# Vehicle Dimension and Mass rule amendment proposals 2016.

# Operator costs and benefits

*Report to New Zealand Transport Agency*

***23 June 2016***

## Contents

**EXECUTIVE SUMMARY**

The freight payload and economic benefits to operators (and eventually to freight customers) and safety benefits to society if heavy vehicle dimensions and mass were increased under potential amendments to the Vehicle Dimension and Mass rule are modelled in the order of $26 million per year. These gains represent a 40-year Net Present Value of $346 million at a 6% discount rate and 1.6% annual growth in Heavy Vehicle Kilometres Travelled (See **Table 23** for summary).

These benefits are available are under a rule change scenario where:

- Heavy vehicle maximum width and height both increase by 50mm from 2500mm and 4250mm to 2550mm and 4300mm respectively. These dimension increases would provide:
  - Improved cubic capacity providing:
    - Increased pallet capacity for refrigerated transport with target annual benefits building to $10.4 million over 15 years.
    - Increased capacity for low density bulk transport (woodchips, rubbish) with target annual benefits building to $1.3 million over 15 years.
  - A $1.0 million annual reduction in truck purchase costs as equipment becomes aligned with US and European standards and therefore reducing current modification costs and allowing access to a larger market for wide-track equipment.

- Seven-axle heavy vehicle combinations' general access mass limits increase by one tonne from 44 to 45 tonnes. Annual benefits begin immediately in year one at over $5.0 million but decline to $2.0 million within seven years. The decline results from an assumed switch of this fleet to 50Max where most of these same benefits are received under an existing policy. The 40-year NPV of these gains is $45 million.

- Eight-axle heavy vehicle combinations' general access mass limits increase by two tonnes from 44 to 46 tonnes. Annual benefits start at $15 million in year four and decline to $10.3 million within seven years. Benefits for GVM increases above one tonne are assumed delayed until year four to allow analysis and improvement of local roads. The decline to year seven results from an assumed switch of this fleet to 50Max. The 40-year NPV of these gains is $152 million.

- Safety benefits to society from all of the above areas of operator cost savings arise from the reduced crash exposure as vehicle kilometres travelled (HVKT) reduce to service an assumed fixed freight task. These annual benefits are modelled to build beyond $1 million. The 40-year NPV of these gains is $12 million.
- This analysis is based on extensive use of assumptions based where possible on industry knowledge. Estimating the current distance travelled for vehicle combinations capable of greater than 44 tonnes and estimating the nature of their demand for take-up of the rule change benefits and the level of operational gains is problematic. Many of the modelling assumptions are therefore of a "what if" nature. The overall model result is an expected value, around which pessimistic and optimistic sensitivity scenarios would be prudent. Reduction and increase of the discount rate to 4% and 8% respectively show that the net benefits are dominated by the uncertainties of take-up and benefit decline in the earlier rather than later periods of the cashflow.

- A critical risk factor in this analysis is potential changes to weight enforcement tolerances. A policy that increases general access GVM by one and two tonnes for seven and eight axles respectively AND also reduces the weighing tolerance down from 1.5 to 0.5 tonnes, could deliver no change in operator efficiency for seven axle vehicle combinations and halve the efficiencies for eight axle vehicle combinations down to a one tonne gain.

## BACKGOUND

1. There are potentially significant freight payload and net economic gains if heavy vehicle dimensions and mass can be increased.

2. The Vehicle Dimension and Mass (VDAM) rules govern weight, size and operating parameters for vehicles on New Zealand roads. The VDAM rule balances the sometimes competing objectives of efficient operation of vehicles with objectives for road safety, and optimisation of pavement and bridge lifecycle costs for both State Highways and Local Roads.

3. The New Zealand Transport Agency (NZTA is working with the Ministry of Transport (MOT) to assess possible benefits and costs of VDAM amendments to deliver these freight productivity gains.

## PURPOSE AND SCOPE OF THIS REPORT.

4. The NZTA has asked in this current report for an assessment of the operator benefits and costs of a smaller set of specific options listed in Table 1 for heavy vehicle combinations capable of operating above 44 tonnes Gross Vehicle Mass (GVM). These options are for increased vehicle width and height, and one and two tonnes increased GVM for seven and eight axle vehicle combinations respectively for general access. Previous drafts of this report investigated a wider set of GVM increases and also considered GVM increases for nine axles vehicles. This report focuses upon benefits to transport operators and also considers safety improvements also benefiting wider society. Wider potential societal benefits such as congestion relief and health gains are not assessed here. Infrastructure costs of the initiatives in Table 1 are addressed separately in a report by IDS. The comprehensive integration of all costs and benefits is a task subsequent to this report that is understood will be undertaken by NZTA and MOT.

5. The MOT earlier received a report from Strategic Advisors "*Castalia*" dated November 2015 that assessed both benefits and costs for a slightly different range of rule change options.

6. The scope of the Castalia report differs in the following ways:
    - Only a one tonne increased mass option.
    - Allowance for 50Max vehicles to operate without a permit within the 50 max network.
    - Increased mass for specific categories - of unclear nature and quantum.
    - Increase pro forma car transport gross mass from 36 to 38 tonnes.
    - Changes to permitting arrangements.

**Table 1. VDAM amendment options assessed in this report**

| Proposal | Existing rule | Potential rule options |
| --- | --- | --- |
| Increase vehicle width by 50mm. | 2500 mm | 2550 mm |
| Increase vehicle height by 50mm. | 4250 mm | 4300 mm |
| Increase Seven axle vehicle combinations Gross Vehicle Mass (GVM) while maintaining General Access on around 80%$_{(1)}$ of combined State Highway and Local Roads. | 44 tonnes | 45 tonnes |
| Increase Eight axle vehicle combinations GVM) while maintaining General Access on around 80%$_{(1)}$ of combined State Highway and Local Roads. | 44 tonnes | 46 tonnes |
| Reduction in weight enforcement tolerance | 1.5 tonnes | 0.5 tonnes |

*Notes: (1) Approximately 3% of the State Highway network has bridges posted for either axle or gross weight limits that prevent operation at 44 tonnes. Significantly greater lengths of local road have similar restrictions.*
*(2) As at early 2016 approximately 4,250 kilometres of HPMV route are available mainly on State Highways. A second tranche of 2,000 kilometres of HPMV routes will become available later in 2016, bringing the total to 6,250 kilometres. These route improvements will provide payload mass benefits, but do not impact payload cubic capacity.*

## METHODOLOGY

7. Separate methodologies were used to assess the current vehicle kilometres travelled (HVKT) for the following two elements of changes to vehicle dimension and mass. The two methodologies are discussed in detail further below.
    a) Vehicle combinations constrained by **cubic capacity** and therefore likely to benefit from increased vehicle height and width.
    b) The fleet constrained by **mass limits** and therefore likely to benefit from an increased in either the 44 tonne general access limit, or an increase in HPMV route limits.

### (i) Cubic capacity methodology

8. The methodology for assessment of benefits for vehicle combinations receiving increased cubic capacity under the potential rule change included the following steps:
    - Estimate cubic capacity gains each vehicle combination type.
    - Estimate fleet size and average HVKTs travelled by each vehicle combination. These HVKTs are the total distance travelled and therefore include both full and empty running.
    - Estimate target take-up fleet size.
    - Estimate the staging of progress by the industry toward this uptake target, in recognition that vehicle and fleet operational changes could take some years to achieve.
    - Calculate the benefits in terms of HVKTs avoided in order to service an assumed fixed freight task.
        a. Calculate payload gains over status quo in tonnes.
        b. Calculate the productivity gain in terms of the percentage of HVKTs avoided in order to service an assumed fixed freight task.
    - Assess the value of each average (loaded and unloaded) kilometre of travel (Vehicle Operating Cost or VOC) avoided.
    - Allow for an assumed 1.6% annual arithmetic increase in HVKTs on the base year for freight task growth. This assumption is based on Table 11 of the *National Freight Demand Study* March 2014, which estimates 48% growth in road tonne kilometres over the 30-year period 2012 – 2042. This equates to 1.6% per year arithmetic growth which has been applied to the 40 years of this current analysis.
    - Consider any increased capital or operational costs on operators necessary to secure the productivity gains. Infrastructure costs or other external costs are not considered in this report.
    - Project net benefits in real terms (no inflation) over 40 years from a base year 1 with freight task growth applied from year two onwards.
    - Calculate target annual benefit after implementation and ramp up of benefits after any start up delay / implementation period. Implementation years are assumed for each category of benefit variously from 1 to 15 years.
    - Calculate the net present value of benefits over 40 years using a real discount rate of 6%. The base year for this calculation is year 1 of cashflows.
    - Calculate the value of safety benefits by summing the HVKTs avoided in order to service a fixed freight task for each vehicle category and calculating the value of fatals and serious accidents avoided. The basis of the assumption of one fatal crash per 59 million heavy HVKTs and one serious crash per 26 million heavy HVKTs is taken from crash and distance analysis on page 61, of the HPMV Technical Report 6 May 2014.
    - Estimate other benefits of increase width – vehicle purchase benefits.

