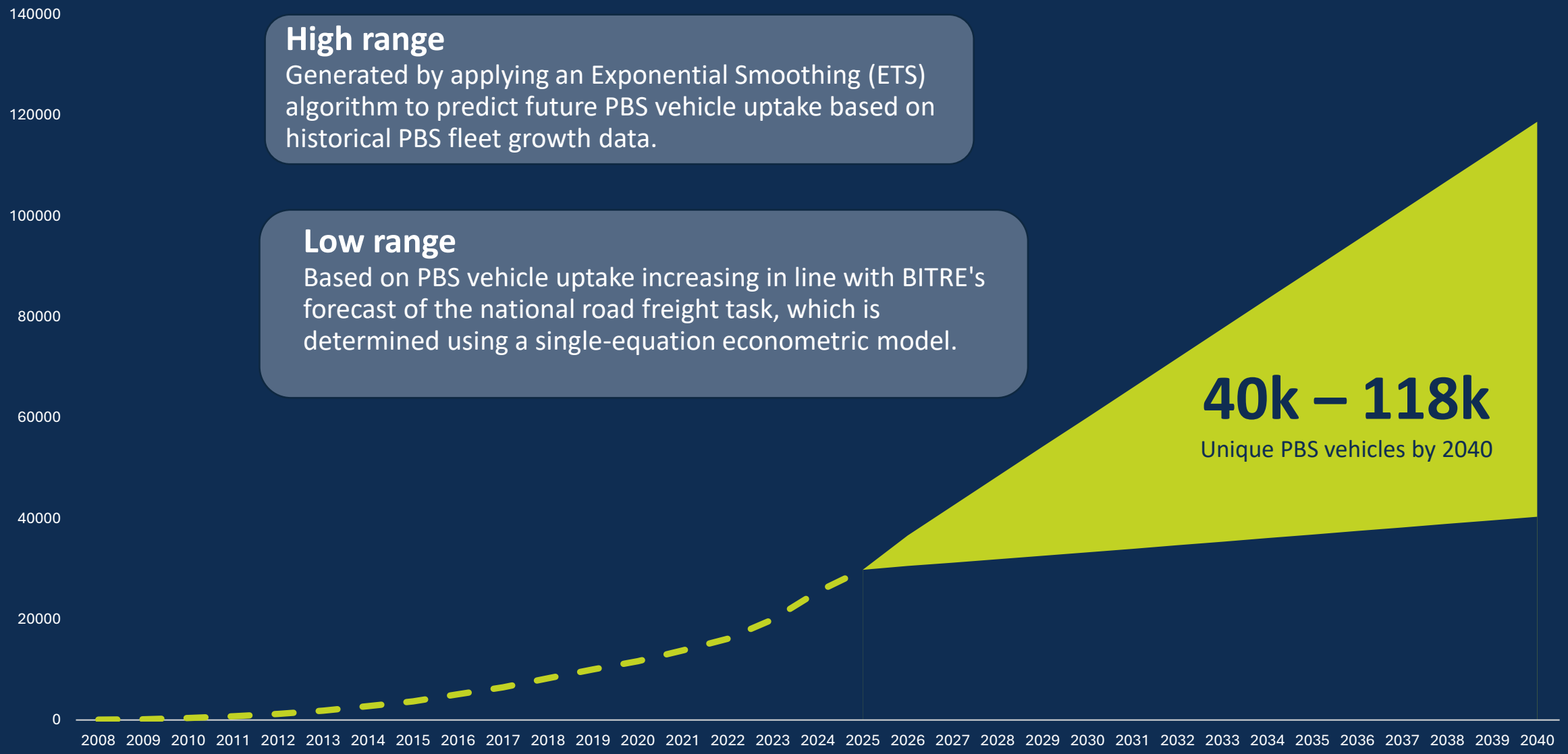
$2.2b
Cost of crashes avoided

2.38b L
Less fuel consumption

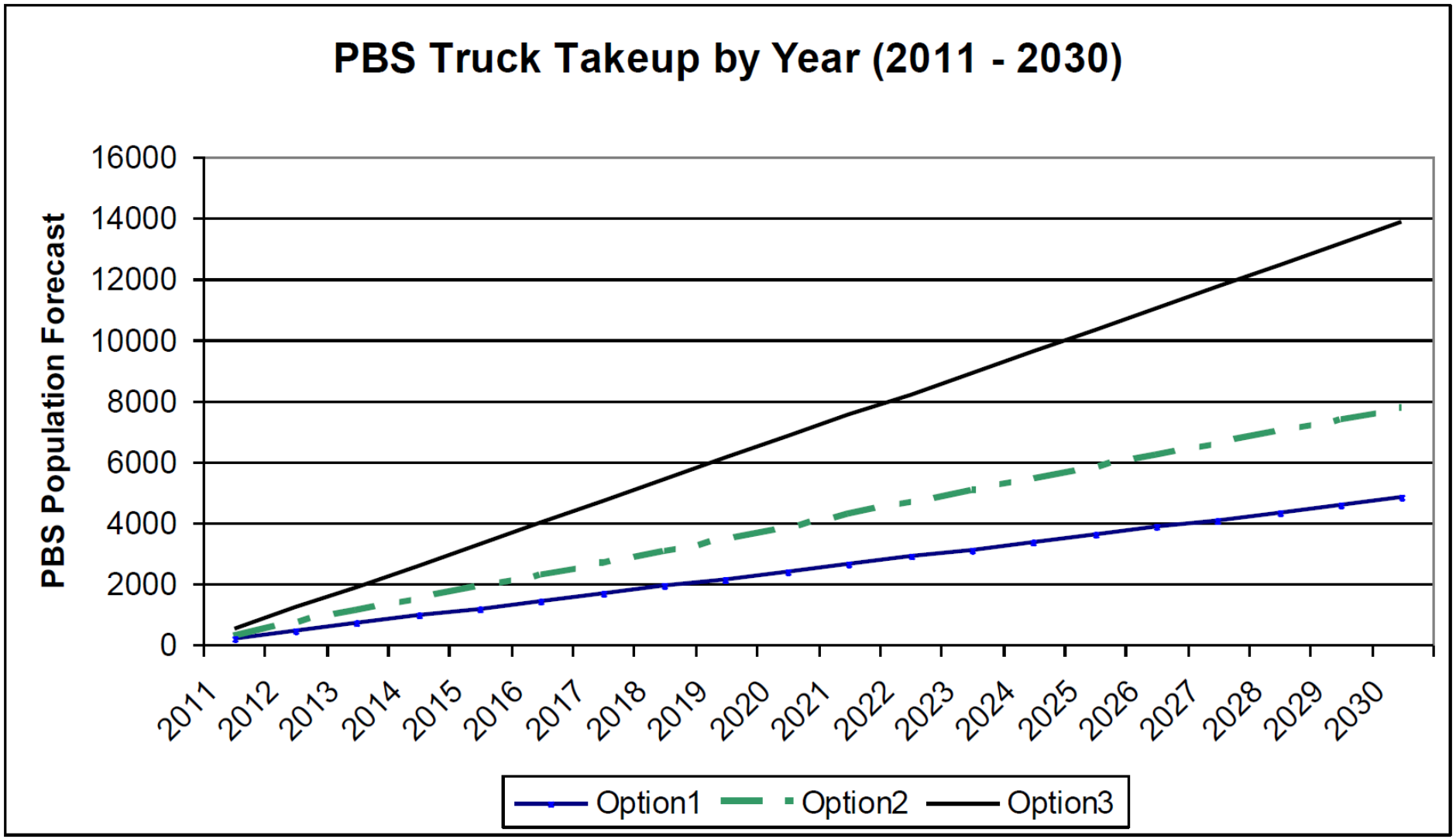
6.38m t
Less CO2 emissions

$45.8m
Cost of CO2 saved

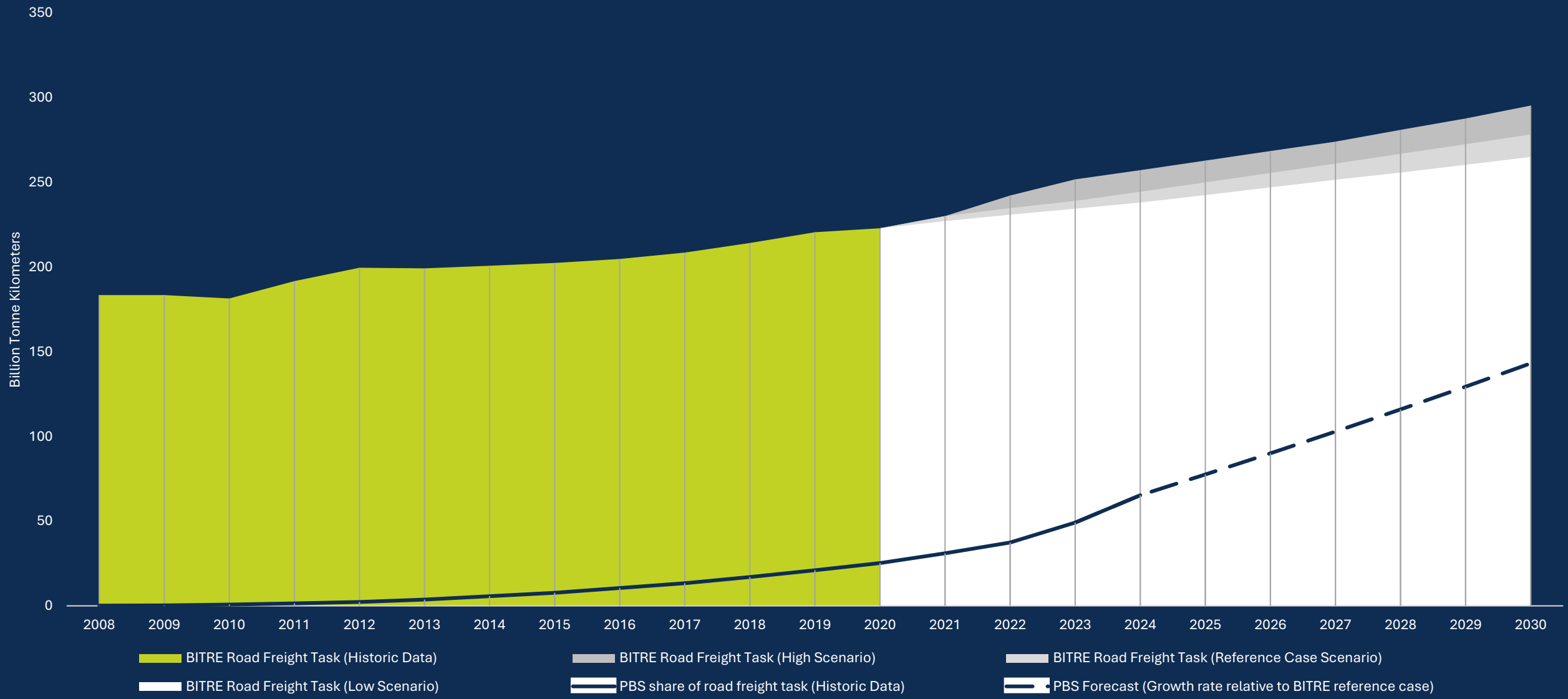
Growth in PBS



PBS RIS in 2012



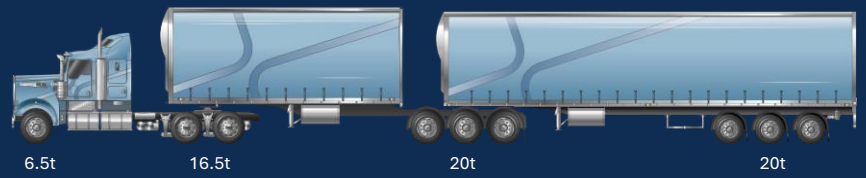
PBS operational share of Australia's road freight task



Comparing apples with apples

Vehicle comparison over a million-tonne kilometer freight task

(transporting 10,000t over 100km)



Conventional 9-axle B-Double
63t Gross combination mass
37.49t Payload
No Road-friendly suspension

Vs

PBS level 11-axle A-Double
85.5t Gross combination mass
56.48t Payload
Road friendly suspension

Kilometers travelled	Vehicle operating cost	Likelihood of being involved in a fatal crash	Fuel consumption	CO2 emissions	Pavement damage for a single trip	Pavement damage for multiple trips
-33% 17,800km reduction	-19% $17k reduction	-79% fatal crash probability reduction	-23% 6,800L reduction	-23% 18.19t reduction	57-133% *More* damaging Depending on pavement surface type	4-35% *Less* damaging Depending on pavement surface type

NHVR tools to evaluate freight vehicle impacts

Freight PASS

Comparing productivity, safety, and sustainability performance across a freight task between heavy vehicle combinations.

