Vehicle Dimensions and Mass Rule Amendment 2010

Funding and investment guidelines

NZ TRANSPORT AGENCY
WAKA KOTAHI

New Zealand Government

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May 2010

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More information

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Glossary of terms

Term	Description
ARTA	Auckland Regional Transport Authority
ATA	Auckland Transport Agency
Axxx	Articulated truck and semi-trailer, where x equals the number of axles in each axle set (group)
AxxxTxx	Articulated truck and semi-trailer plus a full trailer, where x equals the number of axles in each axle set (group)
B-train	Articulated truck with 2 semi-trailers
Bxxxx	B-train, where x equals the number of axles in each axle set (group)
CAPTIF	Canterbury Accelerated Pavement Testing Indoor Facility
Cube out	Payloads that meet volume restrictions before weight restrictions
dTIMS	Deighton's Total Infrastructure Management System
ESA	Equivalent standard axle (calculated using an exponent of 4)
GCM	Gross combination mass – the gross mass of the vehicle combination
GPS	Government policy statement on land transport funding
Gross mass	In relation to any vehicle or combination, means the mass of the vehicle or combination and its load, equipment and accessories
HCV	Heavy commercial vehicle - over 3.5 tonnes gross laden weight
HCV1	Heavy commercial vehicle 1 – a rigid truck with or without a trailer, or an articulated vehicle, with 3 or 4 axles in total
HCV2	Heavy commercial vehicle 2 – a truck and trailer, or articulated vehicle with or without a trailer, with 5 or more axles in total
HPMV	High-productivity motor vehicle
LTMA	Land Transport Management Act 2003
MCV	Medium commercial vehicle – 2 axle truck without a trailer, over 3.5 tonnes gross laden weight
NLTF	National Land Transport Fund
NLTP	National Land Transport Programme
OPermit	The NZTA's overweight permit system
RAMM	Road assessment and maintenance management
RLTP	Regional Land Transport Programme
RTC	Regional Transport Committee
Rxx	Rigid truck, where x equals the number of axles in each axle set (group)
RxxTxx	Rigid truck and full trailer, where x equals the number of axles in each axle set (group)
SRT	Static roll-over threshold
VDAM	Vehicle dimensions and mass
VKT	Vehicle kilometres travelled
VOC	Vehicle operating cost
WIM	Weigh in motion

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1 Introduction

About these guidelines

These guidelines on funding and investment related to implementation of amendments to the Land Transport Rule: Vehicle Dimensions and Mass 2002 (the Vehicle Dimensions and Mass Rule) give you:

- a description of the role of the NZ Transport Agency (NZTA) with respect to implementation of the Land Transport Rule: Vehicle Dimensions and Mass Amendment 2010 (the 2010 VDAM amendment)
- a summary description of the 2010 VDAM amendment, the timetable for implementation of this amendment and reference to further information on the changes
- the plan for investigating routes for permitted high-productivity motor vehicles (HPMVs)
- the likely impacts of HPMVs and how to determine these
- reference to methodology for screening bridges on local roads
- reference to methodology for assessing pavement impacts
- the NZTA's funding and investment approach
- reference to a simplified procedure for economic evaluation of HPMV routes
- a summary of the economic evaluation for the Auckland-Hamilton-Tauranga case study area
- a description of monitoring, evaluation and review of implementation of the 2010 VDAM amendment.

This guide is correct at the time of publication (May 2010). Some information may change over time and interested parties are encouraged to contact their NZTA regional office for the most up-to-date information before applying for funding assistance.

What is the NZTA's role?

The government has given the NZTA, in conjunction with other road controlling authorities, the task of implementing the 2010 VDAM amendment, including new provisions for HPMVs carrying divisible loads on specified routes under permit.

Implementation of the 2010 VDAM amendment will contribute to New Zealand's economic growth and productivity. This is compatible with the government's funding priorities for activities in the National Land Transport Programme (NLTP), which are defined in the current *Government policy statement on land transport funding* (GPS) effective for the three years from July 2009. Together with funding assistance for other land transport activities, the NLTP provides for maintaining and improving public roads. The NZTA is required to give effect to the GPS when preparing the NLTP and must take the GPS into account when approving activities for funding from the National Land Transport Fund (NLTF). The NLTP will therefore be used to provide funding assistance for implementation of the 2010 VDAM amendment. The NZTA will work with approved organisations to assist with funding for additional costs agreed that result from the need to provide for the amended dimension and mass limits.

The NZTA has confirmed the processes to be used for identifying and preparing activities for the NLTP and approving funding from the NLTF for activities relating to the implementation of the 2010 VDAM amendment. The processes are consistent with those applied to planning, programming and funding for other NLTP activities. The NZTA is required to assess each activity or package to ensure it complies with the requirements of the Land Transport Management Act 2003[1] (LTMA). This is done by using the NZTA's funding allocation process[2]. As explained in section 4 of this document, the NZTA has simplified the funding assistance arrangements for activities related to implementing the 2010 VDAM amendment.

In its role of manager of the state highway system, the NZTA is working towards making state highway routes available for HPMVs. For this purpose, a screening level assessment has been completed of all bridges on state highways.

The NZTA also provides assistance and advice to, and cooperates with, approved organisations, and provides advice or assistance to any government agency or local government agency when requested to do so by the Minister of Transport. These guidelines are intended to be part of the NZTA's advice and assistance to both local government and the industry. The NZTA will continue to provide information and hold discussions with interested groups to facilitate implementation of the 2010 VDAM amendment.

The NZTA's regional staff will:

- answer questions about implementation of the 2010 VDAM amendment and application of the amended provisions
- work with local authorities and the transport industry to identify start-to-finish routes for HPMVs
- work with local authorities to commission joint studies of HPMV routes with multi-party funding
- provide advice and guidance to road controlling authorities on assessment of their road assets, identification of upgrade works required and programming and funding of those works
- coordinate with local authorities the issue of HPMV permits for routes involving both state highways and local roads.

How the NZTA works

The NZTA is committed to working collaboratively with public and private sector organisations, including heavy vehicle manufacturers, vehicle working groups, transport operators, road engineers, road controlling authorities and transport users, to develop the land transport system in a strategic manner. Changes to the Vehicle Dimensions and Mass Rule provide an opportunity to do this in a practical way.

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[1] As amended in August 2008.

[2] Details of the funding allocation process are contained in the NZTA's *Planning, programming and funding manual.*

2 Vehicle Dimensions and Mass Rule changes

This section gives:

- a summary of the changes to vehicle dimension and mass limits in the 2010 VDAM amendment
- the timetable for implementation
- where further information on the rule changes can be found.

What is the objective of the changes to the rule?

The objective of the 2010 VDAM amendment is to improve the productivity of the heavy vehicle fleet so that freight can be moved more efficiently and, where possible, enable a given amount of freight to be carried on fewer vehicles, without reducing the safety of road users.

What are the rule changes?

The 2010 VDAM amendment implements changes to some requirements for heavy vehicles and makes provision for long-term permits for HPMVs to operate with divisible loads on specified roads.

Specifically, the changes:

- increase the as-of-right[3] overall length of a towing vehicle and trailer combination from 20 metres to 22 metres
- increase the as-of-right overall length of an articulated truck and semi-trailer from 18 metres to 19 metres
- increase the as-of-right overall length for certain types of rigid bus from 12.6 metres to 13.5 metres
- require a rear underrun protection device to be fitted to a towing vehicle and full trailer combination greater than 21 metres (log trucks)
- allow a quad-axle semi-trailer the option of having one steering axle with increased allowable mass (it currently must have two)
- allow buses to be fitted with bicycle racks that may project beyond the allowable dimension of the vehicle
- exempt certain overdimension farm vehicles from the need to comply with travel time restrictions in the rule if they are able to travel without taking up more than the lane they are using
- allow HPMVs to operate by permit on routes approved by the road controlling authority at a gross mass above 44 tonnes with increased individual axle, axle set and gross combination mass limits
- allow HPMVs to operate by permit at increased length, with approval by the NZTA (or a person or organisation appointed by the NZTA).

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[3] As-of-right means subject only to limits that apply to all vehicles with no additional restrictions or requirements imposed by a permit.

The HPMV permit will specify mass and/or dimension limits that vary from the as-of-right limits for the vehicle (or vehicle combination), and will be subject to conditions including the use of vehicle signage for enforcement purposes. The permit issuing authority may also specify additional conditions of operation, which may, in time, include the use of a satellite navigation system (GPS) or stability control.