### (ii) Increased mass methodology

9. The methodology for assessment of benefits for vehicles taking up increased mass provisions in the VDAM rule included the steps below. The assumptions aim to avoid potential double counting of benefits from increased cubic capacity and mass. The uptake of mass benefits attempts to recognise the portion of the fleet that is cubic capacity constrained and therefore assumed unlikely to benefit from increased mass.

    a) Estimate current annual HVKTs by each category of 44+ tonne capable heavy vehicle combination. It is necessary to determine HVKTs for each vehicle combination type (PAT Class) for two reasons. First, and most important, in order for others (IDS) to determine pavement wear costs, which vary depending on the vehicle combination type. Second, uptake assumptions are best made with respect to specific vehicle combination types. For example, B-Trains are more typically used in linehaul operations with quite different likely demand for increased mass compared with rigid truck and trailers where increased mass is likely of more commercial use. The estimation of heavy HVKTs by vehicle combination category is difficult however because vehicles are registered as individual truck and trailer units and RUC is also purchased separately. Operators can mix and match trucks and trailers and therefore distance travelled in the MV register (from annual re-registration data) for trucks and trailers individually cannot determine vehicle combination distances. From a RUC perspective, trucks, or prime movers (both three and four axles), can be used in a range of combination types. For example, a four axle truck could be used (as far as RUC data can distinguish) EITHER as part of a rigid truck and trailer combination, OR, in an articulated truck and semi-trailer (either three or four axles) OR as part of a B-Train. Conversely, it is not possible to use some RUC trailer data to calculate combination distances travelled because some trailers can be used across multiple combinations types. For example, 4 axle trailers can be used with EITHER rigid truck and trailers OR articulated trucks towing a quad semi-trailer. B-Train vehicle combination types have multiple trailers and these trailers can be used on other combination types, so halving the trailer RUC kilometres is not a simple solution.

    b) A two-step methodology was used to estimate Heavy VKTs (HVKT) by vehicle combination type:
        - Estimate total HVKTs by the 44+ tonne capable fleet by allocating the RUC kilometres purchased by specific RUC trailer types associated with these vehicle combinations.
        - Allocate this total of trailer RUC kilometres travelled to specific vehicle combinations type (PAT Classes) using the share of Weigh in Motion (WIM) site counts for vehicle combinations containing the trailer type. WIM data separately identifies for example the number of passes for each vehicle combination type with four-axle trailers (R12T22, R22T22, A124, A224). The percentage share of passes for each sub category of combinations with four-axle trailers was then used to allocate the four-axle trailer RUC to vehicle combinations. The WIM data comes from six arterial State Highway sites around the country. Most local road traffic at some stage of a trip would typically utilise the State Highway network. While not a perfect representation of the

composition of all HVKTs across both State Highways and local roads, these sites represent around three quarters of the nationwide HVKTs across both State Highways and local roads and are the best available measure.

c) Estimate percentage of operators that are currently weight compliant and therefore in a position to receive new benefits from any VDAM rule change. Vehicle combinations currently operating overloaded are assumed to be already receiving the benefits of the potential rule change - albeit from illegal overloading.

d) Estimate potential uptake of new rule provisions for each category of 44+ tonne capable heavy vehicle combinations. This is measured in terms of percentage of operators with a commercial interest and ability to use any increased mass. The vehicle configuration and capacity of many freight tasks is constrained by cubic capacity rather than a maximum mass limit. Also considered in this uptake assumption is the extent to which existing vehicle combinations that are not currently operating as HPMVs or 50Max, will in fact over time shift to 50Max at least. This change is assumed likely as vehicles wear out and are replaced and as HPMV routes become more widespread. These vehicles changing to 50Max are assumed to not receive a benefit from the proposed increased in General Access mass, as they will already achieve this gain with 50Max capacity on the majority of their network requirements. Because 50Max is an existing VDAM rule provision it is not assumed to be a benefit of the current rule change under consideration.

e) Estimate the staging of take-up and calculate annual and 40-year Net Present Value (NPV) of benefits as for the increased cubic capacity fleet in (i) above. A key implementation timing assumption relates to the period of some years required for recalculation of local road infrastructure capacity before the two tonnes increase for eight axle vehicles can be implemented.

## GLOBAL ASSUMPTIONS

10. This analysis is based on real costs and benefits, that is with no inflation assumption. Annual real freight task arithmetic growth of 1.6% on the base year over 40 years is provided however.

11. A real discount rate of 6% is used for analysis of real costs and benefits over 40 years. Testing of results at 4% and 8% is also undertaken in the sensitivity section at the end of this report.

12. The total benefits assessed in this analysis are largely related to the value of the HVKTs avoided in order to service an assumed fixed freight task. The value of HVKTs avoided varies depending upon the size of the vehicle combinations and also the operating conditions including: loaded/unloaded, rough/smooth, sinuous/straight, steep/flat gradient, congested or uncongested traffic conditions.

13. A base vehicle operating cost (VOC) assumption for 7 axle vehicle combination of $3.00 per km[1] was used and then adjusted for other sizes of vehicle combination and also for each step of proposed increase in GVM driving increase fuel and tyre costs as discussed below.

14. The marginal increase in VOC (Fuel & tyres) is assumed at $0.05 per additional tonne based on: (i) Fuel and tyres being 47.7 % of VOC for HCVIIs in Table A5.0(a) EEM 1/1/2016, and (ii) VOC of $3.00 / km and payload of 26 tonnes. While the marginal increase in VOC will be less than a linear relationship with increased mass, it was assumed VOC increases linearly at 5 cents for each additional tonne of payload (300 cents x 47.7% / 26 tonnes = approximately 5 cents per tonne).

15. The effect on benefits to operators in terms of the percentage decrease in kilometres to service an assumed fixed freight task is an inverse relationship with the percentage increase in payload[2].

16. Table 2 shows the value of each kilometre avoided decreasing by around 98.3% for each additional tonne of payload because of the increased fuel and tyre costs of the heavier vehicle . This assumes the value of opex / km saved decreases by around 5 cents or 1.7% of $3.00 [(1/1+1.7%) = 98.3%.

[1] The "*Review of Road Freight Costs in NZ & Comparable Australian States,* Bob Pearson, 2007, calculated total 8-axle heavy vehicle operating costs including RUC, cost of capital, fuel, driver time and repairs & maintenance of $2.80 per kilometre in 2007. Updating this 2007 figure for inflation to 2016 gives a current cost of $3.25 or a cost of $2.81 per kilometre net of RUC at $0.435 per kilometre.

[2] For example, if payload increases 4.17% from 24 to 25 tonnes, there is a 4% decrease in kilometres to service a fixed freight task.

**Table 2. Base Vehicle Operating Costs (VOC) and value of HVKTs avoided as gross vehicle mass increases.**

| | 7 axles | 8 axles |
|---|---|---|
| | ($/km avoided ) | ($/km avoided ) |
| **Base VOC( $ / km) at 44 tonnes** | 3.00 | 3.05 |
| 45 | 2.95 | 3.00 |
| 46 | | 2.95 |

## Other Externalities

17. While there could be other external effects, such as impacts on other modes potentially including: rail, sea, or ferry cost changes, these are not evaluated in this report.

## RESULTS FOR ANALYSIS OF INCREASE IN VEHICLE DIMENSIONS

### Cubic capacity gains for refrigerated transport

18. The increases in dimensions are assumed to provide solely a cubic capacity benefit for the refrigerated transport fleet. The proposed 50mm increase in vehicle width from 2500mm to 2550mm is estimated in Table 3 to provide a 6.7% decrease in freight HVKTs needed to service an assumed fixed freight task. The gain is based conservatively on the assumption that existing operations are achieving 28 pallets at 2500mm width, and increasing to 30 pallets if 2550mm width were enabled by the rule change. The gain may be greater if current operations are in fact achieving only 26 or 27 pallets. The 50mm increase in height is understood to provide no further material benefits to the refrigerated fleet

**Table 3. Refrigerated capacity benefits from increased vehicle width**

| Refrigerated trucks capacity comparisons | 2500 mm width | 2550 mm width | *Gain* |
|---|---|---|---|
| ***Standard "quad semi" Articulated truck*** | | | |
| Deck length (metres) | 15.1 | 15.1 | |
| Pallets single layer *(Gain)* | 26 | 28 | *8%* |
| ***Current Super Quad proforma*** | | | ***2%*** |
| Deck length (m) | 15 | 15 | |
| Pallets single layer *(Gain)* | 27 | 30 | *11%* |
| ***Assumed pallet gain based on two examples above*** *(Conservative assumption)* | ***28*** | ***30*** | ***7.1%*** |
| Reduction in freight HVKTs | | | ***6.7%*** |

19. A current fleet size of 850 vehicle combinations and a take-up target of 606 is estimated in
20. Table 4. Take-up of the rule benefits over 15 years is assumed as the fleet is replaced and therefore further assumed the increased capacity can be achieved at no additional capital cost to operators.

21. The fleet is assumed to grow by 1.6% arithmetically on the base year as a result of the same rate of freight task growth.

22. Most movements are expected to be able to utilise the increased benefits. "Take-up" is calculated from the number of current fleet kilometres that are assumed can be undertaken with, and benefit from, the larger dimension vehicles.

23. Table 4 assumes completion of target take-up of 75% by year 15, when well over 3.3 million HVKTs would be avoided. This is estimated to save over $10 million from year 15 to service a fixed freight task.

24. The 40-year Net Present Value (NPV) of these annual gains from increased pallet capacity for the refrigerated fleet is estimated at $106 million.

25. The value of safety benefits in terms of crashes (fatals and serious) avoided because of avoided HVKTs is calculated for all of the rule change proposals combined initiatives further below in this report.

**Table 4. Refrigerated fleet size and take-up of proposed rule benefit from increased width.**

| **Fleet size and take-up rate** | | | | | | |
|---|---|---|---|---|---|---|
| Large refrigerated fleet size (Combination/6 axles+) SAY: | 850 | Based on: Halls 400, Big Chill 150, Foodstufs 230 + other 70 (10% of top 3). This is a conservative estimate compared with industry rule of thumb that refrigerated units are approximately 10% of fleet at all vehicle sizes. | | | | |
| % palletised trade | 95% | | | | | |
| % of trade that might over time move to 2550 | 75% | 2550 assumed to become the industry standard | | | | |
| Target take-up | 606 | Take-up years: 15 | | Take-up / year: 40 or 6.7% of target | | |
| ***Year*** | ***1*** | ***2*** | ***3*** | ***5*** | ***15*** | ***40*** |
| ***Cumulative percentage take-up*** | *6.7%* | *13%* | *20%* | *33%* | *100%* | *100%* |
| Cumulative 2550mm wide fleet including fleet growth | 40 | 82 | 125 | 212 | 703 | 902 |
| Freight HVKT reduction as a result of Pallet capacity gain (Super quad 2500 vs 2550) | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% |
| % of combined empty & full kms where improved full capacity can be utilized | 75% | 75% | 75% | 75% | 75% | 75% |
| Annual HVKT / combination (kms/year) | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 |
| HVKTs avoided to service fixed freight task (including freight task growth) | 189,258 | 384,572 | 585,942 | 1,006,852 | 3,474,773 | 4,610,320 |
| Operating costs avoided / km | $3.00 | $3.00 | $3.00 | $3.00 | $3.00 | $3.00 |
| Operating costs avoided per year | $567,773 | $1,153,716 | $1,757,827 | $3,020,555 | $10,424,320 | $13,830,961 |
| **40 Year NPV of pallet capacity benefits** | **$106,323,938** | | From increased pallet capacity for refrigerated fleet | | | |

### Cubic capacity gains for bulk transport from increased width and height

26. The cubic capacity gains for bulk transport are estimated in Table 5. The increase in both width noted above, and a proposed 50mm increase in height from 4250mm to 4300mm, would provide a 3.2% increase in cubic capacity and a 3.1% decrease in HVKTs required to service a fixed freight task. The increased cubic capacity is assumed to be of use to carriers of lower density bulk cargo such as woodchips, rubbish and recycling and manufactured products such as insulation.