Pavement Impact Comparison Calculator

Assists users to estimate vertical pavement wear effects and costs from use of heavy freight vehicles. It considers various factors like different pavement types, vehicle configurations, axle configurations, axle masses, tyre sizes, and road-friendly suspension, offering a wide-ranging analysis.

Dispelling the notion that larger vehicles are inherently more dangerous or polluting by providing an apples-to-apples comparison of heavy vehicle performance

Beta released in 2024, enhanced tools coming soon…

Key new features include:

- Configure over 11 million variations of freight vehicles by unit type and axle group
- Expanded list of productivity, safety and sustainability comparison measures - including for electric and hydrogen vehicle environmental performance
- Pavement wear calculations for quad, quin and split axle groups (with and without RFS)

NHVR tools to reduce the permit burden

Historic Access Reporting Tool (HART)

Enables the NHVR and road managers to filter and analyse access permit application data, supporting a deeper understanding of past decisions

Access Permit Rapid CBA

Enables a clearer understanding of the potential costs associated with heavy vehicle access permit processing and the financial benefits associated with red-tape reduction

Used together, these tools can help road managers increase their productivity, by identifying permit applications for the same vehicle type that are being submitted and approved repeatedly

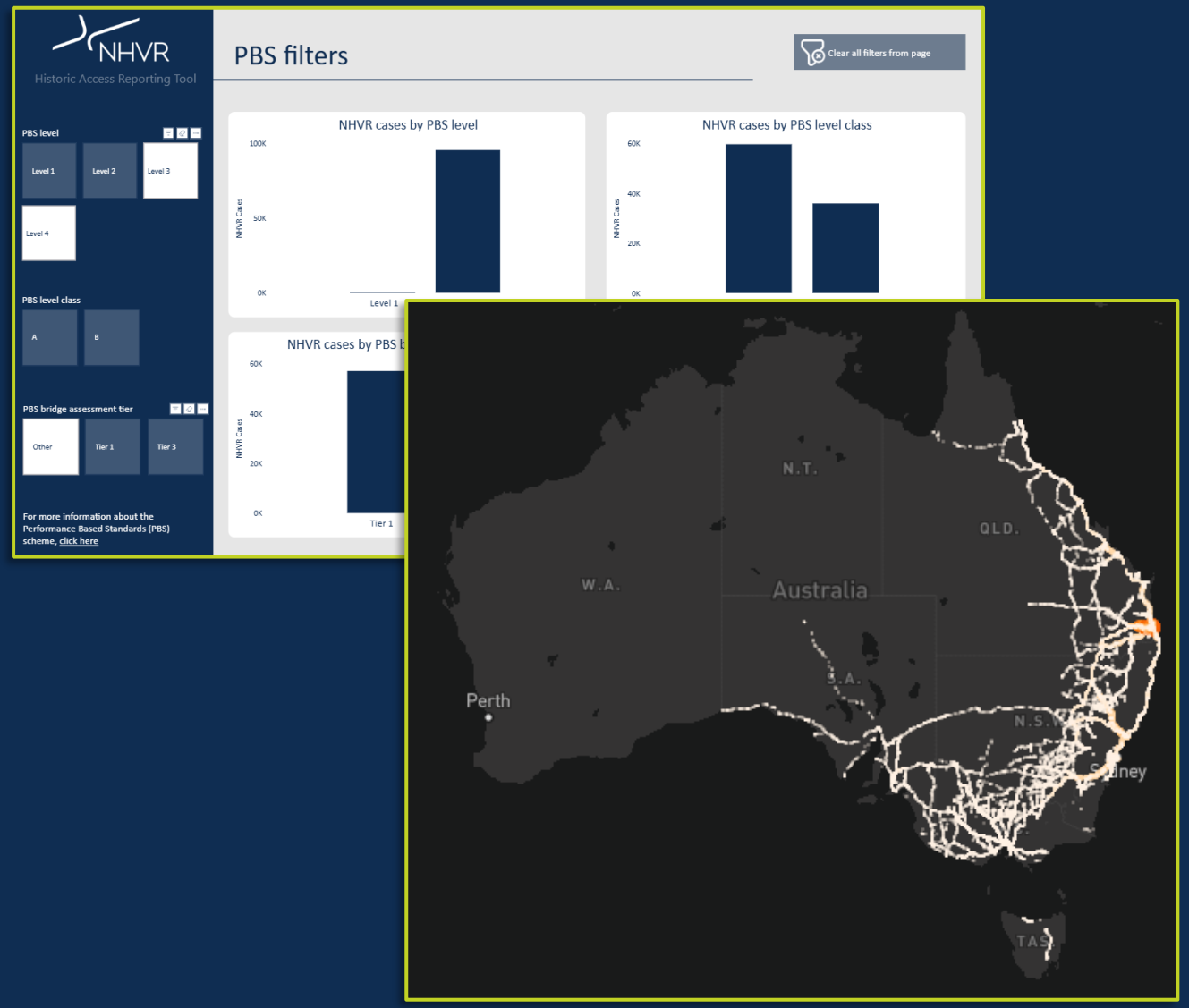
Optimising access

The HART and Rapid CBA allows for:

Easy identification of existing and past usage of road network by PBS vehicles

Highlights burden of permit-based access regimes

Provides supporting evidence for optimising access through red-tape reduction



15 000+

PBS permit applications in 2024

$16.7 million

Combined administrative cost to industry and government

HVSAP

Heavy Vehicle Structural Assessment Permit System (HVSAPS)

- HVSAPS replaces the manual assessments conducted by bridge engineers.
- HVSAPS has been designed to assess
  - Class 1 vehicles—mobile cranes and platform trailers–and
  - Class 2 vehicles—larger freight combinations such as A-Doubles and B-Triples
- HVSAPS has also been future-proofed to assess unique, innovative vehicle types that are starting to emerge on the market—heavier electric vehicles and split axle trailers—and combinations yet to be imagined
- HVSAPS connects directly to the NHVR Portal
- It will be launched on January 1. It will reduce permit turn-around times from months and weeks to days and, in some cases, minutes

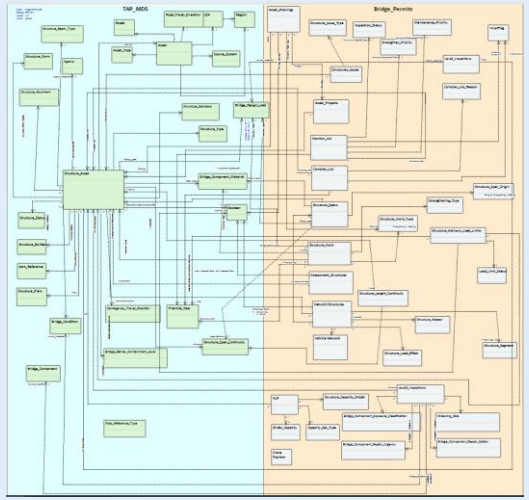
NHVR

Source: DTP Victoria

The current heavy vehicle permit process

Operator Applying for access

In the NHVR Portal



DTP manually process

Returns the results

Access, conditional access or no access

Months of backlog and $$$ to Class 2 operator

Source: DTP Victoria

HVSAPS – end to end process

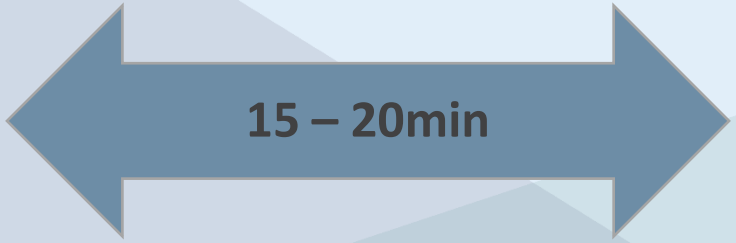
Operator Applying for access

In the NHVR Portal

DTP bridge assessment

Returns the results

Access, conditional access or no access



Source: DTP Victoria

National Automated Access System (NAAS)

NAAS

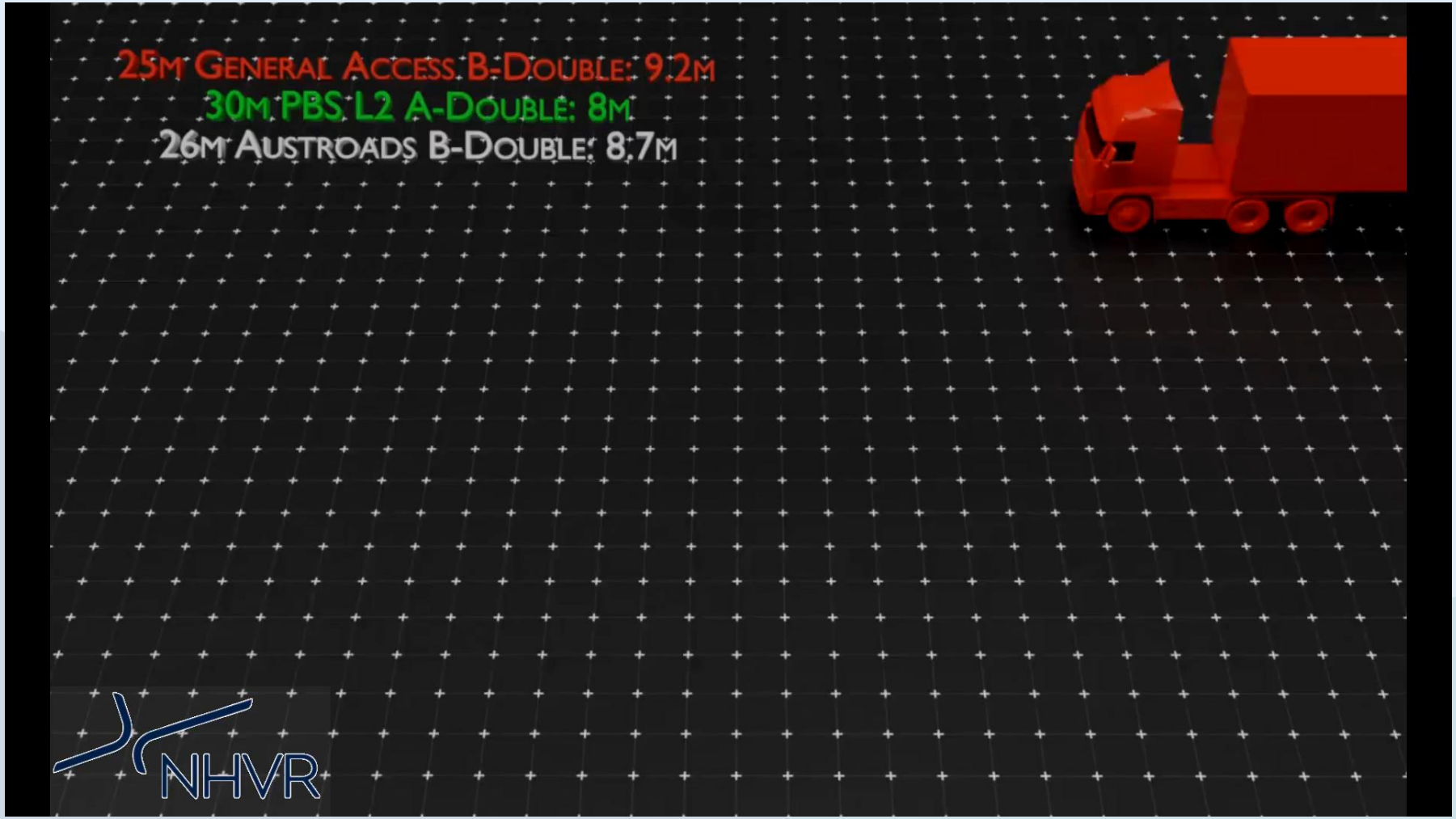
- Being developed by Austroads with parter agencies
- To improve access permit and network management
- NHVR will provide the platform through the NHVR Portal and National Network Map
- Different modules for different vehicle classes (PBS, OSOM etc)
- Certain PBS performance characteristics can be included in the access application
- Low-speed swept path (LSSP)
- Startability
- Gradeability
- Tracking Ability on a Straight Path (TASP)
- High-Speed Transient Offtracking (HSTO)
- Vehicle length

