EVALUATION OF A TWO-YEAR TRIAL OF 30-METRE, 77.5-TONNE B-DOUBLES WITH QUAD AXLE GROUPS

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Abstract

The State of Victoria, Australia, has enjoyed 20 years of successful B-double operation at up to 26 metres long and 68 tonnes total mass. In response to continued rapid growth in some specific transport tasks, a two-year trial was undertaken of B-doubles with quad axle groups at up to 30 metres long and 77.5 tonnes total mass. The trial incorporated vehicles transporting shipping containers to and from the Port of Melbourne, on a road network in Melbourne's west, and vehicles transporting woodchip and mineral sands in bulk to the Port of Portland in Victoria's south-west. There were no adverse outcomes in terms of safety, infrastructure impact, compliance or community acceptance of the vehicles. The trial did however uncover a range of issues with the practicality of the vehicle design, the mass limits, the extent of the available network, and other trial conditions.

Keywords: B-double, trial, quad axle, productivity, safety, infrastructure, network

1. Introduction

From 1 September 2009 to 31 August 2011, the Roads Corporation of Victoria (VicRoads) conducted a two-year trial of Higher Productivity Freight Vehicles (HPFVs) under specific conditions on limited road networks in the State of Victoria. This trial is hereafter referred to as ‘the HPFV Trial’ or simply ‘the Trial’.

1.1. Background

In its Freight Network Strategy (Government of Victoria 2008), the previous Victorian Government recommended a trial of HPFVs to satisfy the growing demand for road freight. VicRoads prepared a set of guidelines for the Trial, which defined a suitable HPFV as a B-double up to 30 metres long, with the potential for quad axle groups on one or both trailers, and a gross mass of up to 77.5 tonnes depending on the axle configuration (VicRoads 2009). The Trial was intended for three specific freight tasks in two areas of Victoria:

- Container transport to and from the Port of Melbourne, in Melbourne’s west
- Woodchip and mineral sands transport in the ‘Green Triangle’ in south-west Victoria.

1.2. Container transport to and from the Port of Melbourne

The Port of Melbourne is Australia’s busiest international container port, handling around 37 per cent of Australia’s container traffic. According to the Port of Melbourne Corporation’s 2010-2011 annual report, a 7 per cent increase in container traffic saw the Port handle 2.39 million TEU[1], or around 6,500 TEU per day, in that year. Most of these containers were transported by truck to or from the Port. The Port predicted growth in container traffic to around 8 million TEU by 2035. With the increasing proportion of 40-foot shipping containers being handled by the Port, the productivity benefit of the existing 26-metre B-double for container transport is diminishing because it can only carry one 40-foot shipping container and one 20-foot shipping container. HPFVs, with their ability to carry two 40-foot shipping containers at one time, provide 33 per cent more TEU capacity (100 per cent more if dealing with 40-foot containers alone). An example of a 4 TEU container-carrying HPFV is shown in Figure 1, alongside a conventional 3 TEU container-carrying B-double.

Higher Productivity Freight Vehicle
30m/77.5t – 4 TEU maximum

Conventional B-double
26m/68t – 3 TEU maximum

Figure 1 – HPFV for container transport, compared with conventional B-double

[1] TEU = Twenty-foot Equivalent Unit (a 40-foot container is 2 TEU)

1.3. Woodchip and mineral sands transport in the 'Green Triangle'

The 'Green Triangle' region in south-west Victoria is experiencing a dramatic increase in truck movements due to the harvest of plantation hardwood, much of which is chipped and exported via the Port of Portland. By 2020 there is expected to be 400,000 hectares of plantation hardwood, a 60 per cent increase on 2006 levels. The Port also receives bulk mineral sands from mine sites further north. Without changes in truck operations, there could in future be one truck passing through the town of Portland every 30 seconds. HPFVs with bulk tipping bodies could be used for each of these transport tasks, reducing the potential number of heavy vehicle movements. Examples of HPFVs for woodchip and mineral sands transport are shown in Figure 2.

Figure 2 – HPFVs for woodchip and mineral sands transport

2. The HPFV Trial

2.1. Announcement of the Trial

In September 2009 the Victorian Government announced the HPFV Trial to be conducted by VicRoads on two road networks:

- one in Melbourne's west, connecting the Port of Melbourne and key intermodal freight terminals with major transport operator yards and empty container parks using the Westgate Freeway, Western Ring Road, Hume Freeway, key arterial roads, and local roads (on request and subject to municipal approval)
- one in the Green Triangle region, connecting the Port of Portland to timber plantations and mineral sands mines via the Princes and Henty Highways.