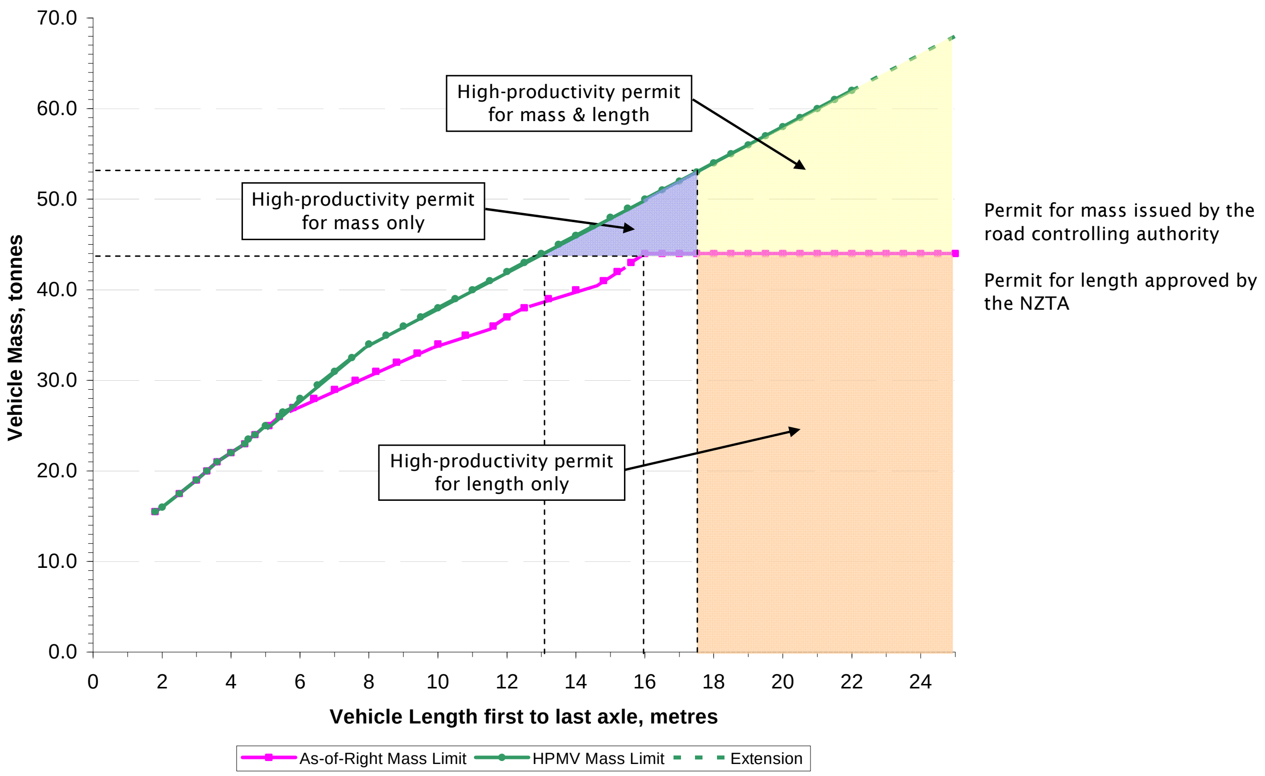
To have a gross mass of more than 53 tonnes, a HPMV will, in practice, have an overall length exceeding the as-of-right limit of 20m or 22m (whichever is relevant) because of the limits on the mass on axle sets and the distance between the first and last axles. Those vehicles, therefore, will also require an overdimension permit from the NZTA or an agent approved by the NZTA.

Provision is also made in the 2010 VDAM amendment for HPMV permits for a vehicle with a gross mass less than 44 tonnes, but longer than the as-of-right limits, to carry payloads that meet volume restrictions before weight restrictions ('cube out'). There is no provision for a standard-sized vehicle with a gross mass below 44 tonnes to have a HPMV permit.

The mass limits allowed as-of-right, ie without a permit, are not changed by the 2010 VDAM amendment.

The mass limits for HPMVs are shown by the green line in Figure 1. The green line shows the increased mass limits for groups of axles and axle sets as well as the overall (gross) mass of the HPMV. The as-of-right mass limits are shown by the red line for comparison.

Figure 1: Mass limits for HPMVs



What about as-of-right mass limit changes?

The 2009 consultation draft of proposed amendments to the Vehicle Dimensions and Mass Rule included increases in mass limits for as-of-right vehicles, as well as the changes in dimension limits and the HPMV permit provisions retained in the 2010 VDAM amendment. Initially, the intention was to implement the increased as-of-right mass limits, together with the provisions for HPMVs, by 1 April 2010.

The proposed change to as of right mass limits has been withdrawn from the 2010 VDAM amendment. After further consideration of issues raised during the submissions process, analysis and feedback from road controlling authorities about the impact such a change could have on road infrastructure, it has been decided further work needs to be done before this proposal can be considered.

The mass limits for HPMVs introduced by the 2010 VDAM amendment are the same, up to a maximum gross mass limit of 44 tonnes, as the previously proposed as-of-right mass limit increases. Therefore, infrastructure strengthened to accommodate HPMVs will, in general, be capable of carrying the previously proposed as-of-right mass limit increases.

What is the timetable for implementation?

The 2010 VDAM amendment, including the provision for long-term permits for HPMVs, was gazetted on 1 April 2010 and came into force on 1 May 2010.

The as-of-right increases in length are available immediately that the rule amendment comes into force.

For HPMVs, the NZTA is progressively assessing routes and expects to complete the assessments by June 2012. Some strengthening work on state highway sections of priority HPMV routes will also be undertaken before June 2012 but most bridge strengthening works will be programmed in later regional land transport programmes (RLTPs) and national land transport programmes (NLTPs).

Where can I find further information on the amended requirements for heavy vehicles?

Information on the changes introduced by the 2010 VDAM amendment is given in www.nzta.govt.nz/resources/vdam-background/docs/key-changes.pdf.

Information on HPMV permits is provided at: www.nzta.govt.nz/vehicle/your/hpmv.html.

The Ministry of Transport website has more information about the background to the rule amendment (external link).

The consolidated version of the Vehicle Dimensions and Mass Rule can be accessed from: www.nzta.govt.nz/vehicle/your/hpmv.html.

3 Studies of HPMV routes

This section explains:

- the plan for implementing HPMV routes
- the role of road controlling authorities and regional transport committees in developing HPMV routes
- how the transport industry, developers and others can contribute to identifying HPMV routes
- how HPMV routes should be investigated
- the likely impacts on HPMV routes and how to estimate these
- the results of a case study in the Auckland/Hamilton/Tauranga area.

What is the plan for implementing HPMV routes?

Table 1 sets out the priority for assessing HPMV routes involving state highways and for identifying required upgrade works.

Local routes not involving state highways, identified for HPMVs by local authorities, the transport industry or other parties, may be assessed by the respective territorial authorities in a different order but should use the methodologies referred to in these guidelines.

The priority given to any upgrade works and the availability of the routes for HPMVs will depend on the potential benefits to freight transport (the amount of freight carried on the route) and the amount of upgrading works required.

Table 1: Priority for assessing state highways for HPMVs

Priority	Region	Key state highway freight routes	Heavy vehicles per-day (aggregated) range on key freight routes	Connectivity
1	Auckland/Hamilton/Tauranga	1, 2, 29, 27	1300–6000	Ports of Auckland, Auckland International Airport, Hamilton, Port of Tauranga
2	Tauranga/Taupo/Whakatane/ East Coast	1, 2, 5, 28, 30, 33, 34	600–2000	Port of Tauranga, east Taupo forestry catchment, Rotorua, Kawerau, Gisborne
3	Waipara/Christchurch/Timaru	SH1, 73A, 74	1000–1400	Lyttelton, Prime Port
4	Taupo/Napier/Palmerston North	SH1, 2, 5, 56	600–1100	Port of Napier, Whirinaki
5	Nelson/Picton/Waipara	SH1, 6, 60, 62	500–1200	Motueka, Picton port
6	Whangarei/Auckland	SH1, 15A, 16, 18	1000–1300	Marsden-North Auckland
7	New Plymouth/Palmerston North/Wellington	SH1, 2, 3, 44	900–1500	Port Taranaki, Whanganui, Levin, Seaview
8	Timaru/Dunedin	SH1, 88	500-1500	Prime Port, Port Otago
9	Dunedin/Invercargill	SH1, 88	500-1500	Port Otago, Gore, South Port, Tiwai

What is the role of local authorities?

Local government has an important role in implementing the 2010 VDAM amendment. This is because heavy vehicle journeys almost always start and finish on roads that are under the control of local authorities. The NZTA will work closely with local authorities to identify strategic start-to-finish routes for freight transport, the economic justification for developing HPMV routes and the timetable for making these routes available.