NHVR

Tasmanian Government

Source: Department of State Growth

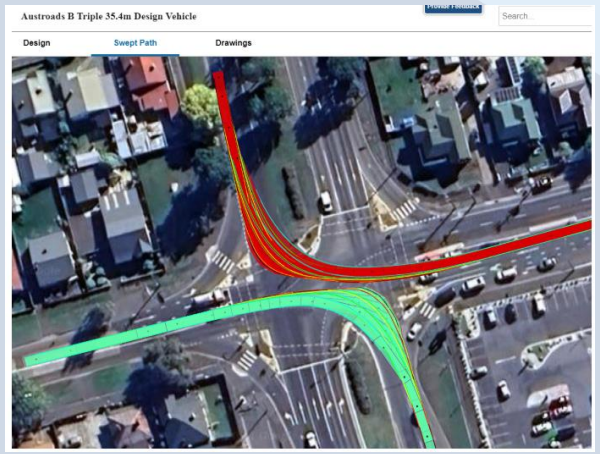
PBS Performance Parameters - LSSP



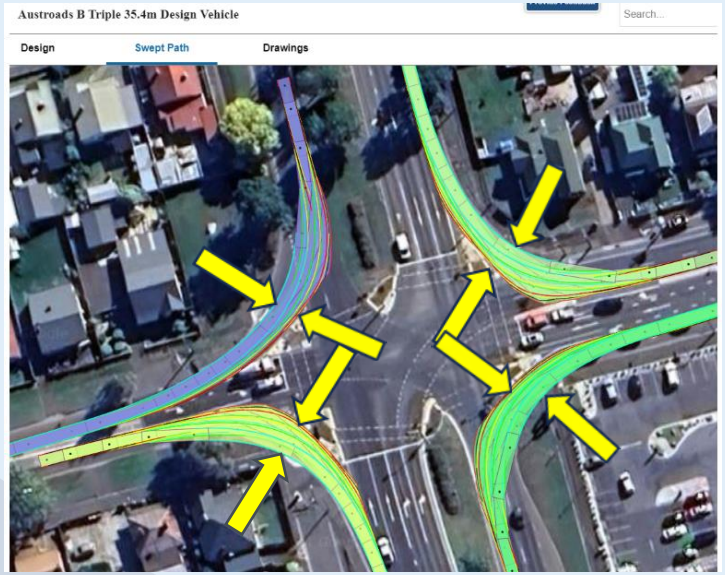
NHVR

PBS Performance Parameters - LSSP

- Reference Vehicles are used to determine LSSP thresholds for all turn options at intersections



35.4m Austroads B-triple (LSSP=10.4m)
OK for all right turn movements



35.4m Austroads B-triple (LSSP=10.4m)
unsuitable for all left turn movements – mounts curbs on left &/or right side of vehicle

<33m long 3-2-3 AD reference (LSSP=9.6m)

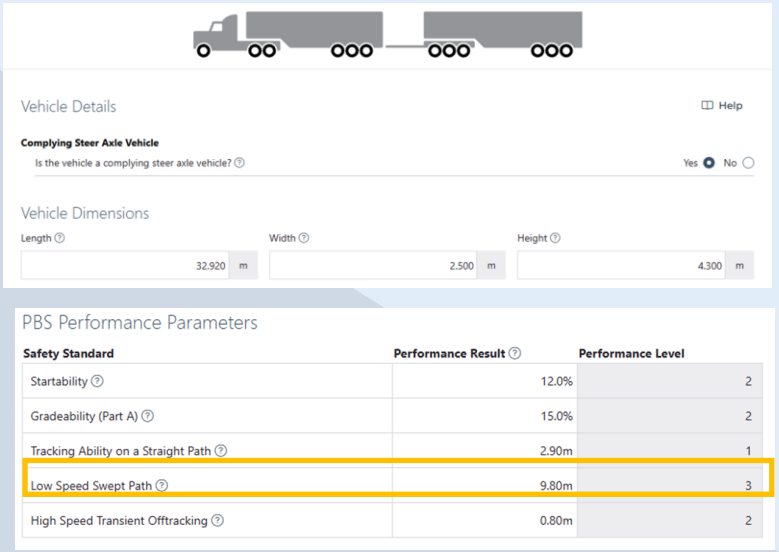
LSSP threshold for these left turn movements set at 9.6m

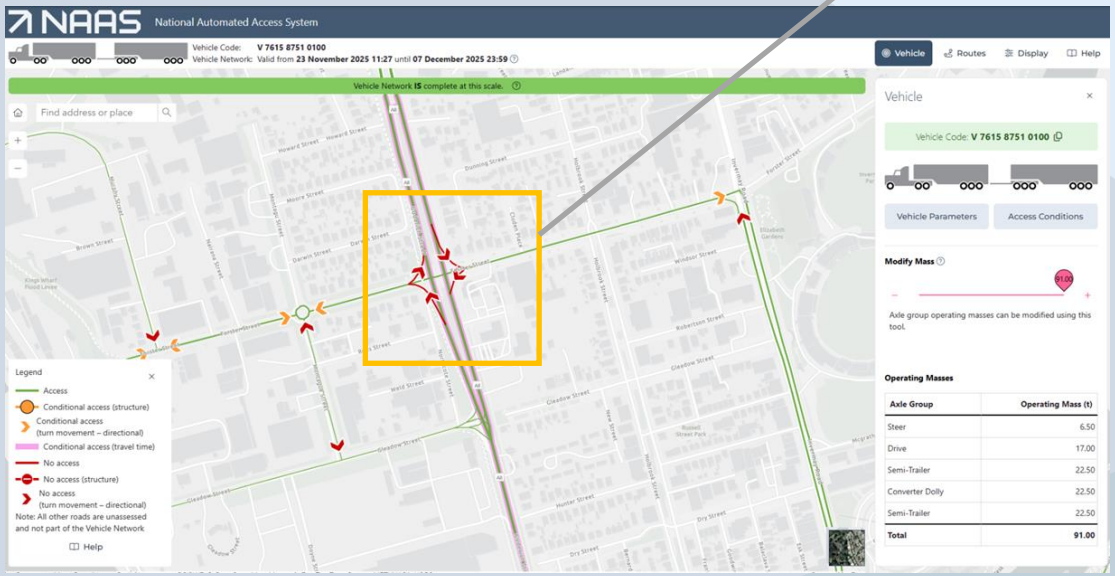
Source: Department of State Growth

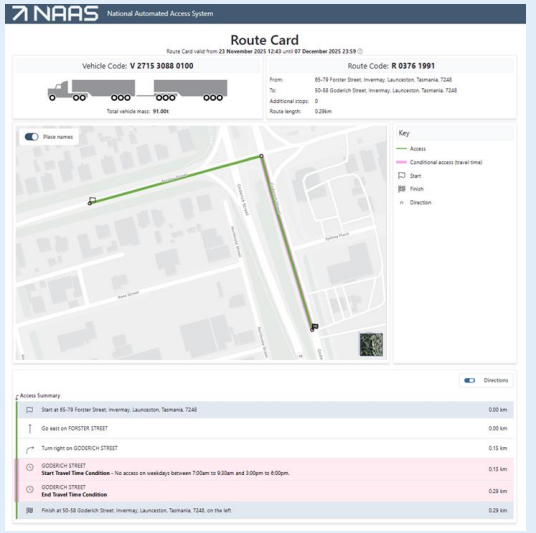
PBS Performance Parameters - LSSP

Based on the LSSP thresholds for turn movements – access is reflected in the NAAS for a PBS combination
This example is a <33m long PBS A-Double with PBS performance for **LSSP of 9.80m**
(i.e. **greater than** LSSP threshold for the Forster St to Goderich St left turns)

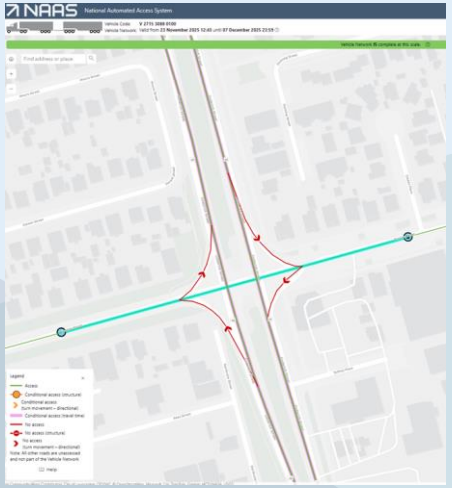
Source: Department of State Growth

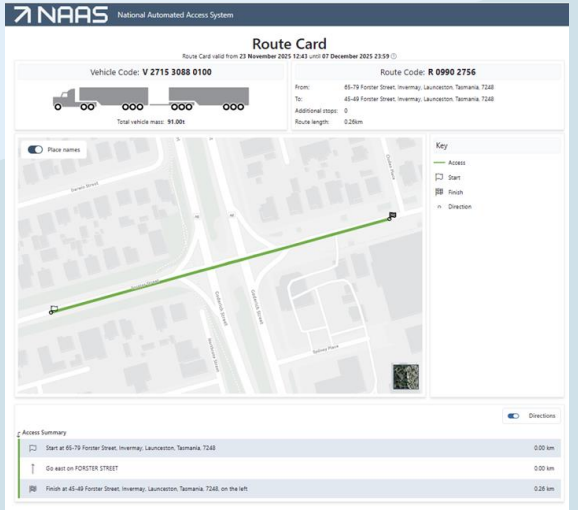






Routes involving right turns (above) or travel straight through the intersection (below) are accepted