The Trial Guidelines, published by VicRoads (2009), contain maps of the above road networks.

2.2. Trial conditions

The Trial Guidelines set out the conditions of the HPFV Trial. Some aspects of the Guidelines are summarised in the following sections.

Vehicle specifications

The permitted vehicle configuration was a B-double with the following maximum vehicle dimensions:

- 30.0 metres overall length

- 2.5 metres overall width
- 4.3 metres overall height (4.6 metres for certain trailers carrying lightweight freight).

The suggested axle configurations are shown in Figure 3.

Figure 3 – Example HPFV axle configurations

Mass limits

Mass limits were as shown in Table 1. These limits allowed a maximum gross mass of 77.5 tonnes for a quad-quad trailer configuration.

Table 1 – Mass limits

Axle or axle group type	Mass limit (tonnes)
Steer axle	6.0 (or 6.5*)
Tandem axle group	17.0
Triaxle group	22.5
Quad axle group	27.0

* If the prime mover meets the national requirements for 6.5 tonne steer axle mass, described in the VicRoads information bulletin '6.5 Tonnes Steer Axles'.

Travel time restrictions

The Trial included an 'avoid peak hours' policy to keep HPFVs off the Westgate Freeway and Western Ring Road during the periods 6:00 AM – 9:00 AM and 4:00 PM – 6:30 PM.

2.3. Trial evaluation

The Trial was intended to be evaluated in terms of the following five performance indicators:

- **Productivity.** "Quantify the effects of HPFVs on the fleet operations of Trial participants, quantify the utilisation of the Trial network by HPFVs, and infer the economic and environmental benefits to the community that may be attributable to the broader use of HPFVs."
- **Safety.** "Capture and characterise any safety-related incidents involving HPFVs."
- **Infrastructure.** "Estimate the impact of HPFVs on pavements, bridges and intersection features by direct measurement or observation."

- **Compliance.** "Monitor and report on any trends in detected non-compliance with the conditions of the Trial."
- **Community acceptance.** "Characterise the community's response to the use of HPFVs on the Trial network."

Productivity

Benefits were expected to arise predominantly from increased payload capacity (mass or volume) per vehicle and a consequent reduction in the number of trips required to carry out a given freight task. A reduction in the number of trips means reductions in fuel consumption, vehicle maintenance costs, driver costs, and possibly the number of vehicles owned by the operator in the longer term. Some discussion of productivity benefits is included in Section 4.

Safety

It was expected that HPFVs would demonstrate improved safety due to their superior dynamic performance, their additional safety features, and because it was likely that only the safest and most experienced drivers would be selected to drive them. Therefore it was considered to be highly unlikely that there would be a rollover, jackknife, or other type of serious crash involving a HPFV during the Trial. Minor nuisances in relation to acceleration time, intersection clearance and low-speed swept path on tight turns may have occurred, but were not expected to jeopardise safety in a measurable way, nor initiate negative public response. Ultimately VicRoads was not alerted to any safety incidents involving the Trial vehicles.

Infrastructure

The Trial network was approved as being safe and suitable for HPFV operation from an infrastructure (pavements and bridges) perspective. Axle loads and spacings were such that HPFVs would have theoretical pavement and bridge loading that was no worse than what is allowed for regular B-doubles (or at an acceptable amount of overstress). In practice, however, it was not known with certainty how HPFVs would affect pavements and bridges. Additionally, despite HPFVs being required to meet PBS standards, their turning behaviour would be more intrusive than common vehicle configurations such that there would be an increased likelihood of the inadvertent striking of kerbs on tight turns, and their acceleration capability may have been such that intersection clearance would not be as rapid as for regular vehicles.

Due to the small number of vehicles participating in the Trial, and the short timeframe of the Trial, it was not possible to reliably measure the effects of HPFVs on the infrastructure by observing changes in pavement and bridge condition. In order to do this effectively, infrastructure condition needs to be monitored over at least five years, and the proportion of HPFVs in the traffic should ideally be much higher than just a handful interspersed among the thousands of regular vehicles using the infrastructure daily.