**Table 5. Cubic capacity gains for bulk transport from increased width and height**

| ***Cubic capacity change*** | **Length (m)** | **Width (m)** | **Height (m)** | **Volume (m3)** |
|---|---|---|---|---|
| **Current capacity (m3)** | 15.00 | 2.50 | 4.25 | 159.38 |
| ***Proposed new total capacity*** | 15.00 | 2.55 | 4.30 | 164.48 |
| **Cubic capacity Gain (m3)** | | | | 5.10 |
| **Payload gain (%)** | | | | 3.2% |
| **Reduction in freight HVKTs (%)** | | | | 3.1% |

27. A current low density bulk fleet size of 158 vehicle combinations and a take-up target of 150 is estimated in Table 6. Take-up of the rule benefits over 15 years is assumed as the fleet is replaced, and therefore it is further assumed that the increased capacity can be achieved at no additional capital cost to operators. The fleet is assumed to grow by 1.6% arithmetically from the base year as a result of the same rate of freight task growth.

28. Most movements are expected to be able to utilise the increased benefits. Table 6 assumes target take-up of 95% by year 15 when around 425,000 HVKTs are avoided. This is estimated to save over $1.2 million from year 15 to service a fixed freight task.

29. The 40-year NPV of these annual gains from increased pallet capacity for the refrigerated fleet is estimated at $13 million.

30. The value of safety benefits in terms of crashes (fatals and serious) avoided because of avoided HVKTs is calculated for all of the rule change proposals combined initiatives further below in this report.

## Bulk fleet size & take-up of proposed rule benefits from increased width & height.

### Table 6. Bulk fleet size and take-up

| **Bulk fleet segment** | **NZ Fleet** | **Take-up %** | **Take-up fleet** | Fleet & Take-up targets are "what if" estimates only |
|---|---|---|---|---|
| Woodchip vehicle combinations | 100 | 75% | 75.0 | 20% of Regal Transport total fleet of 100 is hi-cube and this is expected to go to 50% |
| Rubbish & recycling vehicle combinations | 100 | 75% | 75.0 | |
| Insulation combinations | 10 | 75% | 7.5 | |
| Low density bulk fleet size – SAY: | | | 158.0 | |
| % of trade that might over time move to 2550mm width | | | 95% | |
| Target take-up (vehicle combinations) by year 15 | | | 150 | Take-up of 10 / year |

| ***Year*** | ***1*** | ***2*** | ***3*** | ***5*** | ***15*** | ***40*** |
|---|---|---|---|---|---|---|
| *Cumulative percentage take-up* | *6.7%* | *13.3%* | *20.0%* | *33%* | *100%* | *100%* |
| Cumulative 2550 low density bulk fleet (including 1% real freight task growth) | 10 | 20 | 31 | 53 | 183 | 243 |
| Reduction in freight HVKTs as a result of capacity gain | 3.10% | 3.10% | 3.10% | 3.10% | 3.10% | 3.10% |
| Percentage of movements capacity utilised | 75% | 75% | 75% | 75% | 75% | 75% |
| Annual HVKT / combination | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 |
| HVKTs avoided to service fixed freight task' | 23,198 | 47,138 | 71,820 | 123,412 | 425,909 | 565,095 |
| Operating costs avoided / km | $3.00 | $3.00 | $3.00 | $3.00 | $3.00 | $3.00 |
| Operating costs avoided per year (including freight task growth / benefits inflation) | $69,593 | $141,413 | $215,460 | $370,235 | $1,277,728 | $1,695,286 |
| **40- Year NPV at 6% discount rate** | **$13,032,318** | | **for low density bulk capacity benefits** | | | |

## Truck supply cost benefits from increased vehicle width

31. US and European standard vehicle width is 2055mm as proposed in the rule change. Currently vehicles bought from these sources currently often require modification and costs to fit NZ roads. Alignment of NZ with standard US and European vehicle dimensions is also assumed to reduce average vehicle purchase costs by increasing access to high production volumes of wide track equipment.

32. Table 7 explores the "what if" type of assumption (ie: not based on research evidence), that truck capital costs decline by $5,000. This would represent a 1% saving on a prime mover costing $0.5million. Annual gains could start in the order of $1million with a 40 year NPV of $18 million.

**Table 7. Truck supply cost benefits from increase width**

| | | | | | |
|---|---|---|---|---|---|
| Reduction in current retro-fit costs to bring wider US/Euro standard width back to NZ 2500mm width - and/or reduction in supply cost by ability to source high production volumes of wide track equipment. "What if" assumption. | | | | $5,000 | per vehicle |
| Number of new vehicles per annum to which gains might apply | | | | 200 | |
| Annual capital cost gain | | | | 1,000,000 | |
| ***Year*** | ***1*** | ***2*** | ***5*** | ***15*** | ***40*** |
| Capital cost gain per year (including freight task growth. | 1,010,000 | 1,016,000 | 1,064,000 | 1,224,000 | 1,624,000 |
| **40 year NPV of truck supply cost reduction benefits** | | **$18,021,606** | | | |

## RESULTS FOR ANALYSIS OF INCREASE IN VEHICLE MASS

### Number of current seven and eight axle vehicle combinations capable of operating beyond 44 tonnes GVM

33. The current number of heavy vehicle combinations capable of operating beyond 44 tonnes Gross Vehicle Mass (GVM) is listed in Table 8. These are the heavy vehicles in current operation that could potentially benefit from the potential rule change options. Rigid trucks with three axle trailers (R12T12 or R12T22) are common in the NZ fleet. These combinations can reach 44 tonnes GVM, but cannot go beyond this limit and are therefore excluded from this analysis.

**Table 8. Seven and eight axle vehicle combinations capable of operating beyond 44 tonnes GVM**

| Vehicle combinations capable of operating beyond 44 tonnes GVM | PAT Class | Current GVM (kg) | Current TARE (kg) | Current Payload (kg) |
|---|---|---|---|---|
| **Seven axles** | | | | |
| R12T22. Rigid Truck & Trailer<br>*3 axle rigid truck towing 4 axle trailer* | 751 | 44,000 | 15,763 | 28,237 |
| B1222. B Train.<br>*3 axle articulated truck towing two x 2 axle semi-trailers* | 751 | 44,000 | 15,763 | 28,237 |
| A223 – Articulated truck & semi-trailer ("Tri Semi")<br>*4 axle articulated truck towing a 3 axle semi-trailer* | 713 | 44,000 | 18,000 | 26,000 |
| **Eight axles** | | | | |
| R22T22. Rigid Truck & Trailer<br>*4 axle rigid truck towing 4 axle trailer* | 891 | 44,000 | 17,930 | 26,070 |
| B1232. B Train<br>*3 axle articulated truck towing one x 3 axle semi-trailer and one x 2 axle semi-trailer* | 851 | 44,000 | 18,740 | 25,260 |
| A224. Articulated truck and semi-trailer ("Quad Semi").<br>*4 axle articulated truck towing a 4 axle semi-trailer* | 826 | 44,000 | 19,460 | 24,540 |

## Estimation of total HVKTs travelled by the heavy vehicle fleet capable of operating beyond 44 tonnes GVM

34. A two-step methodology was used to estimate HVKTs by heavy vehicle combination type. Annual RUC data for the year from beginning of July 2014 to end of June 2015 was used. The first step in Table 9 was to estimate 723 million total HVKTs by the seven and eight axle 44+ tonne capable fleet by allocating the RUC kilometres purchased by the trailers associated with these vehicle combinations.

**Table 9. Estimation of total HVKTs by the seven & eight axles vehicle combinations capable of greater than 44 tonnes Gross Vehicle Mass.**

| A.) RUC allocation to 44 tonne or greater capacity vehicle combinations using 2014/15 RUC trailer data | RUC kms 2014/15 |
|---|---|
| 100% of 4-axle RUC Type 43 trailers | 628,445,352 |
| 100% of B-Trains assumed to have a RUC Type 939 trailer | 95,215,975 |
| ***Subtotal of 7 & 8 axle vehicle combinations capable of operating beyond 44 tonne GVM*** | **723,661,327** |

## First step allocation of RUC distance to specific heavy vehicle combination types

35. Total RUC kilometres were allocated to each vehicle combination type in two steps. The first step was on the basis of each combination's share of 2014 WIM counts shown in Table 10.