The NZTA will assist local authorities to:

- work with adjoining local authorities, the NZTA and the transport industry to identify potential start-to-finish routes for HPMVs in their area
- agree joint studies and funding arrangements with adjoining local authorities and the NZTA where appropriate
- provide information for screening of bridges and other structures on local road portions of HPMV routes
- provide information for detailed assessment of bridges and other structures on local road portions of HPMV routes shown by screening as being potentially deficient
- provide information for an analysis of the impacts on pavements and surfacings on local road portions of HPMV routes
- agree an action plan for road assets that are found to be deficient
- agree an economic evaluation of HPMV routes involving local roads
- prepare, assess and submit to the Regional Transport Committee (RTC)/Auckland Regional Transport Authority (ARTA), programmes, projects and packages of upgrade works necessary to implement the agreed HPMV routes
- adjust asset and activity management plans and forward works programmes to reflect changes required as a result of HPMV operation
- undertake any agreed upgrading/strengthening works on local road portions of agreed HPMV routes with funding assistance from the NZTA
- work with the NZTA to issue HPMV permits for routes involving both state highways and local roads.

While some local government regions have already identified potential routes for HPMVs operating under permit, significant work remains in most areas.

Change for the Auckland region

These guidelines refer to the ARTA as used in the Land Transport Management Act at the time of publication of these guidelines. The government intends to replace the ARTA from 1 November 2010 with Auckland Transport as defined in the Local Government (Auckland Law Reform) Bill. From that date, a reference to ARTA in these guidelines should be read as a reference to Auckland Transport.

What should regional transport committees do?

The RTC (ARTA for the Auckland Region) should oversee the identification, strategic analysis and development of end-to-end high productivity vehicle routes in their regions, including the timing and packaging of required upgrade works.

In general there will be no need for variations to regional land transport programmes (RLTPs) because any changes to maintenance and renewal programmes will be in response to changes in demand and not to changes in level of service or objective of the RLTPs. Outside Auckland there is no need to vary an RLTP in respect of any new minor local roads capital works before applying for funding assistance. Other capital works, such as the reconstruction of a significant bridge, may require a variation to an RLTP. However, unless the programme changes are significant, the RTC should not need to consult on the changes.

What opportunities are there for industry input?

'The industry' includes road transport operators, vehicle manufacturers, industries that generate significant freight volumes and land developers. To assist with implementing the 2010 VDAM amendment, the industry can:

- work with the NZTA and local government agencies to identify strategic routes where potential benefits can be gained from transporting freight by HPMVs, and to agree a detailed local implementation plan and timetable
- obtain the NZTA's agreement for any plans involving the use of HPMVs that are longer than allowed by the as-of-right limits
- help and advise the NZTA and local authorities with identifying the likely region-by-region uptake and impacts for HPMVs
- provide funding contributions, where appropriate, to reflect the transport benefits received.

The NZTA and other road controlling authorities need information from the transport industry and associated parties on the likely benefits to the industry (take up) for identified HPMV routes. The industry could take the initiative in this.

The industry may also take the initiative in identifying local potential HPMV routes, ie routes not involving state highways.

How should HPMV routes be investigated?

The NZTA has initially identified the sections of state highway that currently carry significant volumes of freight – see table 1 on page 6. However, start and end links on local roads need to be considered so that a complete practical route is available from sources of freight generation to delivery points.

Once potential HPMV routes have been identified, the next priority is to screen bridges on the route. State highway bridges have already been screened – refer to *Vehicle Dimensions and Mass Amendment Rule 2010: Study on the impact of the rule change on NZTA's bridge stock*, Opus International Consultants. This report also provides a method for high-level screening of bridges on local roads where structural data has not been included in the NZTA's overweight permit. Screening of bridges will give a broad indication of the amount of upgrading work required to accommodate HPMVs. This, together with uptake estimates, will largely determine whether it is feasible to consider upgrading the route to accommodate HPMVs.

Where it appears feasible to upgrade a potential HPMV route, then a detailed study should be commissioned for the route. The study should include all end-to-end routes in an area, ie including both local authority and state highway portions.

The NZTA has prepared terms of reference for studies of HPMV routes – refer to *Terms of reference for study of high-productivity motor vehicle routes*, the NZTA, May 2010. Studies of HPMV routes should comply with the requirements for work category 002: Studies and strategies in the NZTA's *Planning, programming and funding manual*.

The study of HPMV routes must include an evaluation of the costs and benefits involved with making the route available. A simplified procedure for economic evaluation of a HPMV route is provided in *Simplified procedure for economic evaluation of a high-productivity motor vehicle route*, the NZTA, May 2010.

The route study, with an agreed action plan, should be reported to the NZTA to support funding requests for upgrade works where justified, ie where benefits significantly exceed costs.

What are the likely impacts of HPMVs?

The majority of vehicles operating under HPMV permits will be existing vehicles operating at greater gross weights by making full use of their existing load carrying capacity or new vehicles in accordance with pro-forma designs generally within the overall length limit for as-of-right vehicles – see *The development of pro-forma over-dimensional vehicle parameters*, Transport Engineering Research NZ, April 2010. The rule amendment for HPMV permits allows for longer vehicles but factors affecting safety will be considered by the NZTA before a permit for such vehicles is issued. All vehicles issued with a HPMV permit must comply with existing safety requirements for aspects such as braking and rollover thresholds. Road controlling authorities have the ability to place further safety-related conditions on a HPMV permit where appropriate.

The likely impacts of HPMVs are mostly related to the effects of increased vehicle weight on bridges on the selected routes. The impacts on pavements also need to be considered. Weak pavements and vulnerable surfacings are likely to need upgrade works.

The impacts of HPMVs on geometric aspects of a road network, including sight distance, are expected to be minimal.

Road safety is expected to be improved and vehicle emissions reduced because of fewer truck trips being needed for a given freight task.

Further information on network impacts is provided in Appendix B.

How can the take up and benefits be estimated for a HPMV route?

The process for estimating take up and benefits for a HPMV route involves:

- using telemetry (classifier) data (which may already be assigned to routes in a traffic monitoring system or road asset system such as RAMMS) to determine the heavy vehicle VKT for each route segment

- using information from appropriate NZTA WIM sites to determine the characteristics of each heavy vehicle configuration in the traffic stream
- taking account of the nationwide estimates of take up and efficiency gains given in Appendix A of these guidelines for HPMV vehicle configurations
- working with road transport operators in the region to refine the likely take up for HPMVs on particular routes, including estimating the proportion of freight that cubes out and the commercial incentives for use of HPMVs
- only counting heavy vehicles that are likely to travel on complete routes in the region and adjoining regions that are likely to be upgraded to accommodate HPMV weights
- valuing the efficiency gains and other benefits as described in Appendix A.

Further information of the methodology for determining the change in vehicle loading resulting from the VDAM amendment is given in *Methodology: Assessing additional pavement costs from VDM loading for a HPMV route,* Opus International Consultants, May 2010.

How can the impacts be estimated for a HPMV route?

Structures

Vehicle Dimensions and Mass Amendment Rule 2010: Study on the impact of the rule change on NZTA's bridge stock, Opus International Consultants contains a high-level methodology for screening local authority bridges for the purpose of providing a first estimate of bridges that may require upgrading works. The methodology has been developed from the national screening of state highway bridges. This methodology cannot be used to determine the structural adequacy of the bridges.

Based on the state highway screening assessment, it is likely that all bridges built to traction engine loadings and a proportion of bridges built to other standards, will not be readily able to accommodate the increase in loadings without further analysis, and maybe testing.

The method of screening by design loading and span may not be applicable to all bridge types. For example, many timber bridges are in a poor condition and may not have been designed to a standard load. Therefore it would be inappropriate to adopt this guidance for such bridges. Where ambiguity exists, the structure should be categorised as requiring more detailed assessment.

This screening method for bridges on local roads should be carried out as soon as possible and the results conveyed to the NZTA regional programme and funding manager. This screening should then be used to quantify the work required to undertake more detailed assessment of bridges. Refer to section 4 of these guidelines for the funding assistance from the NZTA available for this.

Pavements

Methodology: Assessing additional pavement costs from VDM loading for a HPMV route, Opus International Consultants, May 2010 provides a methodology for estimating the impacts of HPMVs on pavements on specified routes.

Those local authorities that have up-to-date road asset data and a calibrated pavement deterioration model, could assess the impacts on their pavements of the increased vehicle loadings by using the same methodology as that which has been used for state highways that have been investigated so far – see Appendix B. For the state highways 1 and 29 in the Auckland/Hamilton/Tauranga area, dynamic

ESA using an exponent of 1.5 was used to model the additional pavement wear because of the high structural number of the pavements. In other areas a higher exponent is likely to be more appropriate.

A collaborative sampling approach may be more suitable for determining the effects on local road pavements in other areas. A study of representative pavements could be commissioned by a group of local authorities. The NZTA offers assistance with such a study. Funding assistance from the NZTA is addressed in section 4 of these guidelines.

Geometry

As-of-right dimension increases for vehicles will only impact on roads where heavy vehicles operate. The impacts should be minimal because only small increases have been allowed.