Given that calculations by VicRoads senior bridge engineers provided assurances of bridge integrity, and Austroads (2012) proved that a 27 tonne quad axle group is equivalent to a 22.5 tonne triaxle group from a pavement wear perspective (based on equivalent pavement deflection), it was considered that no further assessment of infrastructure effects (pavements and bridges) needed to be conducted during the Trial.

Compliance

Route access could be monitored with certainty using the Intelligent Access Program (IAP), which was a mandatory condition for participation in the Trial. Other aspects of compliance relied on normal on-road enforcement. Ultimately VicRoads detected no significant non-compliant activity throughout the Trial.

Community acceptance

Austroads (2005) presents survey results that detail the community's concerns about road freight vehicles. Figure 4 is a reproduction of Figure 7 of that report.

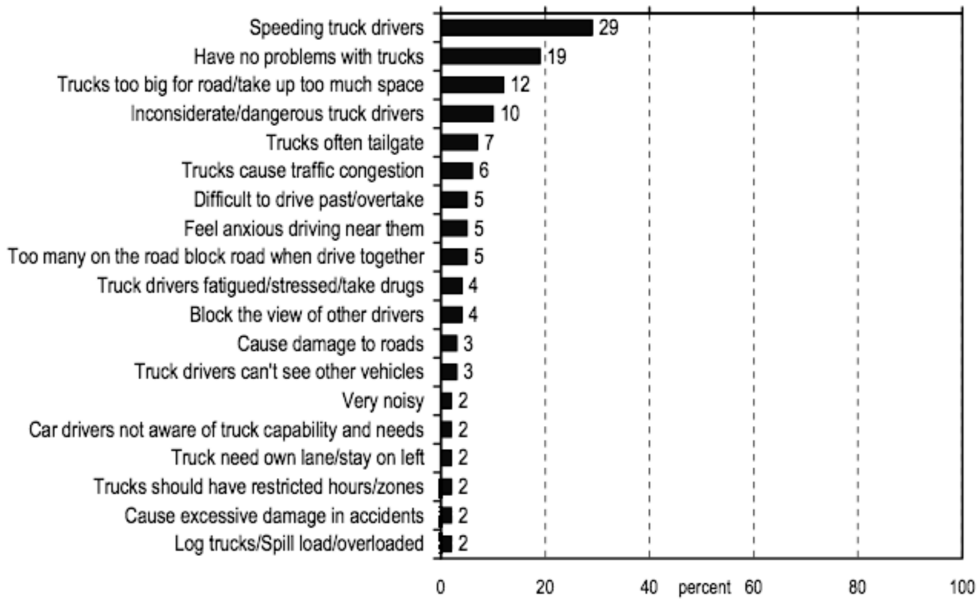


Figure 4 – Community concerns about trucks (Austroads 2005)

While one-fifth of respondents had no problems with trucks, half of respondents cited issues that are driver-related and not truck-related (i.e. the public would not be able to single out HPFVs in relation to those issues). Such issues were therefore not the main focus of the evaluation. Of the remaining respondents, the major issues were road space requirements, congestion, and fear of driving near large trucks. These are the issues that were to be given the most attention when evaluating community feedback.

A later report by Austroads (2007) on community attitudes to road freight vehicles lists heavy vehicle related noise, dust, dirt and exhaust emissions as being the least favourable aspects of trucks to people living or working on or near major freight routes (as opposed to people sharing the road with trucks). It was expected that HPFVs would not result in a measurable difference to the community on these issues.

A more recent study (Synovate 2010), published by the National Transport Commission, found that community concerns regarding heavy vehicles were small in comparison with other issues. Of the top twelve identified major concerns while driving, listed in order of frequency within the sample, the survey found that large vehicles did not feature until the last three items on the list, and only 5 per cent of respondents listed one of those three concerns as their number one concern (Figure 5).