**Table 10. First step allocation of RUC distance to specific vehicle combination types**

| Vehicle combination type | % of all HV WIM counts 2014. see Appendix A.) Table 24. | Share of > 44T passes | Allocation of 2014/15 RUC based on share of 2014 WIM counts |
|---|---|---|---|
| R12T22 & B1222 | 7.0% | 15.7% | 134,613,520 |
| A223 | 0.8% | 1.7% | 14,405,745 |
| R22T22 | 20.0% | 44.6% | 382,563,830 |
| B1232 | 4.6% | 10.2% | 87,657,686 |
| A224 | 4.3% | 9.6% | 82,174,209 |
| R22T23 | 5.4% | 12.1% | 103,486,317 |
| B1233 | 2.8% | 6.1% | 52,601,207 |
| **Total** | **44.9%** | **100.0%** | **857,502,515** |

## Second step allocation of RUC distance to specific vehicle combination types

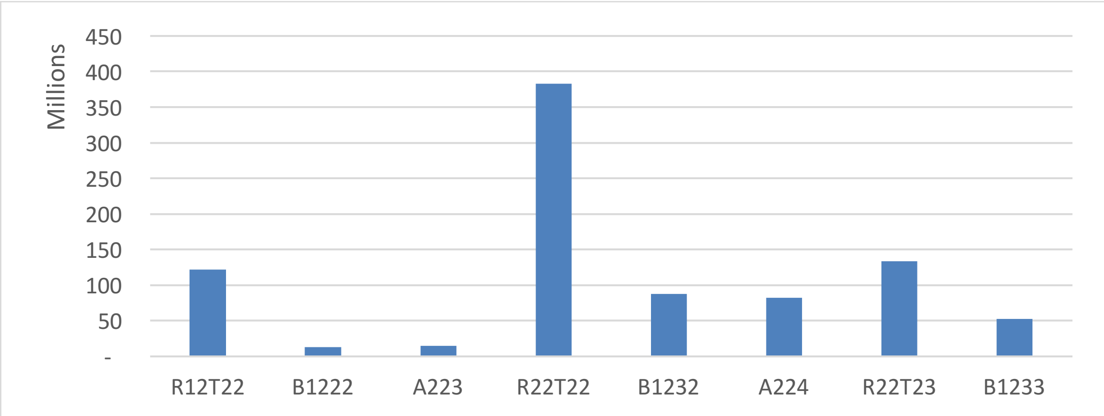
36. The second step was to achieve a finer grained allocation to heavy vehicle combination types of RUC kilometres based on purchases of HPMV and Non-HPMV RUC categories. These allocations are summarised in Table 11 and detailed in Table 12 further below. The table and graph show the dominance of the rigid truck and trailer in the heavy fleet and the eight axle version in particular which is estimated to account for 43% of all 44+ tonne capable HVKTs.

**Table 11. Summary of annual HVKTs using 2014/15 RUC distance data**

| | Class | 2014/14 kms | Share |
|---|---|---|---|
| *Seven axles* | R12T22 | 121,585,017 | 14% |
| | B1222 | 13,028,503 | 1% |
| | A223 | 14,405,745 | 2% |
| *Eight axles* | R22T22 | 382,563,830 | 43% |
| | B1232 | 87,657,686 | 10% |
| | A224 | 82,174,209 | 9% |
| *Nine Axles ((1)* | R22T23 | 133,841,188 | 15% |
| | B1233 | 52,601,207 | 6% |
| | **Total** | **887,857,386** | |

**Note (1) Nine axle vehicles not impacted by the proposals, but included here to assess share of fleet**

**Figure 1. Summary of 44+ tonne annual 2014/15 HVKTs kms by HV combination class**




37. The HPMV RUC categories, while involving the purchase of distance licences for a specific type of prime mover only, also precisely specify the configurations of trailers contained in the vehicle combination. Column (H.) of Table 12 shows the details of HPMV RUC for each vehicle combination. The Non HPMV RUC kilometres are assumed to be the balance of total RUC kilometres for the combination type contained in Table 10 above after accounting for the HPMV RUC categories.

38. This separate identification of HPMV and non-HPMV current vehicle configurations allows more precise rule take-up assumptions to be made in Table 13. Current access at the additional one tonne or two tonnes GVM for HPMV operators is only to HPMV routes, which are soon to total around 6,000 km mainly on State Highways. The proposed rule change would allow access with the additional tonne or more to around 80% of the 90,000 km combined total State Highway and Local Road network length.

**Table 12. Allocation of total trailer kilometres to specific combination / PAT types**

| (A) Combination type | (B) (PAT | (C) Methodology for allocation of total 44 + Tonne RUC kms calculated from Trailer kms in section A.) above to specific Combo / PAT categories | (D) RUC type | (E) % of all HV passes in Table 7.0 2014 WIM report | (F) Share of > 44T passes | (G) What if RUC Kms distributed on share of WIM counts | (H) RUC Kms | (I) Allocation of RUC kms to Combo/ PAT type | (J) Annual RUC kms allocated to Combo / PAT type |
|---|---|---|---|---|---|---|---|---|---|
| **7 Axle** | | | | | | | | | |
| **R12T22** | 751 | 100% of H-RUC | 871 + 43 | | | | 2,766,544 | 100% | 2,766,544 |
| | | 100% of H-RUC | 873 + 43 | | | | 1,505,324 | 100% | 1,505,324 |
| | | 100% of H-RUC | 874 + 43 | | | | 56,624 | 100% | 56,624 |
| | | Share of WIM passes for 44T+ RUC, after calculation of HPMV RUC. These Non-HPMV operators buy Type 6 and various types of trailer RUC. Assume non-HPMV balance of 751 fleet is 90% R12T22 and 10% B1222 | Type 6 & 43 | | | | 130,285,028 | 90% | 117,256,525 |
| **B1222** | | | Type 6 & 29 | | | | | 10% | 13,028,503 |
| **R12T22 & B1222 Sub total** | | | | **7.0%** | **15.7%** | **134,613,520** | **134,613,520** | | **134,613,520** |
| **A223** | 713 | Share of 44+T WIM passes | 14 & 33 | 0.8% | 1.7% | 14,405,745 | 14,405,745 | 100% | 14,405,745 |

| (A) Combination type | (B) (PAT | (C) Methodology for allocation of total 44 + Tonne RUC kms calculated from Trailer kms in section A.) above to specific Combo / PAT categories | (D) RUC type | (E) % of all HV passes in Table 7.0 2014 WIM report | (F) Share of > 44T passes | (G) What if RUC Kms distributed on share of WIM counts | (H) RUC Kms | (I) Allocation of RUC kms to Combo/ PAT type | (J) Annual RUC kms allocated to Combo / PAT type |
|---|---|---|---|---|---|---|---|---|---|
| **8 Axle** | | | | | | | | | |
| R22T22 | 891 | 881, 882 & 883 can be either R22T22 or A224. Split based on WIM proportions | 881 + 43 | | | | 34,701,317 | 82% | 28,565,488 |
| | | | 882 + 43 | | | | 11,853,460 | 82% | 9,757,551 |
| | | | 883 + 43 | | | | 128,833 | 82% | 106,053 |
| | | 100% of 408 combination RUC | 408 | | | | 176,604,656 | 100% | 176,604,656 |
| | | Share of WIM passes for 44T+ RUC, is the assumed total RUC kms for R22T22. Type 14 and 43 RUC is often used by used by operators in preference to 408 combination RUC in order to retain operational flexibility to mix and match trucks & trailers. Type 14 & 43 RUC is assumed to represent the balance after 408, 881, 882 and 883. | 14 & 43 (portion of) | | | | | | 167,530,082 |
| **R22T22 Sub total** | | | | **20.0%** | **44.6%** | **382,563,830** | | | **382,563,830** |
| **B1232** | | 100% of H-RUC | 884 +939+29 | | | | 305,993 | 100% | 305,993 |
| | | 100% of H-RUC | 885 +939+29 | | | | 1,295,307 | 100% | 1,295,307 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 851 | 939 trailer RUC kms which is part of either a 8 axle B-Train (PAT 851) or 9 axle (PAT 951) B-Train | 6 + 939 | | | | | | 86,056,386 |
| **B1232 total** | | | | **4.6%** | **10.2%** | **87,657,686** | | | **87,657,686** |
| **A224** | 826 | 881 can be either R22T22 or A224. Split based on WIM proportions | 881 + 43 | | | | 34,701,317 | 18% | 6,135,829 |
| | | 882 can be either R22T22 or A224, but A224s cannot currently go beyond 44T | 882 + 43 | | | | 11,853,460 | 0% | - |
| | | 883 can be either R22T22 or A224 but A224s cannot currently go beyond 44T | 883 + 43 | | | | 128,833 | 0% | - |
| | | A224 share of WIM passes for 44+ T RUC, net of H-RUC shared between R22T22 and A224 | 14 & 43 | | | | | | 76,038,380 |
| **A224 total** | | | | **4.3%** | **9.6%** | **82,174,209** | | | **82,174,209** |

**Potential take-up of new rule provisions for each vehicle combination category**

39. The assumptions for the potential take-up of new rule provisions for each category of 44+ tonne capable heavy vehicle combinations are shown in Table 13. This is measured in terms of percentage of operators with a commercial interest and ability to use any increased mass. The factors considered in this analysis to influence likelihood of take-up were:

    a. **HPMV / 50 Max status.** These vehicles are identified by their purchase of 800 series H-RUC and this data is shown in red font in Table 13. These combinations are already achieving well beyond 44 tonnes on HPMV networks, but the rule change does provide wider network access at the one or more tonne increase. A small benefit may therefore exist for the HPMV/ 50Max combinations, but of a significantly lesser scale than non-HPMV 44 tonne Class One combinations.

    b. **Current weight compliance of operators** (Rows titled "Compliance") in Table 13. Weight compliance refers to compliance within the General Access 44 tonne GVM limit plus the legitimate use of a 1.5 tonne weighing tolerance. A percentage of current HVKTs are illegally overloaded beyond this combined limit. The proposed rule change would therefore confer no further benefits to these operators beyond legitimising current illegal practices and possibly reducing fines. Table 13 shows assumptions for the percentage of operators that are currently weight compliant. This percentage is used in the calculation of rule take-up HVKTs. See also the discussion further below in Table 14 of changes to weighing tolerance and the potential impact on efficiency gains

    c. **Rural share / linehaul share.** Rural operations are assumed to have greater potential benefits from increased General Access mass with greater likelihood to face mass constraints on payloads. Linehaul operations (freight distribution or plant-to-port transport on arterial routes), are assumed to face cubic capacity constraints and less likely to benefit from increased General Access mass. Assumptions are made to split the Rigid Truck and trailer fleet between Rural and linehaul operations. B-Trains are assumed to be 100% linehaul operations.

    d. **Uptake assumption.** An uptake assumption is made for the percentage of operators existing kilometres where there is a commercial interest and ability to use any increased mass. The weight capacity of the "last mile" for the typical route is a major consideration here. Local roads and bridges have considerable more route length where even the existing 44 tonnes GVM Class One limit cannot be achieved. Rural operators servicing farms, quarries and forestry on local roads are therefore assumed to face an inability to fully take-up the proposed rule's potential benefits.