The impacts of heavier and/or longer HPMVs on passing distance, stopping distance, sight distance at intersections and railway level crossings, swept path (dynamic and static), etc, should be considered by the road controlling authority when considering the suitability of routes for HPMVs and when issuing a HPMV permit.

The NZTA has prepared pro-forma vehicle designs – refer to *The development of pro-forma overdimensional vehicle parameters*, Transport Engineering Research NZ, April 2010 to maximise the new provisions for HPMVs while remaining within an overall length of about 22 metres (the amended limit for as-of-right vehicles). These pro-forma vehicles will meet existing swept path, braking and roll-over requirements, and their length aspects will contain special operating conditions to maintain safety (stopping distance, sight distance, etc). Operations involving HPMVs are likely to transition to these improved vehicle designs over time. The NZTA will not approve a HPMV if the overall length exceeds 25 metres if there is a railway level crossing on the route, because this is the design limit for these crossings.

Case study of the Auckland/Hamilton/Tauranga area

A case study of potential HPMV routes in the Auckland/Hamilton/Tauranga area has been used to assess the benefits and costs of implementing the 2010 VDAM amendment. The results are summarised in Appendix C.

4 Network investment

This section explains:

- how investment in HPMV routes relates to the NZTA's strategic investment direction
- the assessment profile for HPMV route studies and upgrade works
- how the NZTA's policies and procedures apply to activities related to implementing the 2010 VDAM amendment
- the NZTA's funding assistance for HPMV routes
- funding sources other than the National Land Transport Fund
- how to apply for funding assistance
- adjustment to network management and forward works programming.

How do HPMV routes relate to the NZTA's strategic investment direction?

The NZTA's strategic investment direction is set out in section B1.8 of the *Planning, programming and funding manual*.

Investing in road infrastructure required to implement HPMV routes is compatible with the increased priority for investing where greatest economic growth and productivity impacts can be achieved through investing in key freight and tourism routes to lift productivity and improve access to markets.

How are investigations and works on HPMV routes assessed?

Activities and combinations of activities related to implementing the 2010 VDAM amendment must be assessed by the organisation identifying or proposing the activity or combination of activities, in accordance with the NZTA's assessment methods set out in part G of the *Planning, programming and funding manual*. This assessment is required to support requests for funding assistance from the NZTA.

HPMV routes are included as an additional definition of freight routes within the NZTA's Investment and Revenue Strategy that is described in part G of the *Planning, programming and funding manual*.

Studies for HPMV routes may be given a high strategic fit as a freight route when key stakeholders (including the affected road controlling authorities, regional transport committees and industry) agree that the route be evaluated for its suitability for HPMVs. Any upgrades identified from the study are also defined as freight routes. These freight routes may be given a high strategic fit rating.

The road improvement project or package related to implementing the 2010 VDAM amendment will normally be given a medium rating for effectiveness, but may be given a high rating if the requirements for this rating in section G1.5 of the NZTA's *Planning, programming and funding manual* are met.

Economic efficiency calculations should use the simplified procedure contained in *Simplified procedure for economic evaluation of a high-productivity motor vehicle route*, the NZTA, May 2010, and should be rated in accordance with section G1.6 of the NZTA's *Planning, programming and funding manual*.

Applications for funding assistance to investigate HPMV routes and to identify upgrading works need only be assessed against: readiness, strategic fit and effectiveness.

How do the NZTA's policies and procedures apply?

NZTA's policies and procedures set out in the *Planning, programming and funding manual* apply to all activities and combinations of activities relating to implementation of the 2010 VDAM amendment. Any special interpretations of the policies and procedures for the purpose of implementing the 2010 VDAM amendment are set out in these guidelines. In particular, the NZTA has approved special funding assistance as described below.

What funding assistance is available from the NZTA?

Funding assistance from the NZTA for local authorities for HPMV routes is:

a. a one-off grant to a local authority on application, to identify routes for HPMVs, assess the impacts, and identify appropriate responses including strengthening works

b. a one-off grant to a local authority on application, to fund works needed to prevent or repair damage to public roads caused by high productivity vehicles on identified routes.

Proposals for HPMV routes should be discussed with the NZTA regional programmes and funding manager.

Grants for (a) above will be considered on a case-by-case basis and are available during the 2009–12 NLTP period. These grants cover professional services to:

- finalise HPMV routes
- assess up take and benefits
- screen local authority road structures
- determine the capacity of potentially deficient bridges on local roads and state highways
- assess the impacts on pavements
- identify and cost upgrade works required and the timing of these
- evaluate benefits and costs
- update activity management plans.

Assessments should use the methodologies referred to in these guidelines.

Grants for (b) must be supported by route studies completed under (a), or by equivalent previous studies.

The provision of funding assistance as a grant reflects the NZTA's acknowledgement that the provisions for HPMVs are introduced part way through the RLTP/NLTP period and the costs were not planned. This form of funding assistance is also provided to local authorities as an incentive for them to participate fully in identification and assessment of HPMV routes.

What other funding sources are available?

The NZTA encourages road controlling authorities to seek funding contributions from transport operators, industries that generate significant freight volumes and land developers that will benefit from upgrading routes to accommodate increased mass and dimension limits, towards the cost of the upgrading works. The policies and procedures for supplementary funding are set out in the NZTA's *Planning, programming and funding manual*. Supplementary funding refers to contributions that are additional to the standard levels of NLTF and local authority funding specified in the NZTA's published funding assistance policy.

Examples of supplementary funds relevant to implementing the 2010 VDAM amendment are:

- development or financial contributions towards the costs of improving the road network infrastructure (to the benefit of the development)
- betterment from landowners receiving value from road improvements
- additional contributions from local authorities or other parties that reduce the proportion of the NZTA's contribution to the cost of an activity.

The Resource Management Act 1991 (particularly s409) and the Local Government Act 2002 (particularly s106) contain provisions for local authorities to require development contributions or financial contributions, including for road network infrastructure. The Local Government Act 1974 provides for territorial authorities to collect betterment from landowners receiving value from road improvement works.

Supplementary funds are dealt with in a way that reflects the circumstances of the activities and packages. The NZTA has particular regard to where the benefits accrue. In the case where supplementary funds do not affect the scope of the activity or package, the supplementary funds are normally treated as local authority revenue. The contribution can then be used to assist with the local share of the cost of the activity or package.

In a case where supplementary funds lead to a change of scope of the activity or package (eg where a road scheme is significantly modified to enhance the value of a private sector development) or where betterment is required under the Public Works Act 1981 or the Local Government Act 1974 in relation to the purchase of land by a local authority as part of a road scheme, the supplementary funds are normally treated as a third party contribution to the overall cost of the activity or package will reduce the total cost eligible for funding assistance.

The NZTA is reviewing its policy on how the use of supplementary funds is taken into account in determining the priority of a project. Any change will be conveyed as a change to the NZTA's *Planning, programming and funding manual* and/or *Economic evaluation manual*.

How should a road controlling authority apply for funding during 2009–12?

During the 2009–12 NLTP period, road controlling authorities, in regions other than Auckland, are invited to apply directly to the NZTA for funding assistance to investigate HPMV routes and for necessary upgrade works. The application must be made by entry of data into the *Review* module of *LTP online*.

In the Auckland region, all applications for funding assistance must be made through ARTA.

Where HPMV routes involve a number of road controlling authorities, a joint study with multi-party funding should be considered. Such a joint study should only be entered into the programme of one of the road controlling authorities. Upgrade works will, of course, need to be requested in the programmes of the responsible road controlling authorities.

To simplify management of funding assistance, the work categories to be used are:

- w/c 322 – for bridges and other road structures that require upgrading or replacement
- w/c 324 – for pavement strengthening, resurfacing or geometric improvements.

Studies of HPMV routes will be treated as the investigation phase of the upgrade works for funding purposes. As the majority of work on a HPMV route is likely to relate to bridges, studies of HPMV routes should be programmed as an investigation phase under w/c 322.

Both the studies and the upgrade works, if the cost is $4.5 million or less, may be included either in an existing, or a new, group of generic activities. If the upgrade works are over $4.5 million, then they will be treated as a large improvement project.

How should a road controlling authority apply for funding for 2012-15 RLTPs and NLTP?

Applications for funding assistance for the 2012–15 period relating to implementation of HPMV routes must be made in accordance with the standard RLTP development process – refer to Part C of the NZTA's *Planning, programming and funding manual*.

How is network management and forward works programming affected?

The NZTA expects all road controlling authorities to maintain up-to-date activity management plans and processes to effectively provide robust and realistic rationale for future works programmes. Review and update of activity management plans is required as part of the preparation for the 2012–15 RLTP /NLTP. This update should allow for the impacts on HPMV routes.