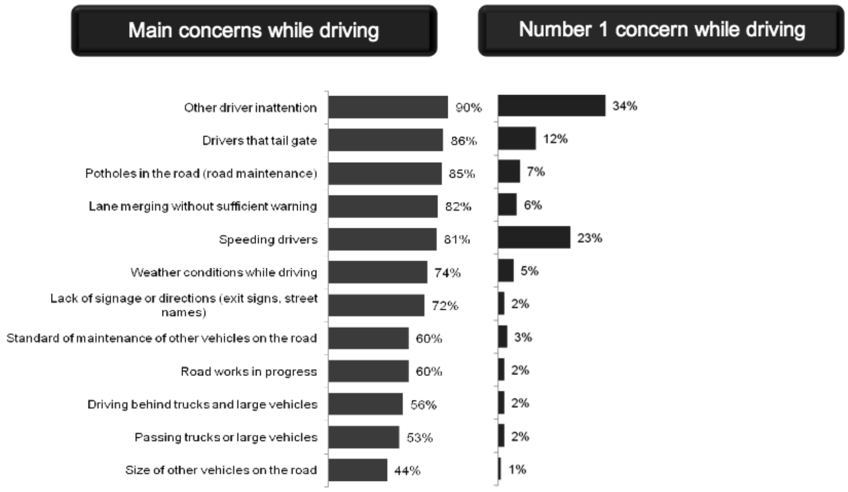


Figure 5 – Hierarchy of public concerns while driving (Synovate 2010)

Methods used for evaluating community acceptance of HPFVs included professional media monitoring services and collation of inbound correspondence to VicRoads, either directly or via the Department of Transport and the Minister's Office. There was no direct consultation or public surveying conducted, as this would have placed undue attention on the larger vehicles by the anti-truck lobby, and possibly would have resulted in skewed public opinion. Other than the media reporting surrounding the launch of the Trial, there was ultimately no relevant media activity of significance.

3. Commercial influences on HPFV operation

The following sections summarise the key topics raised in discussions with potential Trial participants and also those operators who did participate. Some of these topics only apply to operation in the West of Melbourne for container transport.

3.1. Freight Infrastructure Charge

The previous Victorian Government had announced its intention to introduce a Freight Infrastructure Charge (FIC) that would apply to trucks picking up or delivering international shipping containers at Swanson Dock. Its purpose was to fund major infrastructure investments. This prompted many transport operators involved in Swanson Dock operations to consider entering the HPFV Trial. The FIC was later abandoned by the present Victorian Government and the demand for entry into the Trial soon diminished accordingly.

The FIC would have been applied on a per-truck basis. This price signal was aimed at reducing the number of empty and partly-laden trips and would promote the use of HPFVs, because when more TEU were carried by a single truck on a given trip, the attributable FIC would be less per TEU. The FIC was predicted to be in the range of $160 to $180 per truck trip. Given that a transport operator may currently charge barely twice that amount to transport a container, the benefit of carrying more containers on a single trip would have been significant. The FIC was therefore a major market force that had sparked industry interest in HPFV operation. A major criticism of the FIC, however, was that transport operators would not be able to absorb the charge and would therefore seek full cost recovery from customers. Being on a per-truck basis, the FIC per TEU carried by a HPFV would be half of that for a TEU carried by a single articulated vehicle, and this is likely to have made smaller transport operators (who are largely unable to operate HPFVs) uncompetitive or financially unviable. Operators have indicated that even with full cost recovery their customers would expect to pay no more than 25 per cent of the FIC per TEU if the operator uses HPFVs, but it is not always possible to load four TEU onto a HPFV or even to use a HPFV at all for some trips, depending on the destinations and other logistical constraints. Therefore operators of HPFVs may have been required to absorb some of the FIC from time to time.

3.2. Freight rates

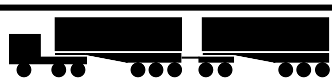
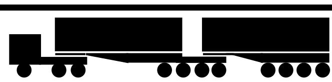
Historically, improvements in truck productivity through regulatory reform have resulted in benefits flowing on to transport customers and ultimately the end users of the products being transported. Transport operators have complained of having their rates ‘squeezed’ whenever they introduce higher productivity vehicles, stating that the only real advantage to them is when they are the first to operate a particular higher productivity vehicle and can enjoy a short period of being better able to secure new contracts or renew existing ones with pricing based on the use of the higher productivity vehicle. The lack of real long-term benefits to the transport operator has been cited as one concern regarding entry into the HPFV Trial.

3.3. Suitability of the B-double configuration

Most container transport into and out of the Port is carried out by single articulated vehicles and 26-metre B-doubles. A single articulated vehicle can carry up to one 40-foot container or up to two 20-foot containers, while a 26-metre B-double can carry up to one 20-foot and one 40-foot container or up to three 20-foot containers. With a trend towards greater use of 40-foot containers, the benefit of the 26-metre B-double over the single articulated vehicle is diminishing. A good way to improve the productivity of 40-foot container transport is to enable two 40-foot containers to be carried by one vehicle combination. The HPFV is therefore one solution to the 40-foot container transport task.