    **e. The extent to which current Non-HPMV operations will in the next few years convert to at least a 50Max operation.** This assumption applies to seven and eight axle rigid truck and trailers currently operating at up to 44 tonnes and not buying H-RUC. Table 13 shows an assumption for the *percentage of fleet not moved to HPMV*. This is the fleet that stands to benefit from increased general access mass. This percentage of fleet not moved to HPMV or most likely 50Max is assumed to decline from 80% to 20% over an assumed seven-year fleet replacement / upgrade cycle. This means the benefits from increased General Access Mass for this portion of the fleet start at a high level but decline rapidly as a shift is made to 50Max.

**Table 13. Rule take-up assumptions and take-up kilometres by vehicle combination type.**

| Combo type | RUC type | Annual RUC kms allocated to Combo / PAT type by year | | | | | | | | Notes on uptake |
|---|---|---|---|---|---|---|---|---|---|---|
| **7 Axle** | | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **40** | |
| R12T22 | 871 + 43 | 2,766,544 | | | | | | | | HPMV fleet will soon already have access at well above 44T to H-Routes making up more than half of SH network by length. But, significantly expanded "last mile" network access offered at the 44+ limits across both SH and local roads - say 80% of the combined network. Assumed this benefit would apply primarily to rural truck & trailers (42% of fleet) & 0% of B-Trains (linehaul operators with existing last mile access largely at 50Max weights). Assume 20% of the rural fleet's existing distance travelled represents the extent of expanded network access at increased general access weights . |
| | 873 + 43 | 1,505,324 | | | | | | | | |
| | 874 + 43 | 56,624 | | | | | | | | |
| | **HPMV RUC sub total** | **4,328,492** | **4,328,492** | **4,328,492** | **4,328,492** | **4,328,492** | **4,328,492** | **4,328,492** | **4,328,492** | |
| | Compliance | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | |
| | Rural share | 42% | 42% | 42% | 42% | 42% | 42% | 42% | 42% | |
| | Existing kms benefiting from expanded GA network | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | |
| | Freight task growth | 100% | 102% | 103% | 105% | 106% | 108% | 110% | 162% | |
| | Expected uptake (kms / year) | **272,695** | **277,058** | **281,421** | **285,784** | **290,147** | **294,511** | **298,874** | **442,857** | |
| | Type 6 & 43 | 117,256,525 | 117,256,525 | 117,256,525 | 117,256,525 | 117,256,525 | 117,256,525 | 117,256,525 | 117,256,525 | Mainly Logs, gravel, grain. 90% of combined R12T22 and B1222 kms are assumed rural R12T22 fleet. 75% interest in addition GA mass x 80% balance of fleet after 20% have gone to 50Max and received benefits anyway in year 1, declining to 20% balance of fleet in year 7 as HPMV take up is assumed to be complete. |
| | Compliance | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | |
| | Linehaul share | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | |
| | Linehaul uptake | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | |
| | Rural share | *100%* | *100%* | *100%* | *100%* | *100%* | *100%* | *100%* | *100%* | |
| | Rural % not moved to 50Max | *80%* | *70%* | *60%* | *50%* | *40%* | *30%* | *20%* | *20%* | |

| Combo type | RUC type | Annual RUC kms allocated to Combo / PAT type by year | | | | | | | | Notes on uptake |
|---|---|---|---|---|---|---|---|---|---|---|
| | Rural uptake | *75%* | *75%* | *75%* | *75%* | *75%* | *75%* | *75%* | *75%* | |
| | Freight task growth | 100% | 102% | 103% | 105% | 106% | 108% | 110% | 162% | |
| | Expected uptake (kms / year) | 52,765,436 | 46,908,473 | 40,840,448 | 34,561,361 | 28,071,212 | 21,370,002 | 14,457,730 | 21,422,767 | |
| **B1222** | Type 6 & 29 | 13,028,503 | 13,028,503 | 13,028,503 | 13,028,503 | 13,028,503 | 13,028,503 | 13,028,503 | 13,028,503 | 10% of combined R12T22 and B1222 kms are assumed to be linehaul B1222 and cubic constrained. Only 10% of kms are assumed to have potential to benefit from additional GA mass. |
| | Compliance | 85% | 85% | 85% | 85% | 85% | 85% | 85% | 85% | |
| | Linehaul share | *100%* | *100%* | *100%* | *100%* | *100%* | *100%* | *100%* | *100%* | |
| | Linehaul uptake | *10%* | *10%* | *10%* | *10%* | *10%* | *10%* | *10%* | *10%* | |
| | Rural share | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | |
| | Rural uptake | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | |
| | Freight task growth | 100% | 102% | 103% | 105% | 106% | 108% | 110% | 162% | |
| | Expected uptake (kms / year) | 1,107,423 | 1,125,142 | 1,142,860 | 1,160,579 | 1,178,298 | 1,196,017 | 1,213,735 | 1,798,455 | |
| **R12T22 & B1222 Sub total** | | **134,613,520** | | | | | | | | |

| Combo type | RUC type | Annual RUC kms allocated to Combo / PAT type by year | | | | | | | | Notes on uptake |
|---|---|---|---|---|---|---|---|---|---|---|
| A223 | 14 & 33 | 14,405,745 | 14,405,745 | 14,405,745 | 14,405,745 | 14,405,745 | 14,405,745 | 14,405,745 | 14,405,745 | Containers interested, reefer less so |
| | Compliance | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | |
| | Uptake | 25% | 25% | 25% | 25% | 25% | 25% | 25% | 25% | |
| | Freight task growth | 100% | 102% | 103% | 105% | 106% | 108% | 110% | 162% | |
| | Expected uptake (km) | 3,241,293 | 3,293,153 | 3,345,014 | 3,396,875 | 3,448,735 | 3,500,596 | 3,552,457 | 5,263,859 | |
| | | | | | | | | | | |
| **TOTAL ALL 7 Axle RUC Kms** | | **149,019,266** | | | | | | | | |
| **TOTAL ALL 7 Axle take-up Kms** | | **57,386,847** | ***Before take-up timing considerations*** | | | | | | | |

**Table 13 (continued) Rule take-up assumptions and take-up kilometres by vehicle combination type –EIGHT AXLES**

| Combo type | RUC type | Annual RUC kms allocated to Combo / PAT type by year | | | | | | | | Notes on uptake |
|---|---|---|---|---|---|---|---|---|---|---|
| **8 Axle** | | ***1*** | ***2*** | ***3*** | ***4*** | ***5*** | ***6*** | ***7*** | ***40*** | |
| | 881 + 43 | 28,565,488 | | | | | | | | |
| | 882 + 43 | 9,757,551 | | | | | | | | |
| | 883 + 43 | 106,053 | | | | | | | | |
| | **HPMV RUC sub total** | **38,429,092** | **38,429,092** | **38,429,092** | **38,429,092** | **38,429,092** | **38,429,092** | **38,429,092** | **38,429,092** | As for R12T22 above - Uptake by rural fleet making up 42% of Rigid truck and trailers, receiving 20% expansion of network access at the higher general access limits. |
| | Compliance | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | |
| | Rural share | 42% | 42% | 42% | 42% | 42% | 42% | 42% | 42% | |
| | Existing kms benefiting from expanded GA network | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | |
| | Freight task growth | 100% | 102% | 103% | 105% | 106% | 108% | 110% | 162% | |
| **R22T22** | **Expected uptake (kms / year)** | **2,421,033** | **2,459,769** | **2,498,506** | **2,537,242** | **2,575,979** | **2,614,715** | **2,653,452** | **3,931,757** | |
| | 408 | 176,604,656 | | | | | | | | |
| | 14 & 43 (portion of) | 167,530,082 | | | | | | | | |
| | Non HPMV RUC kms Sub total | 344,134,738 | 344,134,738 | 344,134,738 | 344,134,738 | 344,134,738 | 344,134,738 | 344,134,738 | 344,134,738 | Weighted average- (58% Linehaul x 10% uptake) + (42% rural x 80% balance in year 1 after assuming 20% go to 50 max and receive benefits anyway x 75% uptake) = 31% uptake. |
| | **Year** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **7** | |
| | Compliance | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | |
| | Linehaul share | *58%* | *58%* | *58%* | *58%* | *58%* | *58%* | *58%* | *58%* | |
| | Linehaul uptake | *10%* | *10%* | *10%* | *10%* | *10%* | *10%* | *10%* | *10%* | |
| | Rural share | *42%* | *42%* | *42%* | *42%* | *42%* | *42%* | *42%* | *42%* | |
| | Rural % not moved to 50Max | *80%* | *70%* | *60%* | *50%* | *40%* | *30%* | *20%* | *20%* | |
| | Rural uptake | *75%* | *75%* | *75%* | *75%* | *75%* | *75%* | *75%* | *75%* | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Weighted average of kms to which gains apply | 31% | 28% | 25% | 22% | 18% | 15% | 12% | 12% | |
| | Freight task growth | 100% | 102% | 103% | 105% | 106% | 108% | 110% | 162% | |
| | **Expected uptake (kms / year)** | **80,011,327** | **73,031,242** | **65,790,991** | **58,290,574** | **50,529,992** | **42,509,244** | **34,228,329** | **50,717,889** | |
| **R22T22 Sub total** | | **382,563,830** | | | | | | | | |
| **B1232** | 884 +939+29 | 305,993 | | | | | | | | 100% linehaul with good existing access at 50 max or better |
| | 885 +939+29 | 1,295,307 | | | | | | | | |
| | Sub total | 1,601,300 | 1,601,300 | 1,601,300 | 1,601,300 | 1,601,300 | 1,601,300 | 1,601,300 | 1,601,300 | |
| | Compliance | 85% | 85% | 85% | 85% | 85% | 85% | 85% | 85% | |
| | Uptake | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| | Freight task growth | 100% | 102% | 103% | 105% | 106% | 108% | 110% | 162% | |
| | Expected uptake (km) | - | - | - | - | - | - | - | - | |
| | 6 + 939 | 86,056,386 | 86,056,386 | 86,056,386 | 86,056,386 | 86,056,386 | 86,056,386 | 86,056,386 | 86,056,386 | 100% linehaul with a very small interest in additional General Access mass |
| | Compliance | 85% | 85% | 85% | 85% | 85% | 85% | 85% | 85% | |
| | Uptake | 5% | 5% | 5% | 5% | 5% | 5% | 5% | 5% | |
| | Freight task growth | 100% | 102% | 103% | 105% | 106% | 108% | 110% | 162% | |
| | **Expected uptake (km)** | **3,657,396** | **3,715,915** | **3,774,433** | **3,832,951** | **3,891,470** | **3,949,988** | **4,008,506** | **5,939,612** | |
| **B1232 total** | | **87,657,686** | | | | | | | | |
| **A224** | 881 + 43 | 6,135,829 | | | | | | | | 100% linehaul with good existing access at 50 max or better |
| | 882 + 43 | - | | | | | | | | |
| | 883 + 43 | - | | | | | | | | |
| | Sub total | 6,135,829 | 6,135,829 | 6,135,829 | 6,135,829 | 6,135,829 | 6,135,829 | 6,135,829 | 6,135,829 | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Compliance | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | |
| | Uptake | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| | Freight task growth | 100% | 102% | 103% | 105% | 106% | 108% | 110% | 162% | |
| | Expected uptake (km) | - | - | - | - | - | - | - | - | |
| | 14 & 43 | 76,038,380 | 76,038,380 | 76,038,380 | 76,038,380 | 76,038,380 | 76,038,380 | 76,038,380 | 76,038,380 | Fuel, curtainsiders, refrigerated. All except fuel assumed to cube out. National Fuel fleet is understood to be 30-40 vehicles = up to 4m kms / year (at 100k/ vehicle) or around 5% of total 76 m km annual quad semi kms. Assume 100% take-up by fuel fleet and a similar take-up by other fleet (ie: total take-up of 105) assuming the balance buy improved equipment allowing loading closer to the mass limit and therefore able to benefit from increased GA mass. While A224 can go beyond 44T, a shift to 50Max is not possible for this configuration, but some operation at standard HPMV seems to take place, but no further shift to the HPMV fleet is assumed for A224s. |
| | Compliance | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | |
| | Linehaul share | *100%* | *100%* | *100%* | *100%* | *100%* | *100%* | *100%* | *100%* | |
| | Linehaul uptake | *10%* | *10%* | *10%* | *10%* | *10%* | *10%* | *10%* | *10%* | |
| | % not moved to HPMV | *100%* | *100%* | *100%* | *100%* | *100%* | *100%* | *100%* | *100%* | |
| | Freight task growth | *100%* | *102%* | *103%* | *105%* | *106%* | *108%* | *110%* | *162%* | |
| | **Expected uptake (kms / year)** | **6,843,454** | **6,952,949** | **7,062,445** | **7,171,940** | **7,281,435** | **7,390,930** | **7,500,426** | **11,113,770** | |
| **A224 total** | | **82,174,209** | | | | | | | | |
| | | | | | | | | | | |
| **TOTAL ALL 8 Axle RUC KMS** | | **552,395,725** | | | | | | | | |
| **TOTAL ALL 8 Axle take-up KMS** | | **92,933,210** | ***Before take-up timing considerations*** | | | | | | | |