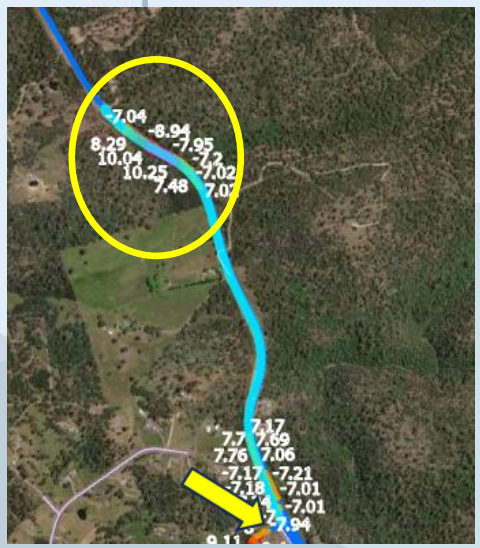


PBS Performance Parameters – Startability and gradeability

PBS Performance Parameters – Startability and gradeability

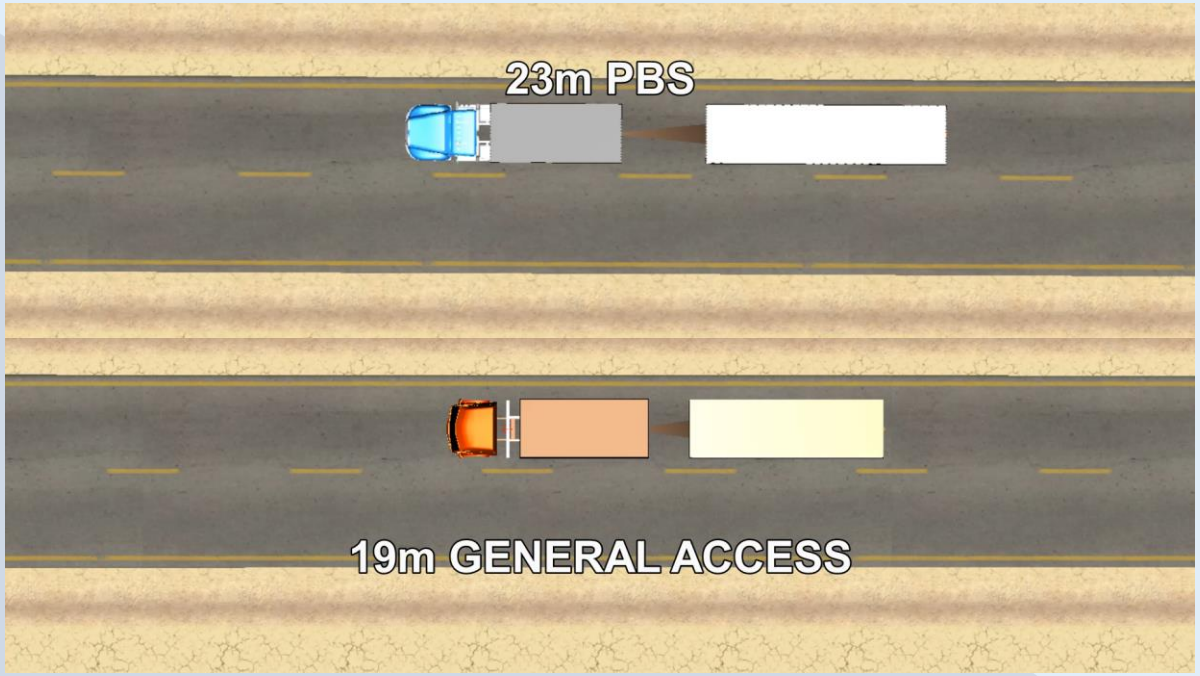
Road gradient measurements (taken at 10-20m intervals) are used to determine thresholds longer road segments This example is on the East Tamar Highway north of Dilston Bypass, where northbound gradient is estimated to exceeds 10.8%

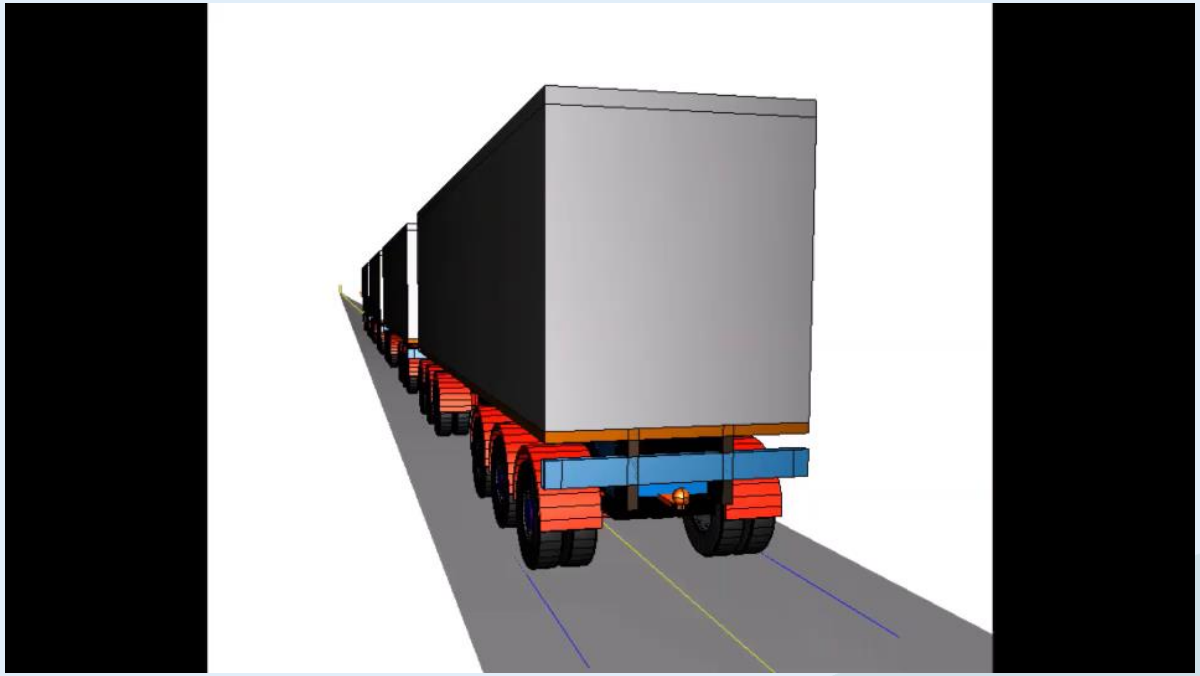
- The northbound carriageway road segments (highlighted aqua) have a 10.9% threshold for applied to them
- This encompasses the section with the higher gradient (circled) and back to the previous major intersection (arrow).



Source: Department of State Growth

PBS Performance Parameters – HSTO and TASP





PBS Performance Parameters – HSTO and TASP

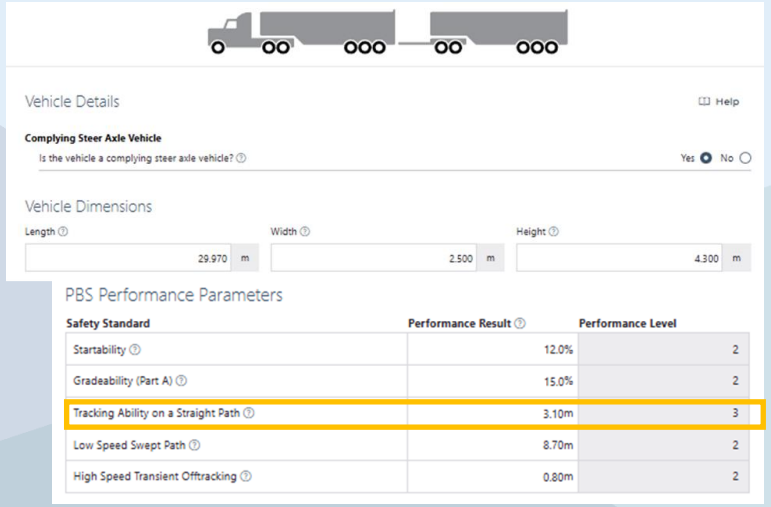
Road segments which have poorer lane & / or shoulder widths may have thresholds for Tracking Ability on a Straight Path (TASP) &/or High-Speed Transient Off-tracking (HSTO) applied to them

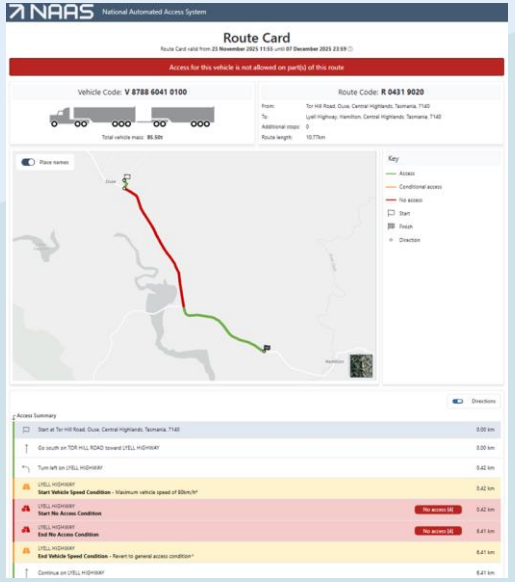
- A relatively short section of the Lyell Highway has relatively poor lane and shoulder width (right image) compared with the remainder of the route (e.g. left image)
- The route along the Lyell Highway is an important dairy route, and therefore the road manager would like to preserve access for A-doubles up to 30m length, but only those vehicles designed with superior PBS performance for TASP and HSTO

For the section of Lyell Hwy highlighted orange:

- TASP threshold is 3.00m
- HSTO threshold is 0.80m

Additionally, an upper speed limit is set at 80km/hr for these vehicles on this section





Source: Department of State Growth

Euro 6

Mass Limits for Euro VI Vehicles

Euro VI vehicles in the PBS scheme are entitled to the same mass increases as prescriptive vehicles, provided a design assessment has been conducted at the increased masses.

1

Euro VI vehicle (complying steer axle)

7 tonnes

Requires: ADR 80/04 engine, front underrun protection device (FUPD), compliant cabin, and tyres with section widths of at least 315mm

2

Euro VI vehicle (single steer axle)

6.5 tonnes

Requires: Engine that complies with ADR 80/04 or later version

3

Euro VI vehicle (twinsteer)

11.5 tonnes

Requires: ADR 80/04 engine, load-sharing suspension system, and tyres with section widths of at least 275mm

PBS Design Approval: Mass Tables

Using a Euro VI vehicle does not automatically allow access to increased mass limits

Re-assessment of combinations at increased Euro VI mass limits is required

DA Mass Tables must include increased Euro VI axle group and total combination masses

Axle Group Masses

The axle mass limits shown in the mass table must reflect the **maximum legal mass limit** for that axle group and **must exclude any mass transfer allowance**.

Mass Transfer

Must be considered in PBS assessment

PBS Assessor has discretion to allow or prohibit

Limiting mass transfer to less than 0.5t is not permitted

Vehicle must meet all Euro VI requirements to be eligible for Mass Transfer

Euro VI Prime Movers in PBS Road Trains

Current Prescriptive Legislation

Under prescriptive legislation, Euro VI prime movers are currently excluded from use in road train combinations.