Some transport operators have indicated that the HPFV as conceived for this Trial is not the ideal solution. Another vehicle combination suited to the transport of two 40-foot containers is the conventional A-double. The A-double equivalent to the B-double HPFV concept is a prime mover towing a triaxle semi-trailer, a tandem axle converter dolly and another triaxle semi-trailer. Table 2 shows that the A-double can carry two 27.5-tonne containers at General Mass Limits, while the B-double can carry only two 26.125-tonne containers at Higher Mass Limits. (Operation at Higher Mass Limits places an additional regulatory burden on the operator in comparison with operation at General Mass Limits.) In addition to this productivity benefit, the A-double offers better control of axle group loads, reduced swept path width, better operational flexibility, lower capital cost, easier coupling and un-coupling, and does not include the maintenance overhead of quad axle groups with steerable axles. Also the trailers are standard triaxle skels that will have good re-sale potential. Section 3.7 examines vehicle productivity more closely.

Table 2 – Comparison of A-double and B-double for carrying two 40-foot containers

	A-double	B-double
Configuration		
Vehicle unit tare weights (t)	9 + 6 + 3 + 6 = 24	9 + 8.75 + 7.5 = 25.25
Container gross masses (t)	27.5 + 27.5 = 55	26.125 + 26.125 = 52.25
Axle group loads (t)	GML: 6 + 16.5 + 20 + 16.5 + 20 = 79	HML: 6.5 + 17 + 27 + 27 = 77.5

3.4. Travel time restrictions

The West of Melbourne travel time restrictions in the Trial Guidelines were found to be highly undesirable by potential Trial participants. Operators were concerned about the possibility of vehicles (and drivers) being held up at the Port for up to three additional hours if they were delayed just prior to the start of one of the restricted time periods. Operators were unwilling to absorb prolonged downtime for HPFVs, particularly given the necessary investment in equipment that can only be paid off "if the wheels are turning."

The sole West of Melbourne operator in the Trial was only able to complete one daytime trip from the Port to Somerton and back in between the restricted morning and afternoon peak times. That trip normally takes 3.75 hours return, and there are only seven hours available between the restricted peak times. With night time travel over the same course taking 3.25 hours, three trips were possible overnight, for a total of four trips in any 24 hour period. Without travel time restrictions, the number of trips per day could increase to six or seven. If a more direct route was available (i.e. Transurban CityLink toll road and Tullamarine Freeway) then two day time trips would be possible between the restricted peak times. Ideally, no travel time restrictions in combination with more direct access to Somerton would allow round-the-clock travel with up to eight trips per 24 hours. There is no evidence to suggest that HPFV operation in peak times would affect traffic congestion any more noticeably than other container transport vehicles.

3.5. Co-ordination of pick-up and delivery times

The Port operates a slot system for container pick-up and delivery, which is aimed at easing congestion and queuing times during peak periods. As the empty container parks begin to introduce similar slot systems, there is an increased need for transport operators to store containers for short periods in their own yards to accommodate the inevitable mismatch between Port slots, empty container park slots, and customer-driven pick-up and delivery times. This increases the number of truck trips and results in a net productivity loss to transport operators, estimated by one operator to be of the order of $1M per annum for their business. Under such conditions a HPFV becomes attractive for its ability to transport four TEU of empty containers on each trip to or from an empty container park, consequently reducing the number of trips required to and from those facilities.

3.6. Approved road networks

Industry had the following key comments on the initial road network that was approved for the Trial:

- Access to the Western Ring Road via the Western Link (Transurban CityLink toll road) and the Tullamarine Freeway was desirable;
- Access to Dandenong via the Southern Link (Transurban CityLink toll road) was desirable;
- Access between the Port precinct and the Westgate Freeway was desired via the Bolte Bridge (Transurban CityLink toll road) in preference to Wurundjeri Way; and
- Access between the Port precinct and areas west of Footscray was desired via direct access as opposed to the circuitous route offered by the approved network. Industry offered some route proposals.

The first three of the above desired routes involve HPFV access to parts of Transurban CityLink, which is subject to approval by Transurban and beyond the control of VicRoads. VicRoads was unable to include those routes in the initial HPFV Trial conditions.