**Potential impact on efficiency gains of potential reduction weighing tolerance**

40. The rule change proposal is understood to include a further provision for reduction in the weighing tolerance by the Commercial Vehicle Inspection Unit (CVIU) of Police from the current 1.5 tonnes to 0.5 tonnes. This provision aims to avoid a ratcheting up of overloading weights. An unspoken concern from operators may however be that they currently load close to the 1.5 tonne tolerance limit. Assuming operators currently load up to say 0.5 tonnes of the tolerance limit, this currently leaves one tonne of tolerance actually used. Therefore, operators are likely to be already achieving 45 tonnes on seven or eight axles. Table 14 shows that a policy that increases general access GVM by one and two tonnes for seven and eight axles respectively AND also reduces the weighing tolerance to 0.5 tonnes, could deliver no change in operator efficiency for seven axles and halve the efficiencies for eight axles down to a one tonne gain.

**Table 14. Potential impact of changes in weighing tolerance on payload gains**

| | Rule assumption | GVM legal limit | Legal tolerance | Legal limit with tolerance | Assumed tolerance (not used) | Tolerance used | GVM achieved | + Gain / (Loss) |
|---|---|---|---|---|---|---|---|---|
| | | [Tonnes] | [Tonnes] | [Tonnes] | [Tonnes] | [Tonnes] | [Tonnes] | [Tonnes] |
| 7 Axles | Existing | 44 | 1.5 | 45.5 | (0.5) | 1.0 | 45 | |
| | Proposed | 45 | 0.5 | 45.5 | (0.5) | 0.0 | 44 | 0 |
| 8 Axles | Existing | 44 | 1.5 | 45.5 | (0.5) | 1.0 | 45 | |
| | Proposed | 46 | 0.5 | 46.5 | (0.5) | 0.0 | 46 | +1 |
| | | | | | *Note [1]* | | | |

*[1] ie: operators assumed to load to within 0.5 tonnes of practical legal limit*

**Further timing of rule benefit take-up considerations**

41. Table 13 above indicates for most combinations types a target take-up in terms of current kilometres of travel that may benefit from the changed mass provisions. Table 13 has some consideration of the timing of take-up in that it recognises the likely shift of rural fleet to 50 max over an assumed seven year period. The benefits of increased General Access mass therefore decline over this period.

42. Two further timing of take-up considerations are made. The first consideration is the time required to analyse and where necessary strengthen the local road network for the change in General Access mass. It is assumed, for the seven axle proposal with the addition of only one tonne, that the realisation of benefits would be available 100% from year one. This is because no change to vehicles is required and road network at this increased weight can be utilised immediately without further analysis or strengthening. However, benefits are assumed to be delayed until year four for the eight axles GVM increase of two tonnes. This is because of the need to analyse local road networks and strengthen infrastructure where the need is identified. Three years is assumed to be required as an average analysis and strengthening time. In reality analysis and strengthening might be spread over a longer period with incremental additional to the extent of local road network available.

43. The second timing consideration is the speed at which operators respond to the rule change provisions. General Access increased limits for seven and eight axle vehicle are assumed to be taken up immediately after routes become available. This is because no significant changes are required to vehicles apart from lengthening of drawbars for rigid truck and trailers at a cost of around $4,000 per vehicle (not included in cost calculations)

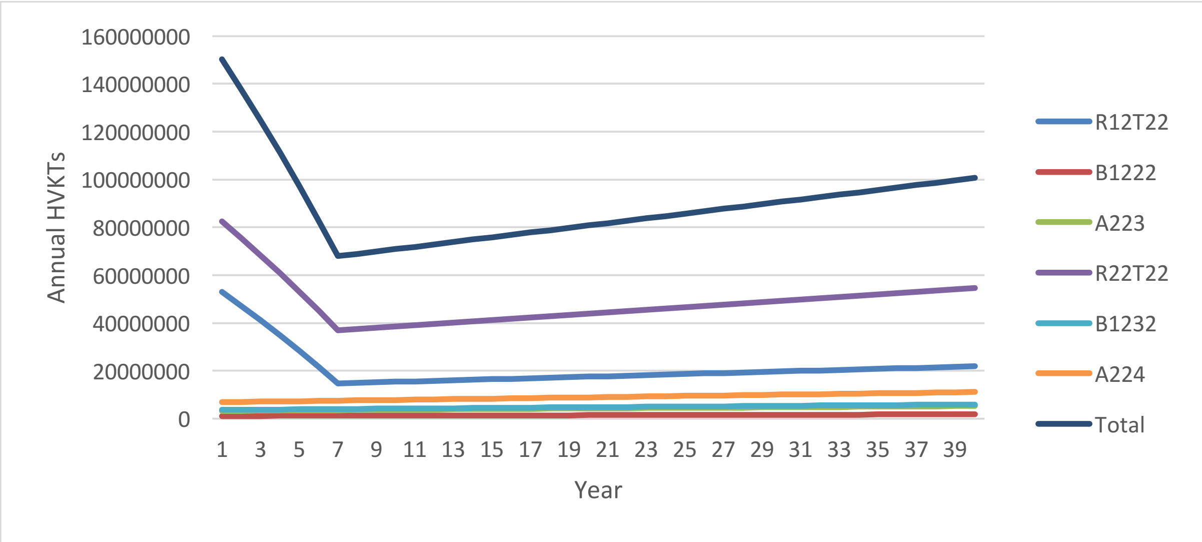
**Summary of take-up kilometres AFTER timing considerations and BEFORE efficiency considerations**

44. A scenario of one additional tonne for seven axles and two additional tonnes for eight axles is shown in Table 15 and graphed in Figure 2. The graph shows:
- The three-year delay in R22T22 benefits as local roads are analysed.
- The decline in seven and eight axle rural fleet rigid truck and trailer take-up kilometres as vehicles are assumed to transfer to 50Max.

**Table 15 Annual HVKTs available for efficiency gains. Seven axles + 1 Tonne, and eight axles + 2 tonnes**

| | | *Annual HVKTs* | | | | | |
|---|---|---|---|---|---|---|---|
| | **Year** | ***1*** | ***2*** | ***3*** | ***4*** | ***5*** | ***40*** |
| **7 axles** | R12T22 | 53,038,131 | 47,185,531 | 41,121,869 | 34,847,145 | 28,361,360 | 21,865,624 |
| | B1222 | 1,107,423 | 1,125,142 | 1,142,860 | 1,160,579 | 1,178,298 | 1,798,455 |
| | A223 | 3,241,293 | 3,293,153 | 3,345,014 | 3,396,875 | 3,448,735 | 5,263,859 |
| **8 axles** | R22T22 | - | - | - | 60,827,817 | 53,105,971 | 54,649,647 |
| | B1232 | - | - | - | 3,832,951 | 3,891,470 | 5,939,612 |
| | A224 | - | - | - | 7,171,940 | 7,281,435 | 11,113,770 |
| **TOTAL** | | **57,386,848** | **51,603,828** | **45,609,746** | **111,237,311** | **97,267,274** | **100,631,007** |

**Figure 2. Annual HVKTs available for efficiency gains. Seven axles + 1 Tonne and eight axles + 2 tonnes**



### Vehicle kilometres travelled and operating costs avoided

45. Table 16 lists GVM increase scenarios for seven and eight axle vehicles as assessed in Tables 17 to 23 further below.