The forward road operations, maintenance and renewal programme for a network should be compatible with the updated activity management plan.

5 Monitoring, evaluation and review

This section explains how implementation of the 2010 VDAM amendment will be monitored, evaluated and reviewed.

Monitoring, evaluation and review project

The Ministry of Transport and the NZTA are jointly preparing a project to monitor, evaluate and review implementation of the 2010 VDAM amendment. This project is anticipated to last about two to three years. The project will help to inform the implementation process in the immediate and long term.

Ongoing consultation and contact with stakeholders will be a necessary and important component of the project, and a feedback mechanism will be set up to assess the users' (transport operators and RCAs) experience.

The project will measure if the 2010 VDAM amendment has achieved the desired outcomes, if any unexpected effects arose, what problems if any need to be addressed, and if any further amendments are required in the future. It will also assist with the on-going implementation of the permit regime for HPMVs.

Appendix A: Vehicle fleet impacts nationwide

This Appendix sets out:

- the estimated numbers of heavy vehicle combinations nationwide
- the likely take up of as-of-right length increases
- the likely take up of weight and length increases by HPMVs nationwide
- the benefits, including efficiency and safety improvements.

Numbers of heavy vehicle combinations

Motor vehicle registration (MVR) and road user charges (RUC) records provide information on the number of registered heavy vehicles, but here is no definitive data on the number of heavy vehicle combinations nationally. This is because the licence information is for the individual trucks and trailers, not the way that they are used in combinations. For example, RUC may be purchased for a three-axle semi-trailer, but the configurations that this semi-trailer could be part of includes two types of articulated configuration and three types of B-train.

The numbers of single unit trucks and heavy vehicle combinations nationwide have been estimated by allocating 2009 RUC purchase data to vehicle types using advice by industry experts from the NZTA and the New Zealand Road Transport Forum – see Tables A1a and A1b below. This gives a total of 76,228 single unit trucks plus vehicle combinations nationwide from a total of 100,312 RUC vehicles.

The length and mass increases introduced by the 2010 VDAM amendment only affect HCV2 combinations.

From Table A1b, rigid truck & trailer combinations that are HPMV capable are estimated to total 11,871 nationwide or three quarters of the HPMV capable fleet. These vehicle combinations are varying configurations of three and four axle trucks and trailers. They are the mainstay of the current rural fleet and also undertake the majority of the line haul freight task. Nationwide, rural rigid truck and trailer combinations are estimated at 3840 made up of logging: 1500, milk: 700, stock and fertiliser: 1640 as advised by industry experts. The balance of this type of combination is 5,235 non-rural rigid truck and trailer combinations.

Table A1a: Allocation of 2009 RUC data to configuration types – as-of-right vehicles (no permit)

Vehicle type[4]	Allocation method (2009 RUC vehicle records to configuration types)	Trucks			Semis			Trailers				Number of each vehicle configuration nationwide
		2 axle	3 axle	4 axle	2 axle	3 axle	4 axle	1 axle	2 axle	3 axle	4 axle or more	
R11	2 axle trucks less 2 axle trucks towing trailers below	42,052										42,052
R12	3 axle trucks less 3 axle trucks towing semis & trailers		12,132									12,132
R22	4 axle trucks less 4 axle trucks towing trailers, semi trailers & B trains			2,566								2,566
R11T1	1 axle trailers	283						283				283
R11T11	50% of 2 axle trailers	748							748			748
R12T11	50% of 2 axle trailers		748						748			748
A122	Industry advice		500		500							500
A123	Industry advice		1,838			1,838						1,838
A124	Industry advice		80				80					80
Total												**60,947**

[4] Refer to Glossary of terms for description of the vehicle type codes.

Table A1b: Allocation of 2009 RUC data to configuration types – HPMV capable (weight and/or length)

Vehicle type	Allocation method - (2009 RUC vehicle records to configuration types)	Trucks			Semis			Trailers				Number of each vehicle configuration nationwide
		2 axle	3 axle	4 axle	2 axle	3 axle	4 axle	1 axle	2 axle	3 axle	4 axle or more	
R12T12	Industry advice		2,796							2,796		2,796
R12T22	Industry advice		1,223								1,223	1,223
R22T12	Industry advice			932						932		932
R22T22 R22T23	Industry advice			6,920							6,920	6,920
Subtotal truck trailers												***11,871***
A223	Losing favour - industry advice			100		100						100
A224	Industry advice			450			450					450
B1222	Rare - industry advice		100		200							100
B1232	Most popular B-train - industry advice		1,850		1,850	1,850						1,850
B1233	Industry advice		900			1,800						900
B2233	Negligible – industry advice			10		20						10
Subtotal truck semi-trailers & B-trains												***3,410***
Total HPMV capable												**15,281**
Total HCV2		**43,083**	**22,167**	**10,978**	**4,112**	**5,532**	**530**	**283**	**1,496**	**3,578**	**8,553**	**76,228**

Increase in payload

Increases in payload potential have been introduced by the 2010 VDAM amendment for as-of-right vehicles as well as for HPMVs.

The 2010 VDAM amendment allows extra length as of right to several vehicle configurations. These are:

- truck and simple trailer – increase from 20 to 22 metres
- truck and full trailer including load – increase from 20 to 22 metres
- towing vehicle and semi-trailer (other than a semi-trailer with two steering axles) – increase from 18 to 19 metres.

Of these increases, the first two are principally to cover car transporters and logging vehicles, and regularise what is currently occuring under permit. On this basis there is little or no new payload benefit arising from the rule change. Only the towing vehicle and semi-trailer combination is considered to have increased payload potential from the 2010 VDAM amendment as-of-right length increase. At present, all quad semi-trailers have two steering axles, and would not be able to be made longer under the 2010 VDAM amendment. It is likely, however, that operators will have a commercial incentive to lock one axle so as to be able to take advantage of the length increase.

Table A2 shows the as-of-right length increases introduced by the 2010 VDAM amendment and also additional length increases for B-trains under HPMV permits (shaded). The number of each type of vehicle combination passing the Drury WIM site in one week is also shown in the table.

Table A2: Length increases for HCV2s (as-of–right increases and assumed increases for B-trains)

Vehicle type	Nationwide number	% of HCV2s nationwide	Number of Drury WIM passes	% of HCV2 passes	Previous length (m)	New length (m)	% length increase	Potential % payload increase
R12T12	2,796	15.8%	226	1.5%	20	22	10.0%	10.0%
R22T12	932	5.3%	252	1.7%	20	22	10.0%	10.0%
R22T22/R22T23	6,920	39.1%	4,698	31.3%	20	22	10.0%	10.0%
A122	500	2.8%	365	2.4%	18	19	5.6%	5.6%
A123	1,838	10.4%	2,691	17.9%	18	19	5.6%	5.6%
A124	80	0.5%	748	5.0%	18	19	5.6%	5.6%
A223	100	0.6%	55	0.4%	18	19	5.6%	5.6%
A224	450	2.5%	932	6.2%	18	19	5.6%	5.6%
R12T22	1,323	7.5%	2,554	17.0%	20	22	10.0%	10.0%
B1222					20	22	10.0%	10.0%
B1232	1,850	10.5%	2,022	13.5%	20	22	10.0%	10.0%
B1233	900	5.1%	45	3.0%	20	22	10.0%	10.0%
B2233	10	0.1%	7	0.05%	20	22	10.0%	10.0%
Weighted average payload increase for Drury WIM HCV2 counts								**8.6%**
Total HCV2s with potential length increase	**17,699**	**100.0%**	**15,007**	**100.0%**				

Table A2 covers all HCV2 vehicle combinations. For these combinations, the assumption is made that the percentage increase in payload resulting from the increased combination length is equal to the percentage length increase. The weighted average potential payload increase resulting from the length increases for the Drury WIM HCV2 traffic stream is 8.6%.

Table A3 shows the payload increases for HPMV capable vehicles resulting from the increased weight limits for these vehicles. This table includes vehicle combinations that require extra length to carry the weight increases. The weighted average potential payload increase for HPMV weight capable vehicles in the Drury WIM traffic stream is 32.5%.