Access through the Footscray/Yarraville area is not ideally suited to truck traffic and is subject to a strong anti-truck community sentiment. Figure 6 shows the 'missing link' between the Port precinct and the areas west of Footscray and Yarraville. It can be seen that the approved route between the transport operator yards and empty container parks in Sunshine Road (top left) and the Port precinct (top right) is much longer than the route that can be taken by regular container transport vehicles, to the point where operators questioned the value of a HPFV.

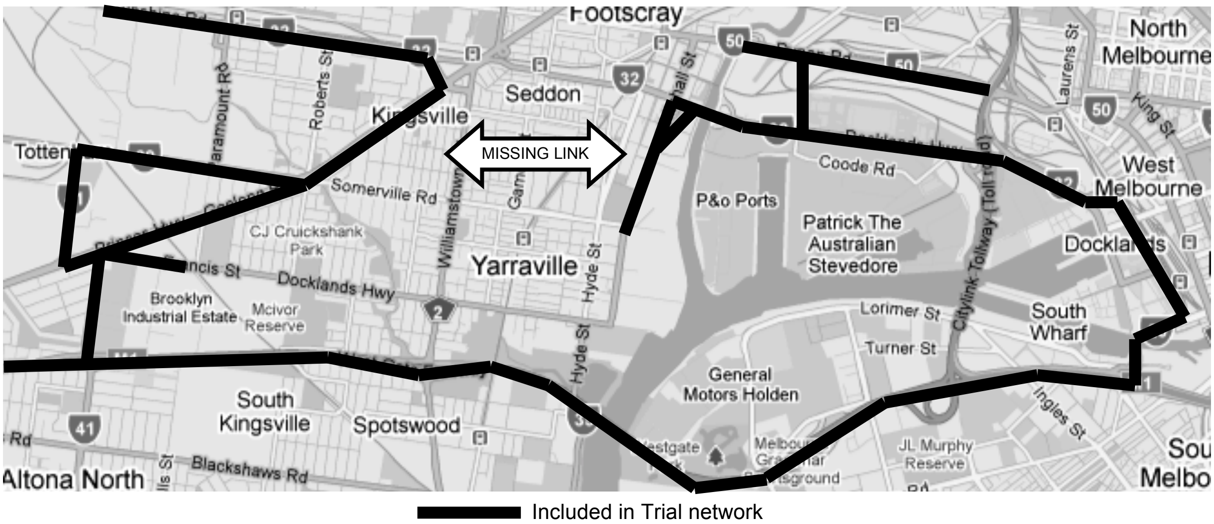


Figure 6 – Circuitous route bypassing Footscray and Yarraville

During discussions with transport operators, options for direct access were suggested. Figure 7 indicates the route proposals and identifies some initial points of interest that were discussed.