**Table 16. Scenarios for GVM increase by number of axles in the vehicle combination**

| Vehicle category by number of axles | Existing GVM | Options for increased GVM limit |
|---|---|---|
| a. Seven axle vehicle combinations GVM increase with circa 80% General Access. | 44 tonnes | 45 tonnes |
| b. Eight axle vehicle combinations GVM increase with circa 80% General Access. | 44 tonnes | 46 tonnes |

## SEVEN AXLE VEHICLE COMBINATIONS

46. Table 17 shows the assumed payload and efficiency gains for a one tonne increase in GVM to 45 Tonnes for seven axle vehicle combinations. The payload gain is 3.5%. The avoided cost per kilometre declines as the mass increases to reflect increased fuel and tyre costs.

**Table 17 Seven-axle vehicle combinations 44 to 45 tonnes GVM. HVKTs and operating costs avoided.**

| Class | Payload gain (kg) | Payload gain % | HVKT avoided (%) | Efficiency | $VOC / HVKT avoided |
|---|---|---|---|---|---|
| ***R12T22*** | 1,000 | 3.5% | 3.4% | 96.5% | $2.95 |
| ***B1222*** | 1,000 | 3.8% | 3.7% | 96.3% | $2.95 |
| ***A223*** | 1,000 | 3.5% | 3.4% | 96.5% | $2.95 |

47. The 40-year NPV of vehicle operating costs gains for seven-axle combinations is shown in Table 18 at almost $45 million for a one tonne GVM increase.

48. The realisation of benefits would be available 100% from year one. This is because few changes to vehicles are required and the road network at this increased weight can be utilised immediately without further analysis or strengthening. In comparison, benefits are assumed to be realised from year four for the two tonne increase in GVM for eight axle vehicles. This is because of the need to analyse local road networks and strengthen infrastructure where the need is identified.

49. Benefits decline to year seven because of assumed transfer of this fleet to 50Max (see Table 13). Benefits then climb again to year 40 with 1.6% annual HVKT growth. Capital cost for operators are assumed at nil and infrastructure costs are considered in a separate analysis.

**Table 18. Seven-axle vehicle combinations 44 to 45 tonnes GVM: Timing and net present value of Vehicle Operating Cost (VOC) gains**

| ***Year*** | ***1*** | ***2*** | ***3*** | ***4*** | ***5*** | ***6*** | ***7*** | ***40*** |
|---|---|---|---|---|---|---|---|---|
| | ***($M)*** | ***($M)*** | ***($M)*** | ***($M)*** | ***($M)*** | ***($M)*** | ***($M)*** | ***($M)*** |
| ***Benefits realisation*** | *100%* | *100%* | *100%* | *100%* | *100%* | *100%* | *100%* | *100%* |
| GROSS BENEFITS: VOC avoided per year | $5.7 | $5.2 | $4.6 | $3.9 | $3.3 | $2.6 | $1.9 | $2.9 |
| Less capital costs to operators | $- | $- | $- | $- | $- | $- | $- | $- |
| NETT OPERATOR BENEFITS | $5.7 | $5.2 | $4.6 | $3.9 | $3.3 | $2.6 | $1.9 | $2.9 |
| **40 Year NPV of Seven axle vehicle combinations increasing GVM from 44 to 45 Tonnes** | | | | | | | | **$44.8** |

## EIGHT AXLE VEHICLE COMBINATIONS:

50. Table 19 shows the payload and efficiency gains for a two tonne GVM increase to 46 tonnes for eight- axle rigid truck and trailers, B-Trains and Articulated truck and semi-trailers. The payload gain is almost a 4% increase. The avoided cost per kilometre declines as the mass scenario increases to reflect increased fuel and tyre costs.

**Table 19. Eight-axle vehicle combinations 44 to 46 tonnes GVM. HVKTs and operating costs avoided.**

| Class | Payload gain (kg) | Payload gain (%) | HVKT avoided (%) | Efficiency (%) | VOC / HVKT avoided ($) |
|---|---|---|---|---|---|
| ***R22T22*** | 2,000 | 7.7% | 7.1% | 92.9% | 2.95 |
| ***B1232*** | 2,000 | 7.9% | 7.3% | 92.7% | 2.95 |
| ***A224*** | 2,000 | 8.1% | 7.5% | 92.5% | 2.95 |

51. The 40-year NPV of vehicle operating costs gains for an additional two tonnes GVM for 8-axle combinations is shown in Table 20 at $151 million.

52. Benefits are not realised until year four for GVM increases above one tonne. This is because of the need to analyse local road networks and strengthen infrastructure where the need might be identified.

53. Annual Benefits start at $15 million in year four and decline to 10.3 million in year seven as this fleet is assumed to transfer to 50Max (see Table 13). Benefits then rise to year 40 with HVKT growth as a function of economic growth.

54. Capital cost for operators are assumed at nil, although the access to wide track equipment due to the other proposal to increase vehicle width is assumed to actually decrease capital costs of vehicles.

55. Infrastructure costs are considered in a separate analysis and the integration of costs, (including any cost of implementing the rule change) and benefits is not within the scope of this report.

**Table 20. Eight-axle vehicle combinations: 8 axles 44 to 46 tonnes GVM. Timing and net present value of Vehicle Operating Cost (VOC) gains**

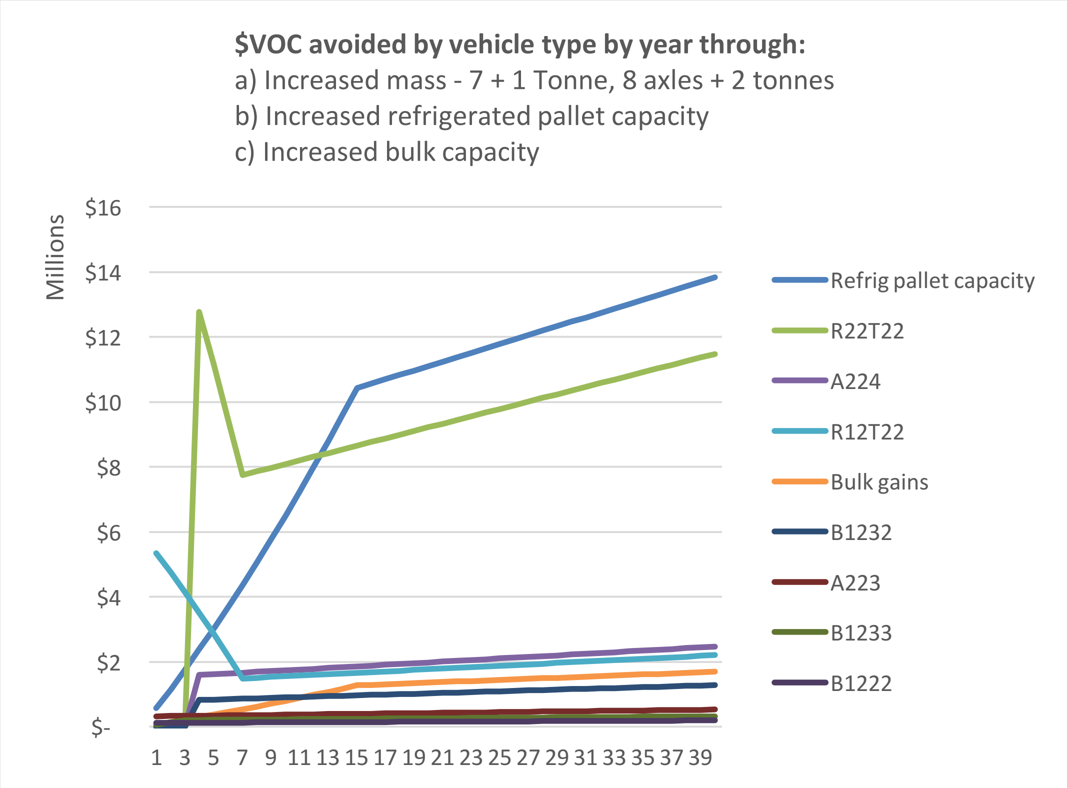
| ***Year*** | ***1*** | ***2*** | ***3*** | ***4*** | ***5*** | ***6*** | ***7*** | ***40*** |
|---|---|---|---|---|---|---|---|---|
| | *($M)* | *($M)* | *($M)* | *($M)* | *($M)* | *($M)* | *($M)* | *($M)* |
| ***Benefits realisation*** | *0%* | *0%* | *0%* | *100%* | *100%* | *100%* | *100%* | *100%* |
| GROSS BENEFITS: VOC avoided per year | $0.0 | $0.0 | $0.0 | $15.2 | $13.6 | $11.9 | $10.3 | $15.3 |
| Less capital costs to operators | $- | $- | $- | $- | $- | $- | $- | $- |
| NET OPERATOR BENEFITS | $0.0 | $0.0 | $0.0 | $15.2 | $13.6 | $11.9 | $10.3 | $15.3 |
| **40 Year NPV of Eight axle vehicle combinations increasing GVM from 44 to 46 Tonnes** | | | | | | | | **$151.8** |

## SUMMARY OF VEHICLE OPERATING COSTS AVOIDED IN SERVICING A FIXED FREIGHT TASK

56. The graph in figure 3 shows:

- The dominance of refrigerated pallet capacity gains in the overall benefits.
- The three-year delay in R22T22 mass benefits as local roads are analysed for eight axles vehicle combinations.
- The decline in seven and eight axle rural fleet rigid truck and trailer mass benefits as vehicles are assumed to transfer to 50Max.
- 1.6% HVKT growth to year 40

**Figure 3. VOC avoided in servicing a fixed freight task.**



## SAFETY BENEFITS

57. Safety gains are assessed from the reduced crash exposure arising from the reduced HVKTs needed to complete an assumed fixed freight task. Annual safety benefits climb to $800,000 by year four for all of the initiatives in the proposed rule combined.

58. Table 21 shows the 40-year NPV of safety gains totaling around $12 million. The table displays a scenario where seven axles receive plus one tonne and eight axles plus two tonnes GVM. These safety gains arise from the vehicle kilometres avoided to service a fixed freight task across all the increased dimension and mass proposals. It is assumed that one fatal crash is avoided per 59 million heavy HVKTs avoided and one serious crash is avoided per 26 million heavy HVKTs avoided. This data is sourced from the crash and distance analysis of "heavy" heavy vehicle combinations on page 61, of the HPMV Technical Report 6 May 2014. Minor crash and non-injury crash costs are not analysed here and therefore the estimated safety gains are likely to be conservative.