PBS Scheme Exception

Within the PBS scheme, Euro VI vehicles may be approved for use in road train configurations through an exemption under *Section 8* of the *Heavy Vehicle (General) National Regulation* - **PBS Pavement Vertical Loading Standard non-compliance.**

A 0.5-tonne Euro VI steer axle mass increase—for 7.1t option available under prescriptive legislation to hauling units of road trains fitted with tyres with a section width of at least 375 mm—is **not permitted** under the PBS scheme. **That means that mass increase to 7.6t is not permitted under PBS.**

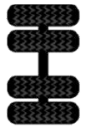
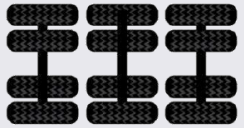
Split axle configurations

Pavement Vertical Loading

- To limit the stress imposed by the vehicle on the layers of the pavement
- Axle loads are specified in MDL
- PBS Vehicles have the same axle load limits as prescriptive combinations
- GML, CML, HML, QML

Axle Group Masses	GML	QML 1	QML 2
Steer (t)	6.5*	6.5*	6.5*
Drive (t)	16.5	17.0	17.0
Semi-Trailer (t)	20.0	21.0	27.0

* Complying steer axle

Axle type	Details	GML (t)
	*Steer axle* *Non steer axle, tyres < 375 mm*	*6.0* *6.0*
	*Pig/tag trailer* *Any other vehicle* *A typical bus*	*8.5* *9.0* *10.0*
	*Single tyres on one ale and dual tyres on the other axle*	*13.0*
	*Pig/tag trailer* *Any other vehicle* *A typical bus*	*15.0* *16.5* *14.0*
	*Vehicles other than a pig trailer with single tyres of width at least 375 mm, or dual tyres*	*20.0*
	*Dual tyres on all groups, steerable rear axle, road-friendly suspension*	*20.0*

More split axle combinations are in PBS

NHVR

Engineering assessment

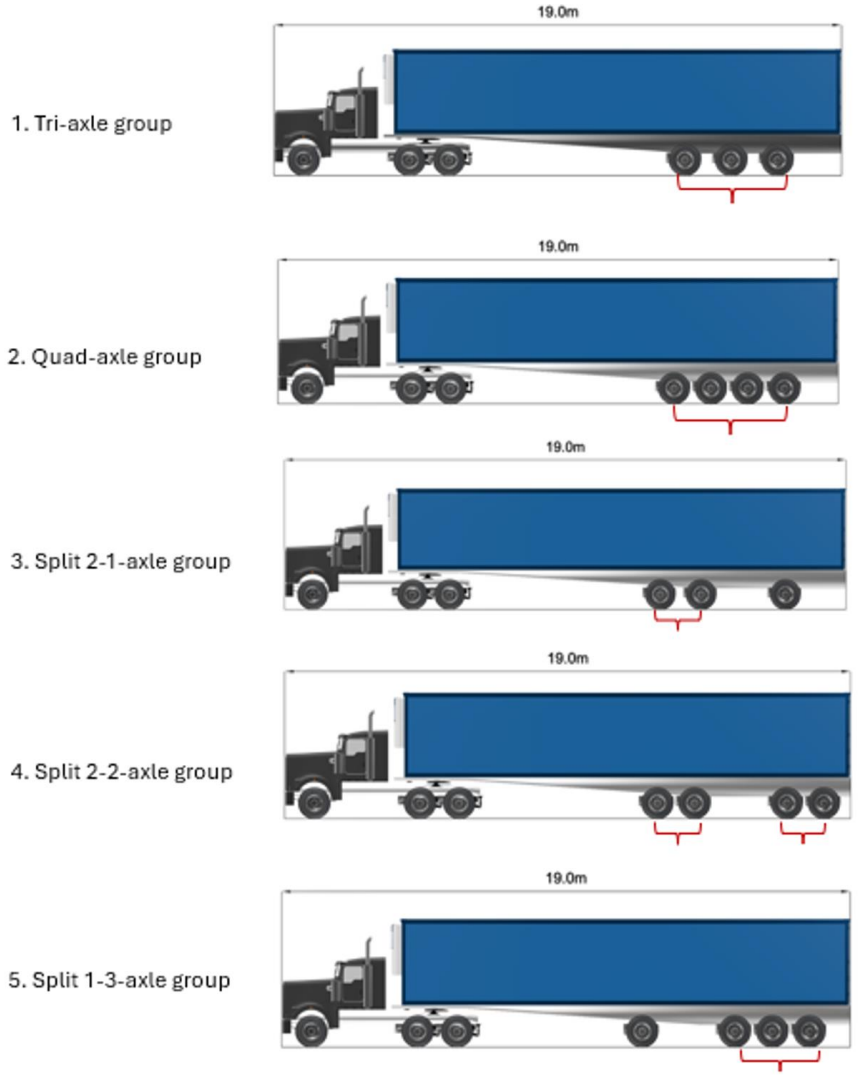
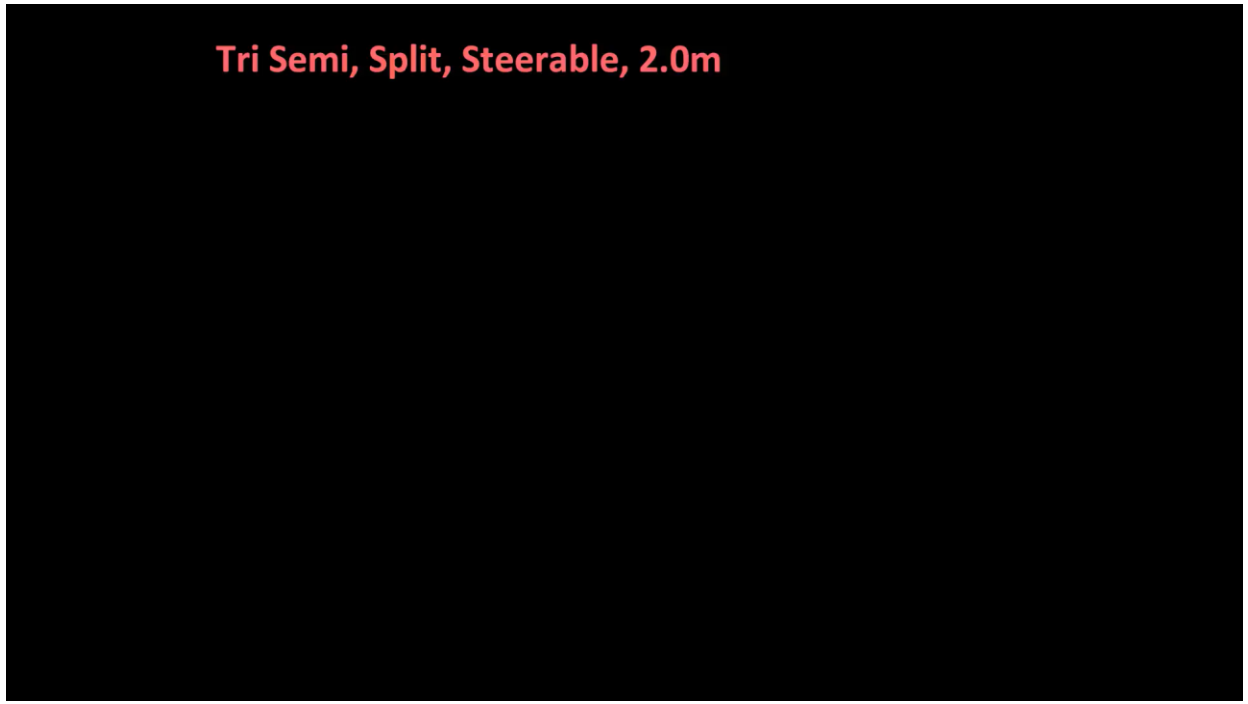


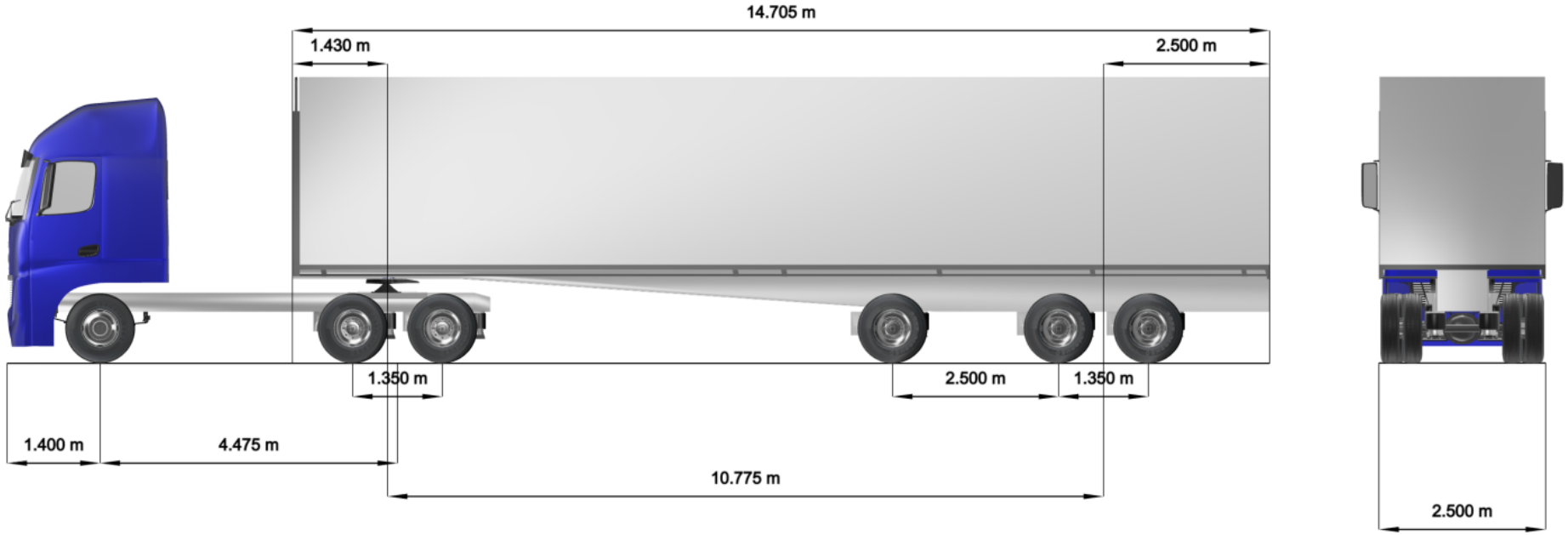
Figure 1 Prime mover semitrailer combinations simulated, GCM of 42.50 tonnes