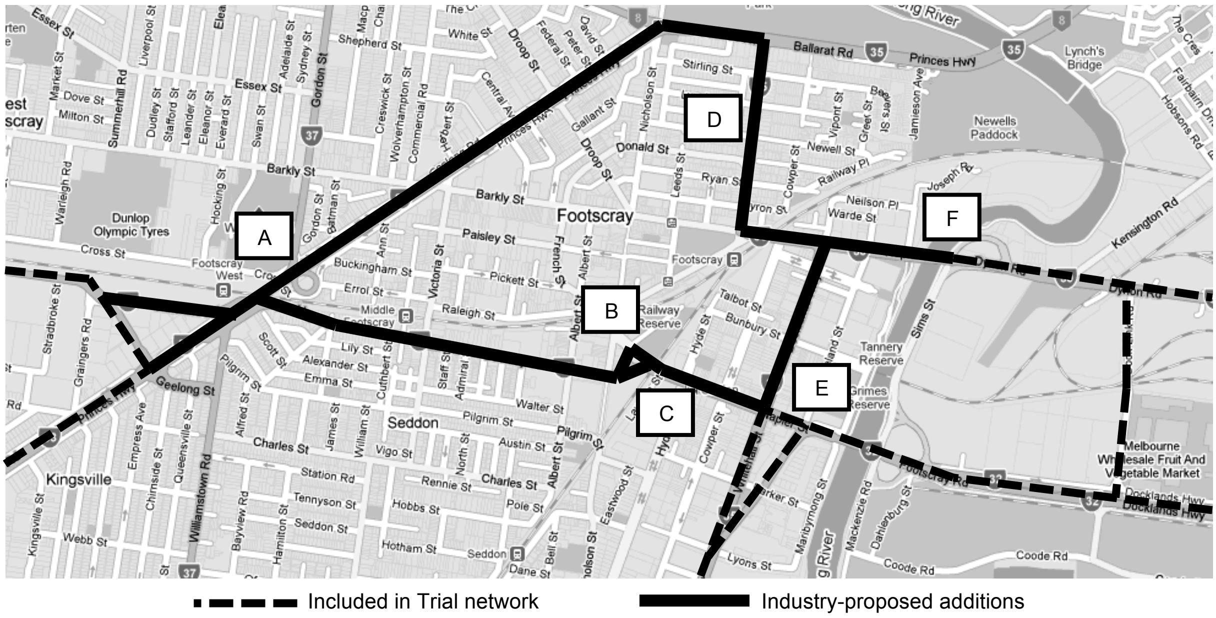


Figure 7: Industry-proposed routes through Footscray

Points of interest on the industry-proposed routes include:

A. **Flyover near Whitten Oval.** This structure would need to have its load capacity checked. It also has a steep grade on each side.

B. **Intersection at the west end of Napier Street.** An eastbound HPFV would be fairly intrusive on other traffic when negotiating this intersection.

C. **Rail overpass on Napier Street.** This overpass has a height clearance of 4.0 metres. The road would need to be lowered to allow HPFV access.

D. **Moore Street.** There is strong community objection to increased truck traffic on this street.

E. **Left-hand turn from Whitehall Street southbound onto Footscray Road eastbound.** A HPFV would struggle to make this turn, requiring a turn from the centre lane. The alternative is to avoid Whitehall Street and continue along Dynon Road to Dock Link Road.

F. **Dynon Road bridge over Maribyrnong River.** This structure would need to have its load capacity checked.

3.7. Gross mass and load distribution

The gross mass of a container vehicle combination can be accurately controlled if the mass of each container is accurately known, but the distribution of load to each axle group can only be accurately controlled if containers are of a fairly consistent mass and 'water-level-loaded' (i.e. their mass is evenly distributed along their length, or at least centred at the geometric centre of the container footprint). When a vehicle combination is designed for carrying containers, the designer calculates the mass of containers that may be carried. Then, assuming that the containers are water-level-loaded, it is possible to determine by straightforward calculation the locations of twist locks for optimal load distribution to each axle group.

When a transport operator must carry containers of inconsistent mass, or if the distribution of mass within each container is unknown, it becomes difficult to achieve good load distribution. For example, a vehicle combination that is laden to exactly the maximum gross mass could have axle group loads that either exceed or fail to reach their limits by several tonnes. To illustrate how poorly some containers can be loaded, the industry advised of certain operations where, for example, the container is loaded while it is standing on end and then it is laid down for transport, or the container is hand-stacked to the roof at one end and then the top of the load tapers down towards the door when the packers realise that there is no need to stack to the roof to fit all of the product in the container. The problem is exacerbated when the containers are imported, because container load distribution is almost impossible to control and stevedores will not take responsibility for axle group loads when loading containers onto vehicles. If the driver of a vehicle becomes aware of poor load distribution from their on-board scales, they have no option but to leave the Port in that state. Some operators may go to a nearby operator's yard and pay to have containers swapped around, but this is often impractical.

Given the industry's concerns about axle group load distribution, the HPFV was seen by some as a means of achieving greater leeway. That is, to operate a HPFV at somewhere below its maximum gross mass may allow some variability in axle group loads and still provide an increase in gross mass when compared with a regular vehicle. This, however, was not the intended use of the HPFV configuration. Others have the view that HPFVs are only suited to lightweight or empty containers, or one heavy 20-foot container on each trailer. Most operators reported that for container transport the economic 'sweet spot' for gross mass of a HPFV is 85 tonnes.