Table A3: Weight increases (Potential HPMVs only)

Vehicle type	Nationwide number	% of potential HPMVs nationwide	Number of Drury WIM passes	% of potential HPMV passes	As-of-right GCM (t)	HPMV GCM (t)	% increase in GCM	Typical tare (t)[5]	Existing maximum payload (t)	HPMV maximum payload (t)	Potential increase in maximum payload
R22T12	932	7.5%	252	2.3%	44.00	50.80	15%	20.00	24.00	30.80	28.3%
R22T22/R22T23	6,920	55.4%	4,698	42.8%	44.00	53.60	22%	20.25	23.75	33.35	40.4%
A223	100	0.8%	55	0.5%	43.80	45.80	5%	19.00	24.80	26.80	8.1%
A224	450	3.6%	932	8.5%	44.00	48.80	11%	19.50	24.50	29.30	19.6%
R12T22 / B1222	1,323	10.6%	2,554	23.3%	44.00	50.00	14%	16.00	28.00	34.00	21.4%
B1232	1,850	14.8%	2,022	18.4%	44.00	50.49	15%	22.25	21.75	28.24	29.8%
B1233	900	7.2%	457	4.2%	44.00	55.00	25%	24.00	20.00	31.00	55.0%
B2233	10	0.1%	7	0.1%	44.00	57.80	31%	25.50	18.50	32.30	74.6%
Weighted average payload increase for Drury WIM HPMV weight capable vehicle counts											**32.5%**
Total HCV2s with potential weight increase	**12,485**	**100.0%**	**10,977**	**100.0%**							

[5] Tare weights are based on the 10th percentile weights at the Drury WIM site.

Take up of length increases by AoR vehicles nationwide

Nationwide take up of increased length by articulated truck and semi-trailers

There are 2968 articulated truck and semi-trailer combinations nationwide eligible for as-of-right length increases from the 2010 VDAM amendment (vehicle types A122 to A224 in Table A2).

These vehicle combinations gain one metre of maximum length as of right, except for configurations that include a quad semi-trailer with two steering axles. While it is theoretically possible for articulated truck and semi-trailer combinations to operate as HPMVs, the issues for road geometry that would be created make it unlikely that any significant number of HPMV permits for such vehicles would be issued.

The estimated take up for these vehicle combinations operating as-of-right is shown in Table A4. The potential take up is based on the current average length of vehicles of each configuration as measured at the Drury WIM site – the greater the length, the higher the take up rate assumed. The total number of vehicle combinations taking up the length increase is estimated to be 838 combinations. As the increase comes as of right, it is assumed there are no route constraints. The 838 combinations are 28% of the number of truck and semi-trailer combinations nationwide.

Table A4: Nationwide take up of length increases by as-of-right truck and semi-trailers

Vehicle description	Nationwide number	Potential take up %	Potential take up numbers	Potential take up % - core routes only	Potential take up number - core routes only	Likely take up %
A122	500	10%	50	100%	50	10%
A123	1,838	30%	551	100%	551	30%
A124	80	90%	72	100%	72	90%
A223	100	30%	30	100%	30	30%
A224	450	30%	135	100%	135	30%
Total AoR	**2,968**		**838**		**838**	**28%**

Take up for HPMVs nationwide

As well as vehicle combination type, take up is also a function of:

- the commercial attractiveness of the HPMV provision, taking account of the type of load carried, the road user charges payable, etc
- the number of vehicles that cube out – this ranges from 10% to 80% depending on the configuration type. Industry experts can advise on the likely cube out percentages
- travel involving routes or areas that are unlikely to have the capacity to accommodate the increased mass limits.

Tables A5 and A6 summarise the vehicle types and numbers that are HPMV capable either for weight or length, and the estimated take up of weight and length increases. Vehicle combinations that would require extra length as well as extra weight are included in the weight table only, as the increase in load only gives rise to one extra benefit.

Table A5: Nationwide take up of weight increases by HPMVs

Vehicle type	Number	Cubed out %	No. cubed out	Balance	Potential take up % of balance	Potential take up numbers	Potential take up % - core routes only	Potential take up number - core routes only	Likely take up %
R12T22, R22T12, R22T22, Rural	3,840	10%	384	3,456	80%	2,765	10%	276	7%
R12T22, R22T12, R22T22, Non rural	5,235	80%	4,188	1,047	80%	838	90%	754	14%
Total truck & trailers	***9,075***							***1,030***	***11%***
A223	100	30%	30	70	60%	42	90%	38	38%
A224	450	30%	135	315	60%	189	90%	170	38%
B1222	100	30%	30	70	60%	42	90%	38	38%
B1232	1,850	30%	555	1,295	60%	777	90%	699	38%
B1233	900	30%	270	630	60%	378	90%	340	38%
B2233	10	30%	3	7	60%	4	90%	4	38%
Total truck semi-trailers & B-trains	***3,410***							***1,289***	***38%***
Total weight capable HPMVs	**12,485**					**5,035**		**2,319**	**19%**

Nationwide take up of increased weight by rigid truck and trailer combinations

The 9075 seven and eight axle rigid truck and trailer combinations (vehicle types R12T22, R22T12 and R22T22) nationwide are capable of carrying the increased weights permitted for HPMVs. Of these 10% of rural combinations and 80% of non-rural rigid combinations are assumed to cube out. Of the balance of both rural and non-rural combinations, 80% are assumed to have a commercial incentive to take up the increased HPMV mass limits. However, if the assumption is made that only core routes will be available, the percentage of vehicles taking up the weight increases is estimated at 10% of rural and 90% of non-rural vehicles. In conclusion, on a nationwide basis assuming availability of core routes only, the net take up of weight increases by rigid truck and trailer combinations would be 276 rural vehicles and 754 non-rural vehicles. This is a total of 1030 combinations or 11% of the total number of HPMV weight capable truck and trailer combinations nationwide.

Nationwide take up of increased weight by articulated truck and semi-trailer and B-train combinations

Table A1b shows that a total of 3410 HPMV weight capable articulated truck and semi-trailer and B-train combinations are estimated nationwide. Of the HPMV capable articulated truck and semi-trailers and B-train combinations, 30% are estimated to cube out. Of the balance 60% are estimated to have a commercial incentive to take up the weight increases. Of these combinations, 90% are estimated as being able to take up the benefits when only core routes are available. Nationwide, take up of HPMV capable articulated truck and semi-trailer and B-train combinations is estimated at 1289 vehicles, or 38% of the total number of these combinations.

Table A6: Nationwide take up of length increases by HPMVs

Vehicle type	Number	Cubed out %	No. cubed out	Potential take up % of cubed out	Potential take up numbers	Potential take up % - core routes only	Potential take up number - core routes only	Likely take up %
R12T12	2,796	30%	839	40%	336	90%	302	11%
R12T22, R22T12, R22T22, Rural	3,840	10%	384	85%	326	90%	294	8%
R12T22, R22T12, R22T22, Non rural	5,235	80%	4,188	85%	3,560	90%	3,204	61%
Total truck & trailers	***11,871***		***5,411***		***4,222***		***3,800***	***32%***
B1222	100	30%	30	50%	15	90%	14	14%
B1232	1,850	30%	555	85%	472	90%	425	23%
B1233	900	30%	270	85%	230	90%	207	23%
B2233	10	30%	3	85%	3	90%	2	23%
Total B-trains	***2,860***		***858***		***720***		***648***	***23%***
Total length capable HPMVs	**14,731**		**6,269**		**4,942**		**4,448**	**30%**

Nationwide take up of increased length by rigid truck and trailer combinations

Rigid truck and trailer combinations that are likely to take up increased length include the weight capable seven and eight axle combinations discussed above and the six axle combination R12T12, a total of 11,871 vehicles. For the six axle combination it is estimated that 30% cube out. It is estimated that 85% of seven and eight axle combinations and 40% of six axle combinations have a commercial incentive to take up the increased length. Uptake is assumed to be constrained by geometry issues on some routes, and likely uptake is estimated at 90% of potential uptake. This implies a take up of 302 six-axle truck trailers, or 11% of that type, and 3498 seven and eight axle truck trailers, or 39% of combinations of those types nationwide.

Nationwide take up of increased length by B-train combinations

Table A1b shows a total of 2860 HPMV capable B-train combinations. These combinations can operate at increased length under HPMV permits. A length increase of 2 metres is used, as shown in table A2, based on the pro-forma designs for HPMVs.

Of these combinations 30% are estimated to cube out. Potential take up is assessed at between 50 and 85% of the cubed out combinations, depending on type. Assuming that geometry further constrains take up to 90% of potential, likely take up nationwide is estimated at 14% for B1222s, and 23% for other B-trains, a total of 648 vehicles.

Total take up by HPMVs nationwide

Table A7 summaries the estimated number of HPMVs that are estimated to take up the weight increases and the length increases.

Table A7: Nationwide take up of HPMVs

	Nationwide number	Potential take up		Likely take up	
		Number	% of HCV2 vehicles	Number	% of HCV2 vehicles
Total HCV2 vehicles	17,699				
HPMV with Increased weight	12,485	5,035	28.4%	2,319	13.1%
HPMV with Increased length	14,731	4,942	27.9%	4,448	25.1%

Efficiency gains

Efficiency gains come from reduced trips to service the same amount of freight.

Efficiency gains for as-of-right vehicles and HPMVs from increased length

Efficiency gains of 10% from increased length have been estimated for truck and trailer combinations and for B-trains as shown in Table A2. This is based on an assumed extra length of 2 metres, a 10% increase on the previous maximum length.