Aassessments against the proposed PHL standards

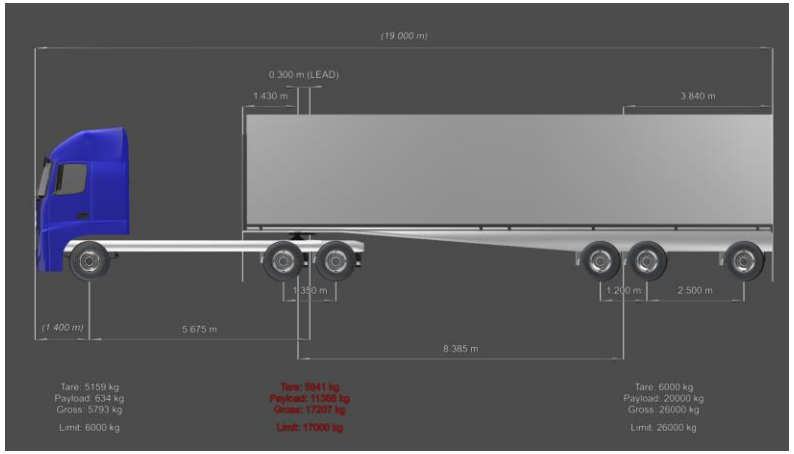


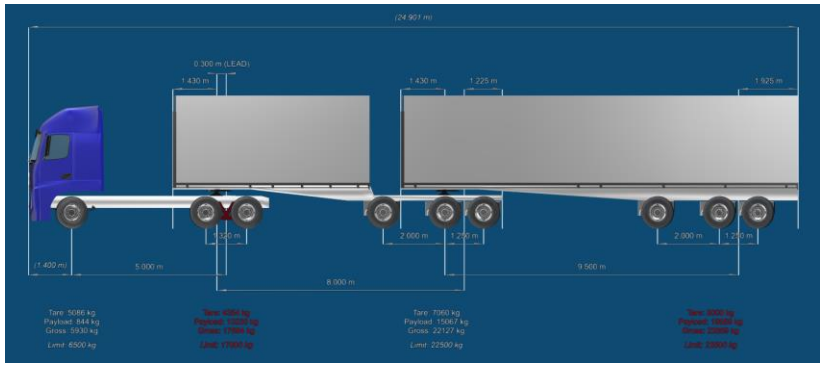
Subject vehicle

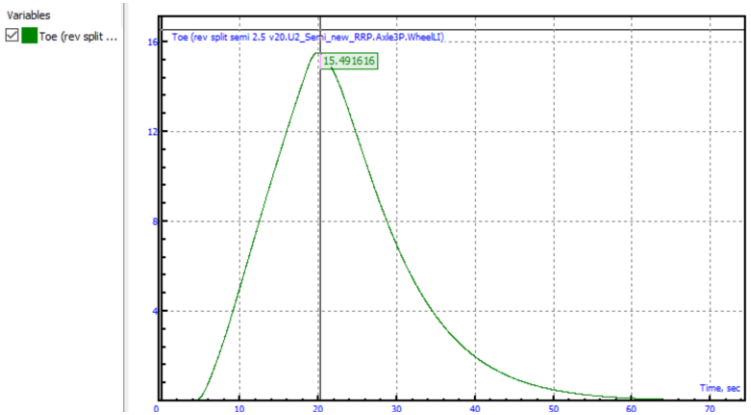
- Split tri-axle group configuration trailer, where the trailer axles can carry up to 26t
- Longer trailer length allows for greater volume of load to be carried when compared to prescriptive semi trailers
- The first trailer axle is steerable with a minimum articulation of 12 degrees

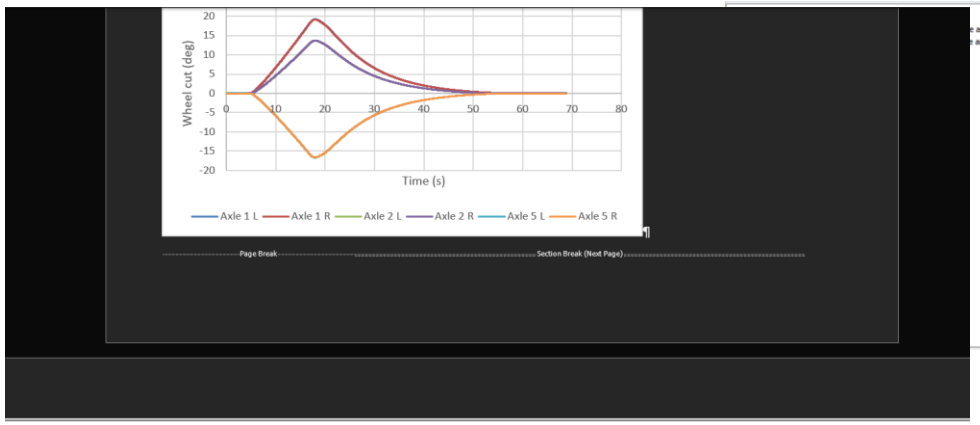


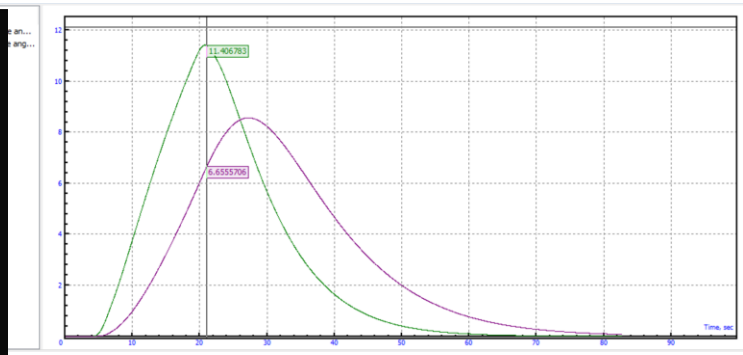
Performance assessments



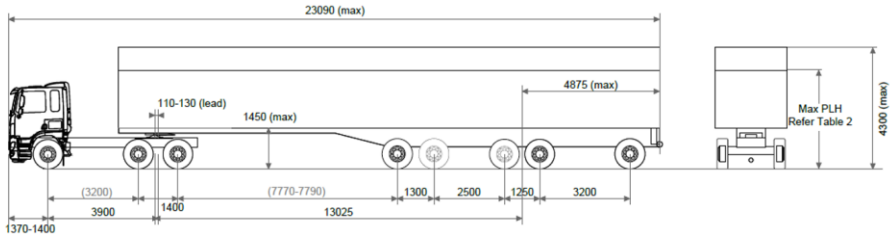








LAYOUT 1

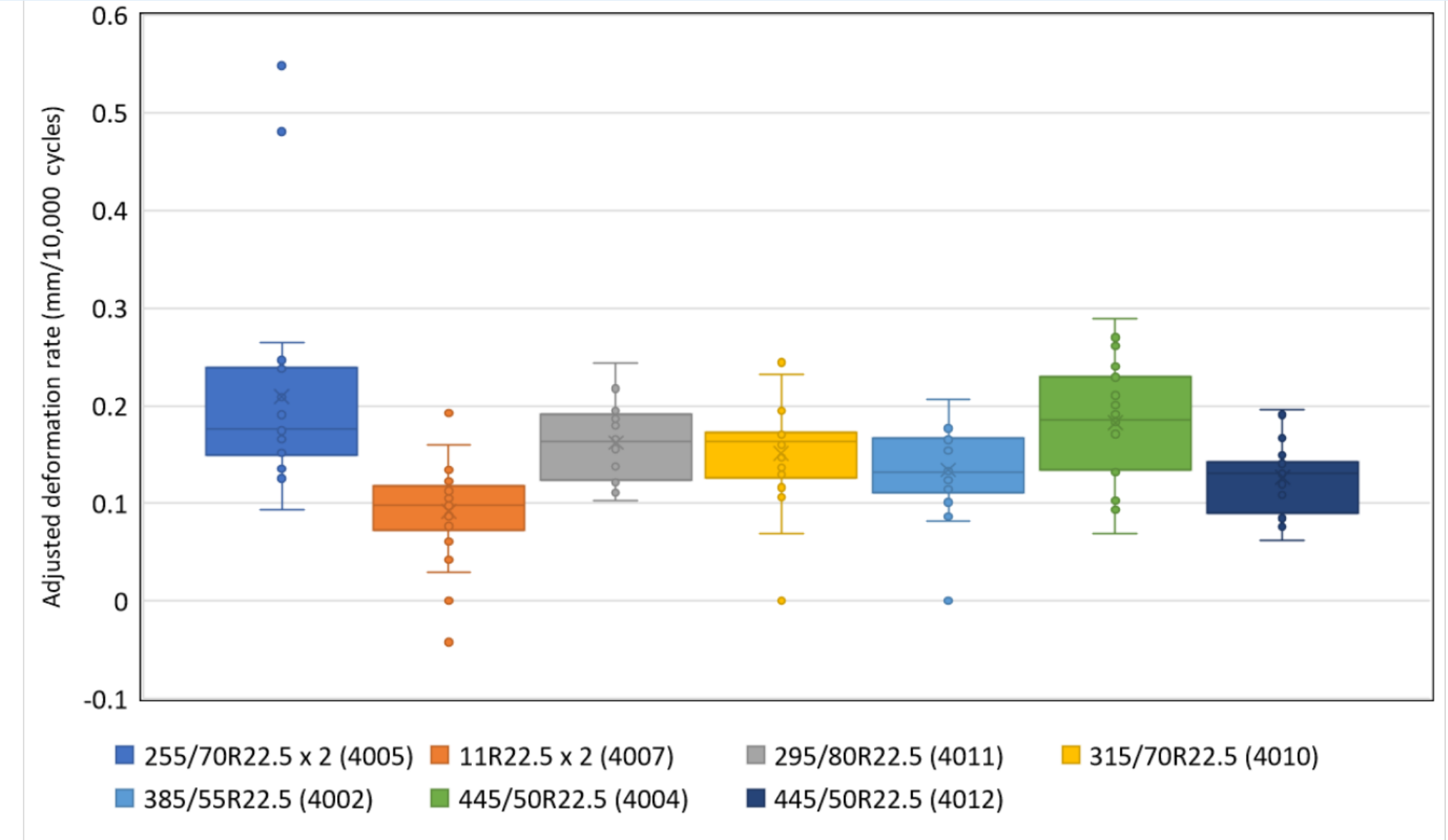


Initial results for existing PBS combinations

Split Axle Group Vehicle Combination	Max self-steering axle articulation
B-Double with three axle groups (2-1-3)	11.4°
A-Double with five axle groups (1-2-3-1-2)	11.0°
PM Semi with two axle groups (1-2)	8.2°
PM Semi with two axle groups (1-3)*	13.4°
PM Semi with two axle groups (2-2)	10.1°
PM Semi with three axle groups (2-2-1)*	17.9°

NHVR

Pavement deformation rates

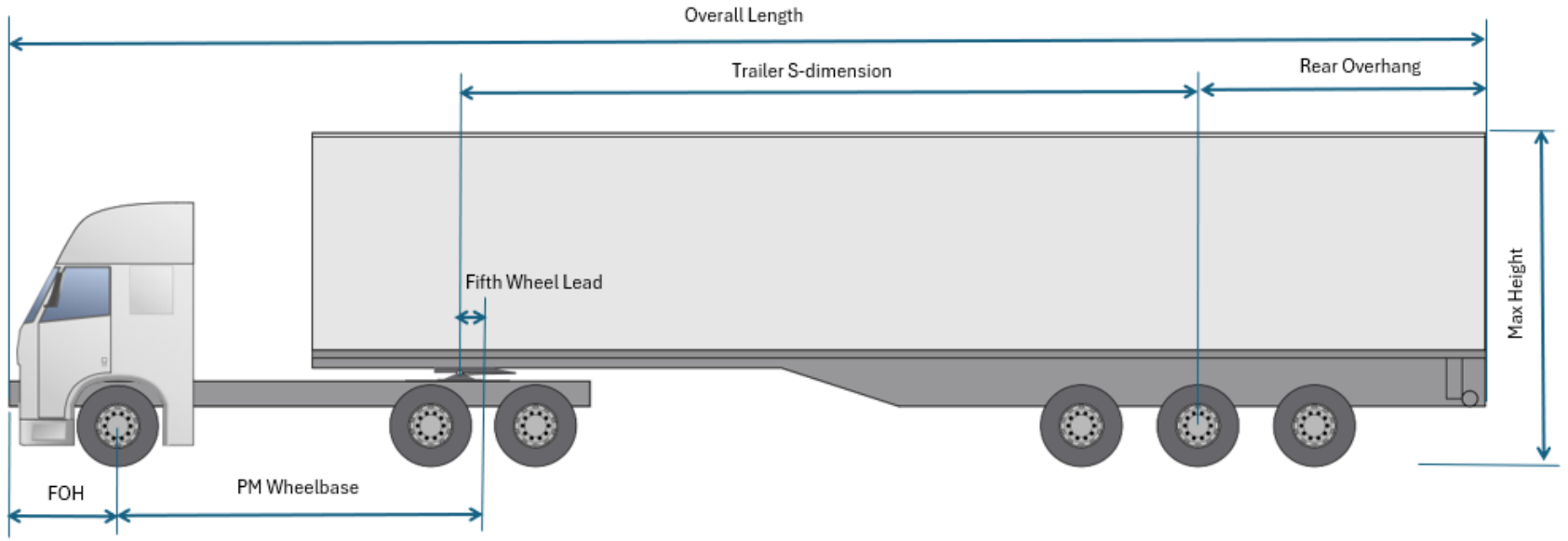


NHVR

Review of the Heavy Vehicle National Law (HVNL)