4. Productivity benefits

4.1. West of Melbourne

The sole West of Melbourne operator quoted the following productivity figures in relation to transport between the Port of Melbourne and the Somerton intermodal rail terminal:

- Their company's transport task is around 25,000 containers per annum. With around 60 per cent of their containers being 40 feet long (2 TEU), their transport task is around 40,000 TEU per annum.
- With approximately equal numbers of semi-trailers (maximum two TEU) and conventional B-doubles (maximum three TEU), and no HPFVs, this requires around 70 truck movements per day. Given that not every truckload will reach the maximum possible number of TEU (e.g. due to mass limits or operational reasons), this is more than the theoretical minimum number of trips required.
- HPFVs carrying two heavy (e.g. 26+ tonne) 20-foot containers require half of the number of trips required to transport the same containers with semi-trailers. Conventional B-doubles are generally capable of carrying two equal mass containers only if the containers are each less than 26 tonnes.
- HPFVs carrying four light 20-foot containers require half of the number of trips required to transport the same containers with semi-trailers, and three-quarters of the number of trips required to transport the same containers with conventional B-doubles.
- Conventional B-doubles can only carry one 40-foot container, so HPFVs carrying two light 40-foot containers require half of the number of trips required to transport the same containers with conventional B-doubles.
- If conditions allowed 24-hour operation and a more direct link between the Port of Melbourne and the Somerton intermodal rail facility, HPFV operation would provide a large productivity increase for this operation.

4.2. Green Triangle

Woodchip transport

The woodchip transport task for the participating operator was 20,000 tonnes per month on a 45-kilometre lead from a loading facility in Myamyn, Victoria, to the Port of Portland. The HPFV offered a 12 per cent payload increase over the conventional 26-metre B-double. Some of this benefit was eroded by increased costs. There was an 8 per cent increase in fixed costs (registration, insurance, driver salary, depreciation) and an 8 per cent increase in variable costs per kilometre (fuel, maintenance and tyres).

The productivity benefit of this vehicle was ultimately measured as 44 per cent because of the innovative bottom dumping system that was employed. This combination of bottom-dumping trailer equipment and the corresponding receiving infrastructure at the Port slashed the vehicle unloading time from a long-term average of 33 minutes gate-to-gate using a whole-vehicle tipping method to just 6 minutes gate-to-gate with bottom dumping, reducing the overall return journey time and allowing 13 trips per day, up from 10 using the tipping method. The operator was of the view that the bottom dumping system made the HPFV viable for this particular operation, whereas without the system its viability was modest in comparison with other transport options.

By mid-2011, one 77.5-tonne unit was in 24-hour operation and was completing 390 trips per month, resulting in 700 hours and 36,000 kilometres of operation per month.

Mineral sands transport

The mineral sands transport task for the participating operator was 33,000 tonnes per month on an 80-kilometre lead from a processing plant in Hamilton, Victoria, to the Port of Portland. The HPFV offered a 12 per cent payload increase over the conventional 26-metre B-double. The operator has reduced the number of vehicles on the task and has consequently reduced carbon dioxide emissions by approximately 59,000 kg per annum. These benefits have been offset by a 22 per cent increase in repair and maintenance costs, and there is decreased operational flexibility due to the route restrictions on HPFVs. Despite the increase in costs, the operator has found the HPFV operation to be economically viable.

By the end of 2011, two 77.5-tonne units were in 24-hour operation. The operating units were completing 336 trips per month and travelling up to 350,000 kilometres per year.

5. Concluding remarks

The HPFV Trial demonstrated that HPFV operations in the Green Triangle region can be economically viable and a useful productivity boost for the significant bulk haulage operations in the region. It also demonstrated that the conditions set down for West of Melbourne container transport operations were highly unpopular, initiating a process of stakeholder consultation and a review of the policy. Operation of all Trial vehicles is continuing beyond the initial Trial period and the Trial conditions are soon to be reviewed.

References

- Austroads (2005) *Community attitudes to road freight vehicles*, Austroads Publication No. AP-R274/05, Austroads, Sydney.
- Austroads (2007) *Community attitudes to road freight vehicles*, Austroads Publication No. AP-R314/07, Austroads, Sydney.
- Austroads (2012) *Estimates of Equivalent Load for a Quad Axle*, Austroads Project Report, Austroads, Sydney.
- Government of Victoria (2008) *Freight Futures – Victorian Freight Network Strategy*, Office of the Minister for Roads and Ports, Melbourne.
- Synovate (2010) *Understanding public perceptions of road freight*, National Transport Commission, Melbourne.
- VicRoads (2009) *Guidelines for Next Generation High Productivity Freight Vehicle Trial in Victoria*, Roads Corporation of Victoria, Melbourne.