59. This analysis assumes that the following two risks either act to balance each other out, or they are of a minor scale only.

    a. any prospect that new vehicle will likely incorporate better safety equipment, providing lower crash risk, or
    b. Any risk that increased vehicle mass increases the frequency or severity of crashes.

**Table 21. Safety gains for all elements of the rule change:**

| *Year* | *1* | *2* | *3* | *4* | *40* |
|---|---|---|---|---|---|
| **Pallet capacity gains.** | 189,258 | 384,572 | 585,942 | 793,369 | 4,610,320 |
| **Low density bulk gains.** | 23,198 | 47,138 | 71,820 | 97,245 | 565,095 |
| 7 Axles + One tonne GVM | 1965,954 | 1,768,206 | 1,563,239 | 1,351,054 | 994,526 |
| 8 Axles + Two tonnes GVM | 0 | 0 | 0 | 5,155,686 | 5,167,097 |
| Total avoided HVKTs | **2,178,410** | **2,199,916** | **2,221,002** | **7,397,353** | **11,337,039** |
| Fatal crashes avoided at 1 fatal / 59 million kms | 0.04 | 0.04 | 0.04 | 0.13 | 0.19 |
| Cost per fatal injury crash of life(1) | $4,582,000 | $4,582,000 | $4,582,000 | $4,582,000 | $4,582,000 |
| Value of fatal injury crashes avoided | $169,178 | $170,848 | $172,485 | $574,486 | $880,446 |
| Serious crashes avoided at 1/26 million kms | 0.08 | 0.08 | 0.09 | 0.28 | 0.44 |
| Cost per serious injury crash | $857,000 | $857,000 | $857,000 | $857,000 | $857,000 |
| Value of serious injury crashes avoided | $71,804 | $72,513 | $73,208 | $243,828 | $373,686 |
| **Total value of fatals & serious avoided** | $240,981 | $243,360 | $245,693 | $818,314 | $1,254,132 |
| **40-Year NPV of safety gains: 7 Axles + 1 tonne and 8 axles +2 tonnes** | | | | | **$11,781,477** |

Notes
(1) Source: Table 4 "Social cost of road crashes and injuries 2014 update" December 2014, MOT
(2) From Page 61, HPMV Technical Report, 6 May 2014.

## SUMMARY OF NET BENEFITS

60. The net benefits to operators and society arising from the avoided HVKTs to service a fixed freight task are summarised in Table 23. The table shows total annual benefits in year 15 of $29 million. The 40-year net present value of these gains discounted at 6% is $346 million.

61. This is an initial, high level assessment of uptake, costs and benefits. Input assumptions have a wide range of certainty. The annual benefits in year 15 and the NPV of these gains therefore also exist in a range around these single point estimates.

### Sensitivity discussion

62. This analysis is based on extensive use of assumptions based where possible on industry knowledge. Estimating the current HVKTs for vehicle combinations capable of greater than 44 tonnes and estimating the nature of their demand for take-up of the rule change benefits and the level of operational gains is problematic. Many of the modelling assumptions are therefore of a “what if” nature. The overall model result is an expected value, around which pessimistic and optimistic sensitivity scenarios would be prudent.

63. A sensitivity analysis based on increasing or decreasing the discount rate by 33% is shown in Table 22. The results indicate that there are significant benefits regardless of the discount rate employed. The net benefits are dominated by the earlier rather than later periods of the cashflow.

**Table 22. Sensitivity of 40-year net present value to changes in discount rate.**

| | **Seven Axles + 1 Tonne / Eight Axles + 2 Tonnes** | | |
|---|---|---|---|
| % change in discount rate | -33% | | 33% |
| Discount rate | 4% | **6%** | 8% |
| 40 year NPV | $484 million | **$345 million** | $258 million |
| % change in NPV | +40% | | -25% |

**Table 23. Summary of Net Operator benefits.**

| ***1.0*** | **Vehicle height & width increase** | ***44T*** | ***45T*** | ***46T*** | | **Target annual gain** | ***Years to achieve target gain (2)*** | **TOTAL 40 year NPV** |
|---|---|---|---|---|---|---|---|---|
| | | ($M) | ($M) | ($M) | | ($M) | ($M) | ($M) |
| | 1.1 Refrigerated pallet capacity | | | | | 10.4 | *15 Y* | 106 |
| | 1.2 Low density bulk cubic capacity | | | | | 1.3 | *15 Y* | 13 |
| | 1.3 Truck supply cost benefits | | | | | 1.0 | *1 Y* | 18 |
| 2.0 | **Seven axle vehicle combinations increases from 44T to 45 Tonnes GVM - with General Access on 80% of combined State Highway and Local Roads** | | | | | | | |
| | 44 to 45 tonnes GVM | | 45 | | *Declining to Y7 >* | 2.0 | *7 Y* | 45 |
| ***3.0*** | **Eight axle vehicle combinations increases from 44T to 46 T GVM - with General Access on 80% of combined State Highway and Local Roads** | | | | | | | |
| | 44 to 46 tonnes GVM | | | 152 | *Declining to Y7 >* | 10.3 | *7 Y* | 152 |
| ***4.0*** | **Safety benefits:** reduced crash exposure from km avoided | | | | | 0.8 | *5 Y* | 12 |
| | **TOTAL gains ($ millions)** | | | | | **$26** | | **$346** |
| | ***Notes:***<br>*(1) This is an initial, high level assessment of uptake, costs and benefits. Input assumptions have a wide range of certainty/uncertainty*<br>*(2). Various assumptions are made as to the number of years required by industry to achieve the full target annual gains.* | | | | | | | |

## Appendix A.) Table 24. Heavy vehicle classification & counts from WIM Annual Report 2014

| Part | 9.0 CLASSIFICATION SCHEME | | | | |
|---|---|---|---|---|---|
| Table | Table 5.0 \| Heavy vehicle classification scheme | | | | |
| EEM (PEM) Class | Vehicle Type Group | PAT Class | Vehicle Types in Class | Volume | % |
| Bus & MCV | Rigid | 20 | o--o (short truck or bus) | 111,332 | 3.5% |
| | | 21 | o----o (truck or bus) | 599,618 | 18.3% |
| | T&T | 300 | o--o--o (truck towing light trailer) | 36,280 | 1.1% |
| | | 401 | o--o--oo (truck tow light 2 ax trailer) | 36,327 | 1.1% |
| Bus & HCV1 | Rigid | 31 | o--oo (truck or bus/coach) | 256,613 | 8.1% |
| | | 301 | o--oo (tractor without semi-trailer) | 2,711 | 0.1% |
| | | 34 | oo--o (twin steer truck) | 945 | 0.0% |
| | T&T | 30 | o--o-----o (artic e.g. bread truck) | 4,845 | 0.2% |
| | | 402 | o--oo---o (truck tow light 1 ax trailer) | 7,574 | 0.2% |
| | | 44 | oo--o---o (twin steer tow 1 ax trailer) | 72 | 0.0% |
| HCV1 | Rigid | 45 | oo--oo (heavy truck) | 281,581 | 8.8% |
| | | 47 | o--ooo (heavy truck) | 235 | 0.0% |
| | | 511 | oo--ooo (heavy truck) | 1,262 | 0.0% |
| | Artic | 41 | o--o--oo (artic A112) | 24,271 | 0.8% |
| | | 42 | o--oo--o (artic A121) | 211 | 0.0% |
| | T&T | 40 | o--o--o--o (truck tow heavy trailer) | | 0.0% |
| HCV2 | Artic | 50[1] | o-o-o-o-o (mobile crane) | | 0.0% |
| | | 53 | o--oo--oo | 40,567 | 1.3% |
| | | 57 | o--o-----ooo | 5,074 | 0.2% |
| | | 69 | o--oo--ooo | 161,798 | 5.1% |
| | | 68 | oo--oo--oo | 31,174 | 1.0% |
| | | 747 | o--ooo--ooo | 135 | 0.0% |
| | | 791 | o--oo--oooo | 69,457 | 2.2% |
| | | 713 | oo--oo--ooo | 24,025 | 0.8% |
| | | 826 | oo--oo--oooo | 137,045 | 4.3% |
| | | 847 | o--ooo--oooo | 862 | 0.0% |
| | A Train | 622 | o--o--oo--o-o | 59 | 0.0% |
| | | 74 | o--oo--oo--o-o | 52 | 0.0% |
| | | 85 | o--oo--oo--o-oo | | 0.0% |
| | | 89 | o--oo--ooo--o-o | | 0.0% |
| | | 810 | o--oo--ooo--o-oo | | 0.0% |
| | B Train | 751 | o--oo--oo--oo | 224,500 | 7.0% |
| | | 851 | o--oo--ooo-oo | 146,190 | 4.6% |
| | | 811 | o--oo--oo--ooo | 1,564 | 0.0% |
| | | 951 | o--oo--ooo-ooo | 87,725 | 2.8% |
| | | 1032 | o--oo--ooo-oooo | 1 | 0.0% |
| | T&T | 503 | o--oo--oo (truck tow light trailer) | 810 | 0.0% |
| | | 52 | o--oo--o--o | 6,951 | 0.2% |
| | | 63 | o--oo--o-oo | 18,773 | 0.6% |
| | | 66 | oo--oo--o--o | 2,882 | 0.1% |
| | | 62 | o--oo--o-o-o | 4,443 | 0.1% |
| | | 61 | o-o--o-o--oo | 12 | 0.0% |
| | | 751 | o--oo--oo-oo | | 0.0% |
| | | 77 | oo--oo--o-oo | 36,679 | 1.2% |
| | | 771 | oo--o--oo--oo | 145 | 0.0% |
| | | 891 | oo--oo--oo-oo | 638,016 | 20.0% |
| | | 915 | oo--oo--oo-ooo | 172,588 | 5.4% |
| | | 914 | oo--oo--ooo-oo | 3,084 | 0.1% |
| | | 1020 | oo--oo--ooo-ooo | 6,191 | 0.2% |
| | | 1020 | oo--ooo--oo--ooo | | 0.0% |
| | | 1133 | oo--oo--ooo-oooo | | 0.0% |
| | | x | various (twin steer A train) | | |
| | | 999 | Not classified | 3,184,679 | 100% |