Proposed changes in dimensions under the review of the law

- NTC has requested the NHVR to perform an engineering assessment to evaluate the safety of specific combinations with an overall length increased from 19m to 20m and height from 4.3m to 4.6m
- Over 100,000 computer simulations were conducted to determine the impact to the amount of road space taken up by these longer combinations
- PBS Level 1 LSSP performance was selected (7.4m) as the acceptable limit for LSSP



Parameters used in the scanning study

Table 1. Parameters used in scanning study

Parameter	Minimum (m)	Maximum (m)	Increment (m)	Number
Prime mover front overhang	1.2	1.6	0.2	3
Prime mover Wheelbase	3.5	7	0.1	36
Trailer S-dimension	8.6	10.5	0.1	20
Trailer rear overhang	2.8	4.0	0.1	13
Prime mover width	2.5	2.55	0.05	2
Trailer width	2.5	2.55	0.05	2

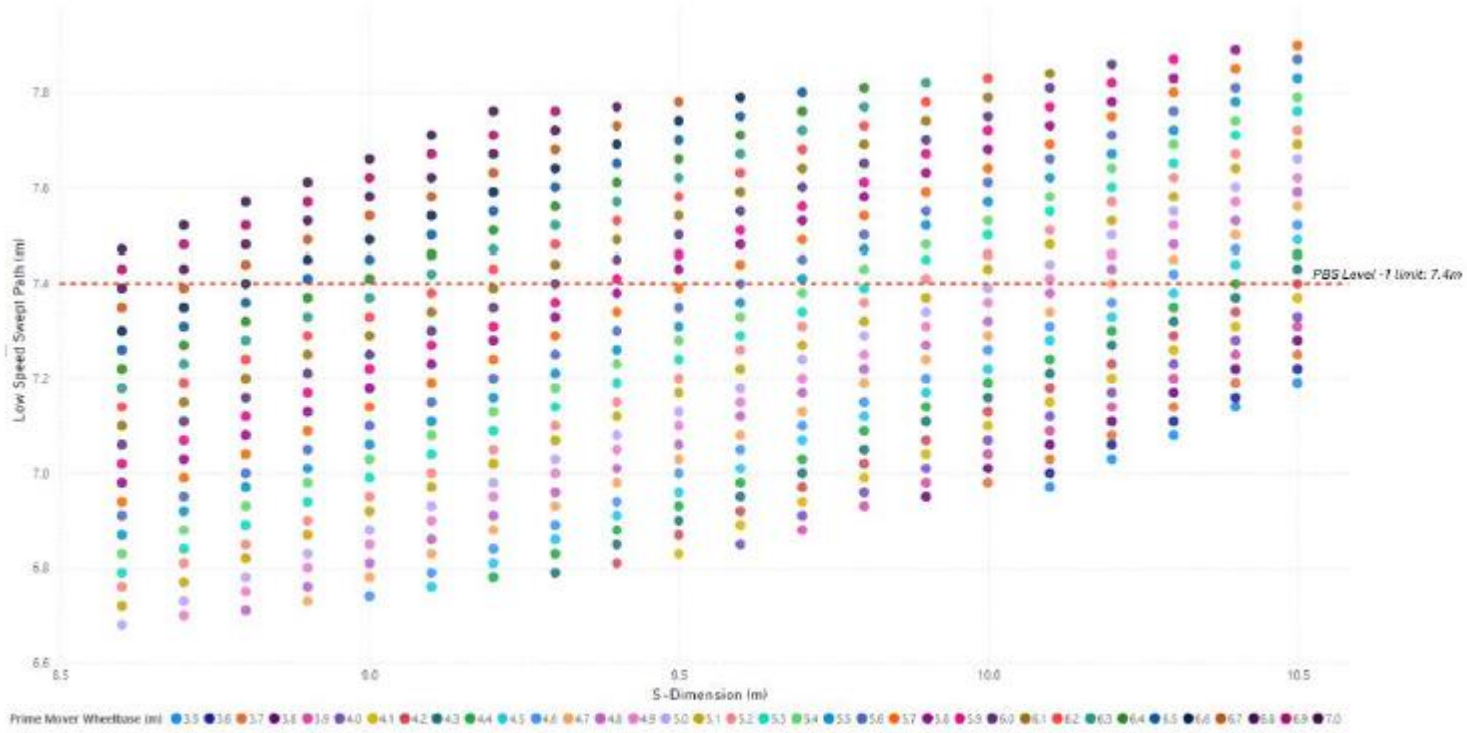
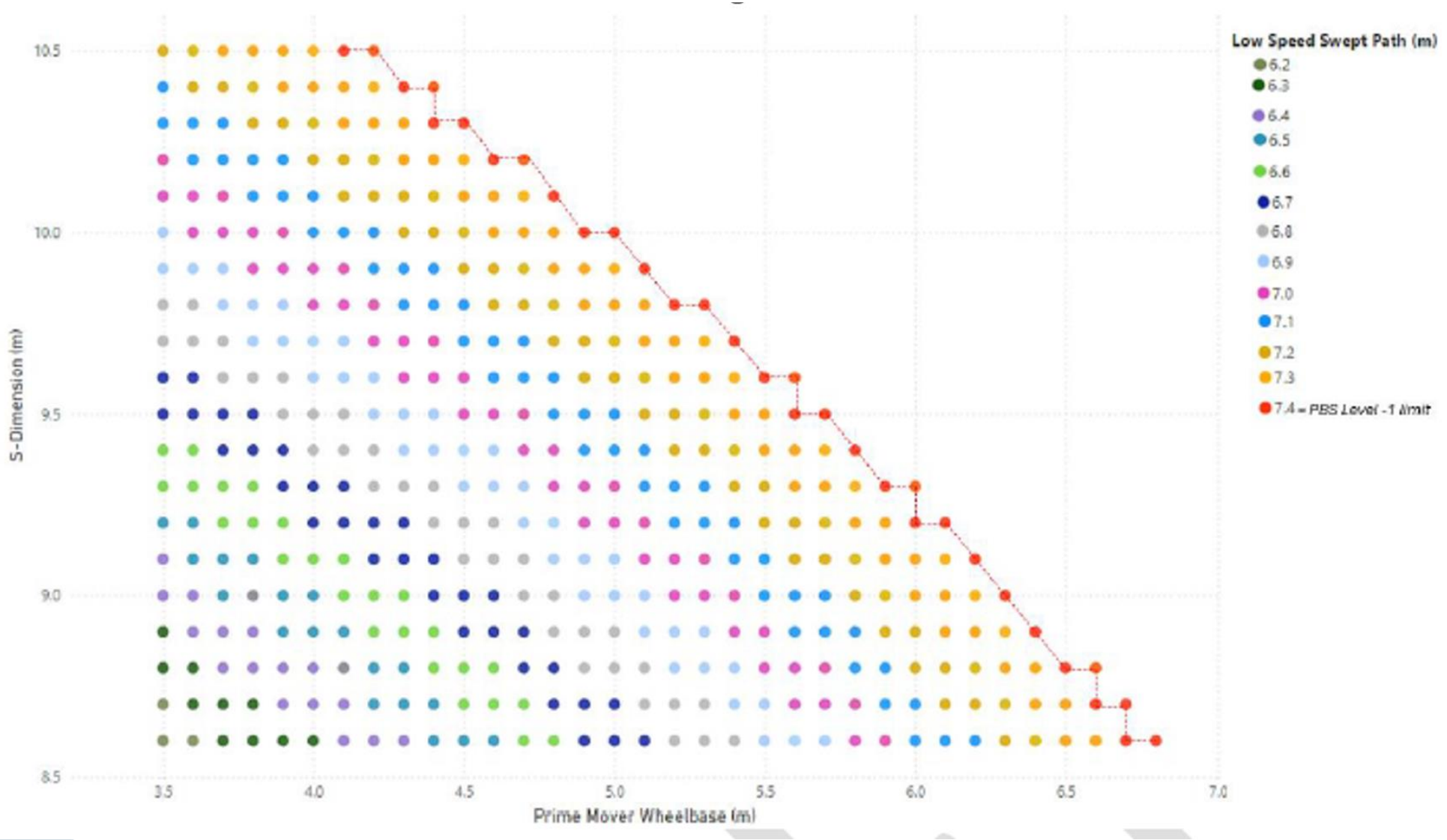


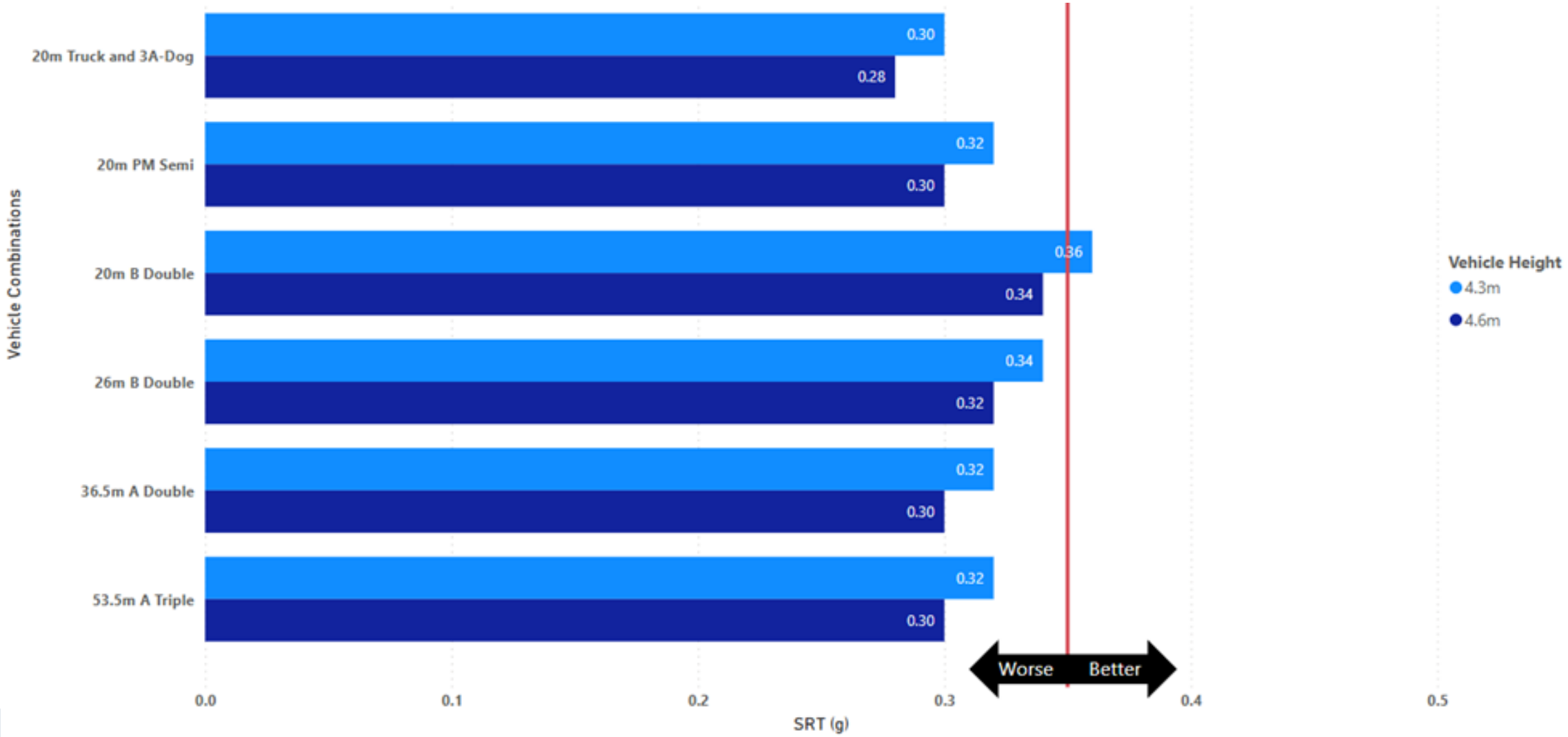
Figure 4 Low Speed Swept Path performance envelope for combinations with overall length 19m - 20m