Similarly, efficiency gains of 5.6% have been assumed for articulated truck and semi-trailer combinations based on the increase in maximum length from 18 to 19 metres available to these vehicles as of right. It is assumed that these benefits will be available with no special capital investment.

Efficiency gains for HPMVs from increased weight

Table A3 shows potential efficiency gains for HPMVs of between 8% and 75% depending on the vehicle combination type resulting from the increased mass limits. The weighted average for weight capable HPMVs based on Drury WIM data of 32%. The take up of efficiency gain will depend on the availability of freight and the type of freight, among other factors. It is assumed that on average 50% of this potential efficiency gain is taken up, giving a weighted average efficiency gain for the Drury HPMV weight capable vehicles of 16%.

Value of vehicle operating cost savings and emissions reduction

The value of vehicle operating costs (VOC) saved through trip reductions are calculated by multiplying the vehicle operating cost per kilometre by the number of vehicle kilometres saved by vehicles carrying increased weights.

The VOC for HCV2 vehicles varies with operating speed and gradient. Values are given in table A5.5 of Appendix A5 of the NZTA's *Economic evaluation manual*. These costs are the resource costs of operating the vehicle, ie they are net of taxes and road user charges.

Reduced VKTs for the same freight task also provide a reduction in vehicle emissions. CO2 saved is related to VOC by the equation given in section 9.7 of Appendix A9 of the NZTA's *Economic evaluation* *manual*. The value of emissions reduction is assessed using the value of $40 per tonne of CO2 saved given in section A9.6 of the appendix.

Composite values of VOC and CO2 savings are given in Table A8 below.

Table A8: HCV2 vehicle operating costs including CO_2 – in $/km (July 2008)

% gradient	**Mean HCV2 speed** (over length of route)				
	10–30km/h	**31–50km/h**	**51–70km/h**	**71–90km/h**	**91–105km/h**
0	1.82	1.66	1.69	1.82	1.97
1 to 3	1.93	1.76	1.79	1.93	2.09
4 to 6	2.43	2.28	2.35	2.53	2.72
7 to 9	3.13	3.06	3.21	3.45	3.70
10 to 12	3.79	3.88	4.14	4.47	4.78

For purposes of calculating benefits, full efficiency gains are assumed when all bridges on the route have been upgraded and vehicles have been provided with weight and length capacity. Some efficiency gain could be available without infrastructure investment, eg all bridges on the route could be capable of carrying vehicles with a 5% greater payload than is possible under as-of-right weight and dimension limits. For the period leading up to full efficiency gains, efficiency gains could come on stream as infrastructure is upgraded. If capital investment can be scheduled in a way to make complete parts of the route available, efficiency gains could increase linearly from the initial gains to full gains.

Safety benefits

Safety benefits arise from the reduced exposure to crash risk resulting from reduced heavy VKT. These benefits are determined by using accident rate analysis as described in Appendix A6 of the NZTA's *Economic evaluation manual*. The reduction in typical heavy vehicle accident rate (reported injury accidents involving heavy vehicles per year) resulting from the reduced heavy VKT is estimated using the general model (12) and table A6 (reproduced as Table A9 below).

Table A9 Rural mid-block equation coefficients (b_0) for heavy vehicle crashes

Annual average daily traffic (AADT)	**Coefficients b_0 by terrain type**		
	Level terrain (0 to 3%)	**Rolling terrain** (3 to 6%)	**Mountainous terrain** (> 6%)
≤ 4,000	19	40	50
> 4,000	19	19	41

The cost per reported injury accident saved is $700,000 for near rural areas and $1,174,000 for remote rural areas – refer table A6.22 of Appendix A6 of the NZTA's *Economic evaluation manual* (July 2006).

Increased rollover risk has been noted as a potential disbenefit but this is assumed to be mitigated by the static roll-over threshold (SRT) requirements that will continue to apply to both HPMVs and as-of-right vehicles.

Increased crash severity is assumed at zero based on Australian reviews indicating that further increases in mass are unlikely to make any material difference to existing crash severity.

Traffic growth

The freight task is forecast to increase by 70 to 75% over the next 25 years with all modes carrying a share of the increase. For the purpose of determining the benefits of implementing the 2010 VDAM amendment, a nominal arithmetic growth in road freight of 2% per annum should be allowed for.

Appendix B: Road network impacts

This appendix describes the likely impacts on HPMV routes. It explains:

- the road network impacts that have been assessed for state highway structures and pavements
- the likely impacts on local roads.

What are the impacts on state highways?

Structures

A screening assessment has been carried out for all state highway structures to assess their ability to accommodate HPMVs (and the previously proposed as-of-right mass limit increases) – refer to section 6 of *Vehicle Dimensions and Mass Amendment Rule 2010: Study on the impact of the rule change on NZTA's bridge stock*, Opus International Consultants, April 2010. The methodology used was an adaption of the NZTA's *OPermit system* which compares the effect of vehicle loadings with actual member capacities obtained from rigorous analysis methods.

This national screening of state highway bridges indicated that:

- the proportion of state highway bridges potentially defficient for HPMV loads varies between 6% and 21% for regions with 13% nationally
- the expected cost to upgrade all the potentially deficient bridges is $90.6 million and the 95th percentile is $130 million (although it is expected that not all state highways will become HPMV routes)
- the average likely cost per bridge for upgrading is $147,000 and the 95th percentile cost per bridge is $210,000
- all bridges designed to HN-HO-72 are capable of carrying the increased loads
- bridges designed to H20-S16-T16 are likely to be able to carry the increased loads except for spans greater than 51 metres
- bridges designed to H20-S16-44 with spans less than 25 metres are likely to be adequate for the increased loads
- approximately 30% of all bridges designed to traction engine loads will require strengthening for the previously proposed as-of-right mass limit increases.

See section 3 of the NZTA's *Bridge manual* for the HN-HO-72 design loading.

The above analysis does not take into account the likelihood of extra strength being found through more complex assessment methods (including load testing).

The screening assessment has assumed that no concrete decks will require replacement due to the increased loadings. However, an inspection regime will be implemented to ensure that any vulnerable decks are monitored and addressed as required.

The next stage of assessing bridges on state highways is to carry out a detailed assessment of those bridges indicated as being potentially deficient by the OPermit screening.

Pavements

Impacts of HPMVs of up to 53 tonnes gross mass on planned pavement maintenance have been assessed for state highways in the Auckland/Hamilton/Tauranga area - refer to *VDM rule amendment impact on state highway pavements*, Opus International Consultants, 8 April 2010 and *Addendum 2: VDM rule amendment impact on state highway pavements*, Opus International Consultants, 23 April 2010. This mainly theoretical assessment of pavement wear used RAMM and dTIMS pavement data and modelling together with research from the CAPTIF facility on the effects of axle weights. The damage exponent used for these state highway pavements was 1.5 in place of the standard value of 4. The exponents identified from the CAPTIF research ranged from 1.5 to 7 depending on pavement strength.

Allowing for efficiency gains (less heavy vehicle trips) with HPMVs, the loading impact on pavements is a 2.9% increase on state highways 1 and 29 and 28% increase on State Highway 1B. This large increase for State Highway 1B mainly results from the HPMV traffic diverted from state highways 2 and 27 and because the pavements on State Highway 1B are weaker than on state highways 1 and 29.

Increase in reactive (routine) maintenance was also estimated in the study. The cost of this maintenance activity increases because the increased loading from HPMVs reduces the life of the pavements.

The study also identified vulnerable areas of pavements and surfacings as:

- chip-sealed pavements and surfacing on high stress curves and on high speed curves
- intersections requiring vehicles to stop and/or change direction.

In the case of high stress curves, increased loading increases the risk of chip polishing and surfacing distress. Chip polishing, which is directly related to heavy vehicle loading, results in increased surfacing treatment frequency and also includes additional cost from the need to import high polished stone value (PSV) chip. With the increased loading it is anticipated that some of the high stress curve surfacings will fail earlier and, when replaced, will require more robust surfacings. The estimated effects of the higher loadings on high stress curves on the state highways studied are:

- 25% of single coat seals on these curves will need to be replaced with a multi-coat seal over the next five years
- 5% of multi-coat seals on these curves will need to be replaced with asphaltic concrete surfacing
- 50% of the high stress curves will require one additional resurfacing prior to the next rehabilitation because of increased chip polishing.

In the case of high speed curves, an observed effect of heavy vehicle traffic has been the shearing of basecourse or asphaltic concrete layers on the curve outer wheel track. There is likely to be a similar shear effect at vulnerable intersections. As a result of the higher loadings it is estimated that 20% of pavements and surfacings on vulnerable high speed curves and at vulnerable intersections will only achieve half their expected life.