Relationship between the Pm wheelbase and trailer S-dimension



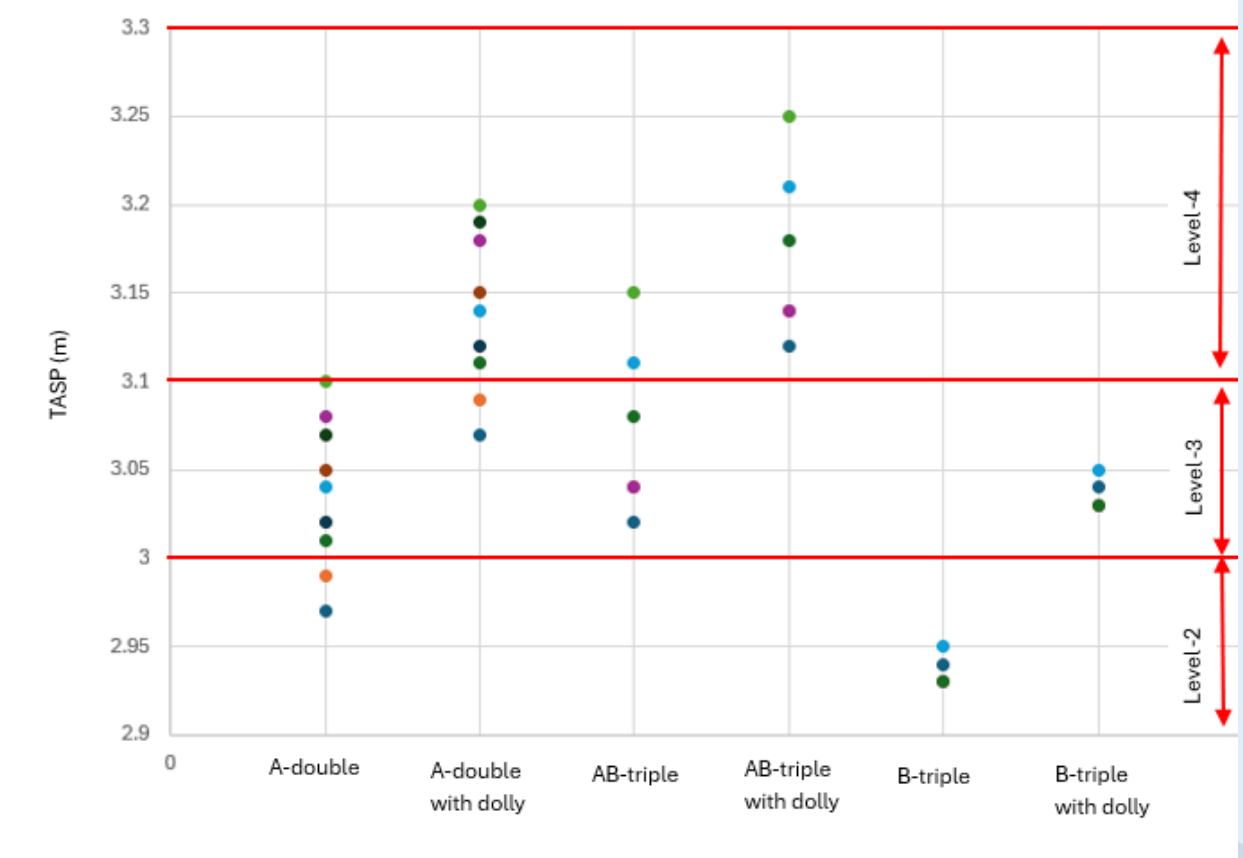
Performance assessments

SRT – 4.3m vs 4.6m – various combinations



Other projects related to the impacts of PBS combinations

Assessment of lane widths

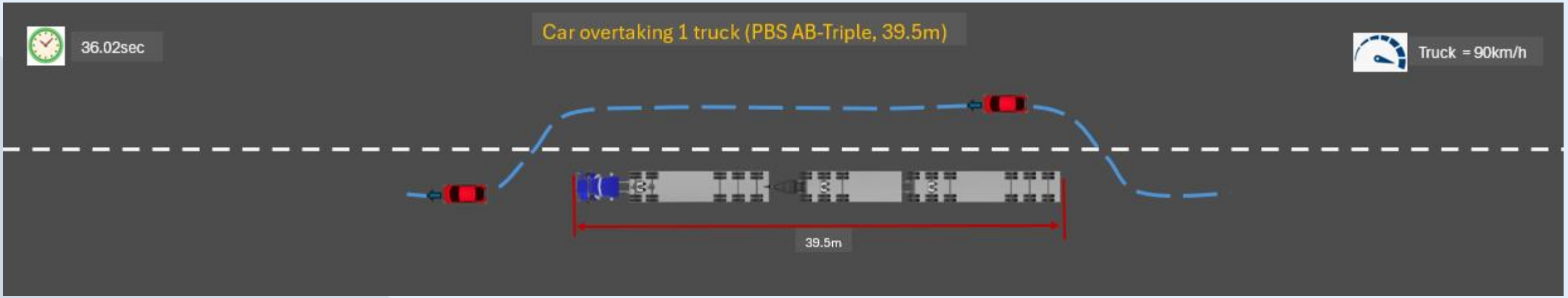


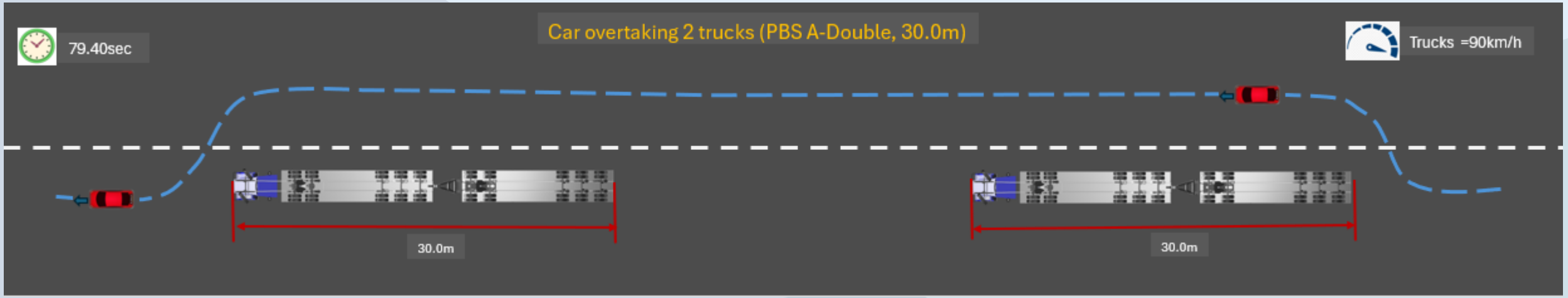
Tracking ability on a straight path (TASP) is the key factor for lane width requirements at high speeds:

- PBS vehicles are assessed for TASP,
- A 39.5m long AB-Triple combination achieved a TASP of just 2.8m
- Non-PBS vehicles are not assessed against TASP requirements
- Simulations show that these vehicle are likely to exceed the performance of the PBS combination and can be as high as 3.25m and as such require more road space than this PBS combination to operate safely, yet they are legally allowed

NHVR

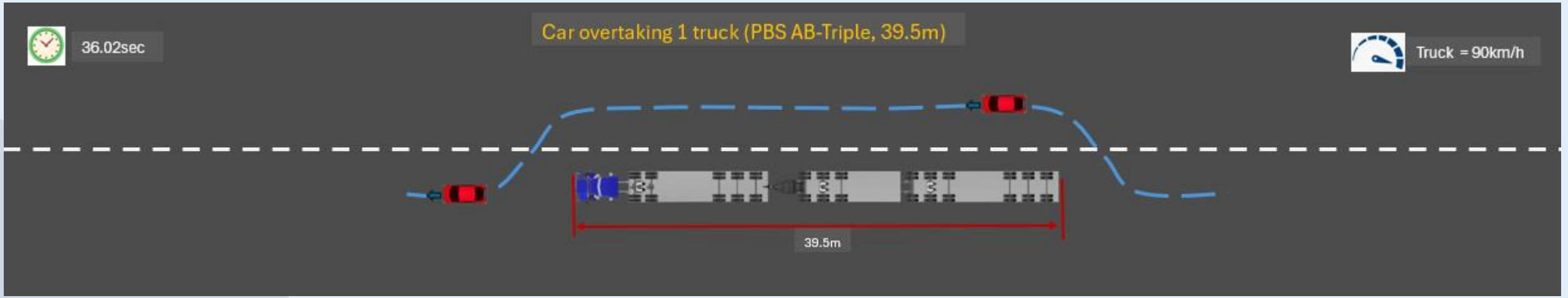
Overtaking time comparison

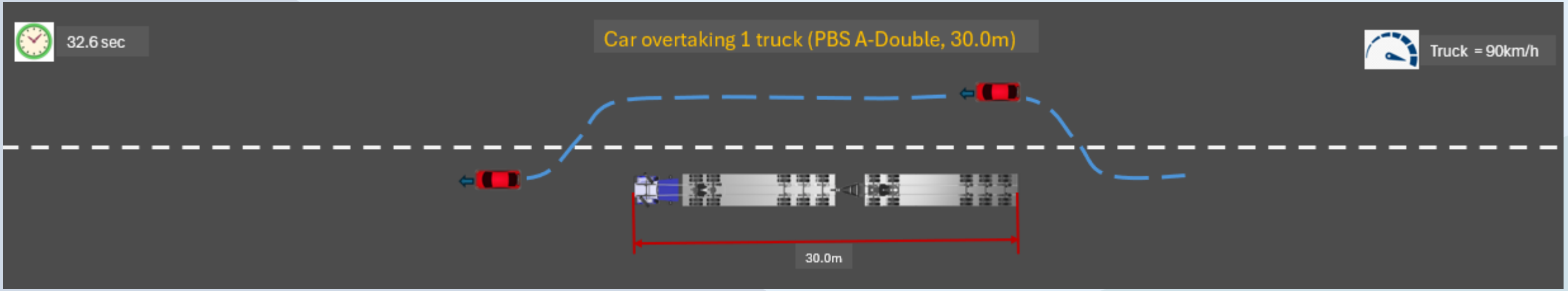




NHVR

Overtaking time comparison





	no of trips	total overtaking time (sec)
30m long trucks	197	6422
39.5m long truck	156	5619

NHVR

THANK YOU