The modelling of wear effects, plus the estimates for increased reactive maintenance, and treatment of surfacings on high risk curves and intersections, indicates that the impacts of HPMVs on pavements on core state highways in the Auckland-Hamilton-Tauranga area, assuming freight tonnage stays the same, are $321,000/year in years 1 to 10, $204,000/year in years 11 and 12, and $77,000/year in later years. This compares with the current annual cost for planned and reactive pavement and surfacing maintenance for this network of $21 million.

As for normal operations, the outputs from RAMM, dTIMS and the other assessments are only a guide to pavement renewal treatment need. The actual need for treatment and funding should be subject to inspection and other considerations.

What are the likely impacts on local roads?

Structures

The impacts of HPMVs on bridges on local roads are likely to be similar for the same type of structure as that for state highway bridges. This is because the same design loadings (and often the same designs) have been used for many bridges on local roads. However, local roads are likely to have more bridges with timber elements, so overall the impact on bridges is likely to be greater than for state highways.

Section 4 of *Vehicle Dimensions and Mass Amendment Rule 2010: Study on the impact of the rule change on NZTA's bridge stock*, Opus International Consultants, April 2010 provides a screening method for assessing the financial impact of the previously proposed as-of-right mass limit increases for local road bridges. This method is based on the results for the screening of state highway bridges. It can also be used to evaluate the adequacy of bridges for HPMVs.

Table B1: Adequacy of bridges by design loading and span

Design loading	Date of construction	Adequacy for increased loadings		
		Span 3.0-24.9 m	Span 25-50.9 m	Span 51m +
HN-HO-72	1972 - present	Adequate	Adequate	Adequate
H20-S16-T16	1961 - 1971	Adequate	Adequate	Inadequate
H20-S16-44	1943 - 1960	Adequate	Inadequate	Inadequate
Traction engine	1933 - 1942	Inadequate	Inadequate	Inadequate

Pavements

While the case study of state highway pavement impacts referred to above found that a damage exponent of 1.5 was appropriate for state highways 1 and 29, an exponent of 4 was appropriate for the pavement on State Highway 1B, which is more like a local road. Damage exponents of 4 or more will most likely be applicable for many rural local road pavements. This means that the percentage change in ESA will be greater for local road pavements than that found for state highways 1 and 29 in the case study. The effect is likely to vary from area to area.

As noted for state highway pavements, theoretical modelling is useful to give an indication of need for treatment but other factors must also be taken into account.

Geometry

There may be impacts on geometric aspects of roads from both the increased as-of-right length for heavy vehicles and from permitted HPMVs with extra length. Generally the impacts will be minimal because HPMVs longer than the as-of-right limits will only be approved provided the vehicle can manoeuvre safely, by either meeting standard vehicle performance for general access or equivalent safety performance on a specified route. HPMVs longer than 25 metres will only be approved if there is no railway level crossing on the proposed route and after a professional assessment of the route to ensure that the vehicle would stay within its lane and interact safely with other road users.

Appendix C: Auckland/Hamilton/Tauranga case study

This appendix summarises the results of a case study used to explore the economics for infrastructure investment to support implementation of the 2010 VDAM amendment. The case study evaluates the benefits and costs associated with both the as-of-right length increases and HPMVs on core routes between Auckland, Hamilton and Tauranga. This area has been chosen by the NZTA as the first to be assessed in detail for ability to accommodate the VDAM amendment, including the introduction of permitted HPMVs, because it is a key area for freight transport.

The full report of the case study is available – *Vehicle Dimension and Mass Rule Implementation: Case study of the core state highway network in the Auckland/Waikato/Bay of Plenty triangle: High-level assessment of benefits and costs*, Stimpson & Co, 28 April 2010.

Scope of the case study

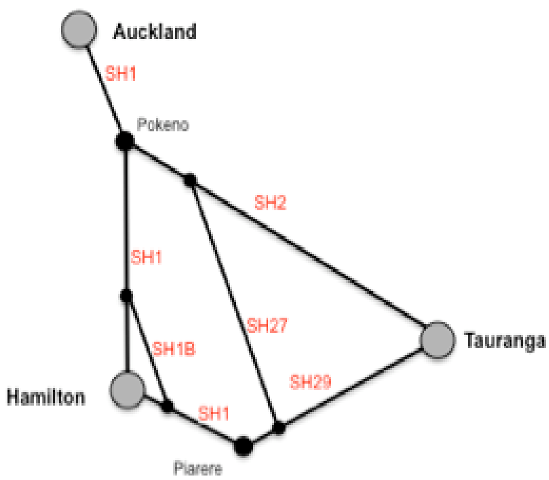
The case study considers the following four core routes:

- Auckland to Hamilton via State Highway 1.
- Auckland to Tauranga via state highways 1 and 2.
- Auckland to Tauranga via state highways 1, 2, 27 and 29.
- Hamilton to Tauranga via state highways 1 and 29.

The study assumes that only one route will be available to HPMVs for travel between Auckland and Tauranga. This route is via state highways 1, 1B (the Hamilton bypass), 1, and 29. Heavy vehicles that currently travel between Auckland and Tauranga via state highways 2 and 27 are assumed to transfer to the HPMV route as HPMVs if ther are efficiency gains in doing so (taking account of the additional travel distance together with the increased payload).

The routes are shown in Figure C1.

Figure C1: Core state highway routes for Auckland/Hamilton/Tauranga



The route detail within the Auckland region for purposes of assessing bridge costs includes: SH16 from the central motorway junction (CMJ) to Kumeu, SH16 from CMJ to the port, SH20 from SH1 to Mt Roskill and SH20a. For the purposes of trip length, the study assumes a single origin and destination point in the Auckland region centred upon the CMJ. This implies that CMJ is the centre of gravity for the Auckland region freight task. It is also assumed that each trip includes, on average:

- 5.0km of travel on local roads in Auckland
- 0.25km of travel on local roads in Hamilton
- 0.1km of travel on local roads in Tauranga.

Route lengths used in the analysis are:

- Auckland to Hamilton via state highway 1 – 129.3km
- Auckland to Tauranga via state highways 1 and 2 – 211.1km
- Auckland to Tauranga via state highways 1, 2, 27 and 29 – 235.1km
- Hamilton to Tauranga via state highways 1 and 29 – 116.4km
- Auckland to Tauranga via state highways 1, 1B, 1 and 29 – 244.1km.

Heavy vehicle traffic volumes

NZTA telemetry data giving average annual daily traffic counts (AADT) for 2008 was used to estimate HCV2 VKT on each route sector.

For each route, the lowest HCV2 AADT of the telemetry sites on the route was multiplied by route length to estimate total VKTs travelled on that route by HCV2 vehicles. The lowest telemetry count for the route was chosen because it is the maximum number of vehicles that can have travelled the entire route. For Auckland to Tauranga, the vehicle counts on the routes currently used (including state highways 2 and 27) were multiplied by the length of the single route proposed for HPMVs.

Benefits

Efficiency gains

Efficiency gains were calculated from the HCV2 trips saved based on the payload increases and the nationwide average take up rates estimated in Appendix A of these guidelines.

The average annual daily trips by HCV2 vehicles taking up the rule benefits by route are:

Route	Mass permits	Length permits	Total permits	AoR length
Auckland–Hamilton SH 1	76	122	198	106
Auckland–Tauranga SH 1/2				37
Auckland–Tauranga SH 1/2/27/29				60
Hamilton–Tauranga SH 1/29	78	104	182	
Auckland–Tauranga SH 1/1B/1/29	34	54	88	47
Total	**188**	**280**	**468**	**250**

Efficiency gains from length increases for both as-of-right vehicles (vehicle types A122, A123, A124, A223 and A224) and HPMVs likely to require a length permit (vehicle types R12T12, R12T22, R22T12, R22T22, B1222, B1232, B1233, and B2233) are assumed to increase linearly from zero in year one to full gains in year seven.

Efficiency gains for HPMVs requiring weight permits (vehicle types R12T22, R22T12, R22T22, A223, A224, B1222, B1232, B1233, and B2233) are assumed to increase from 25% of full gains in year one to full gains in year 10.

Vehicle operating cost savings and emmission reductions

A vehicle operating cost of $2.00/kilometre has been used to calculate vehicle operating cost savings for the case study. This is equivalent to an HCV2 operating on an average gradient of 2½% at a mean speed of 95km/h.

CO2 reductions are calculated from the VKT saved at a rate of 2.6 tonnes of CO2/1000 litres of fuel with the value of CO2 at $40/tonne.

Accident cost savings

Accident cost savings have been calculated from the VKT saved using the equation:

Reported injury accidents/year = 40 x exposure (the heavy vehicle prediction model given in A6.5 of appendix A6 ofthe NZTA's *Economic evaluation manual* assuming an AADT of ≤ 4000 and rolling terrain),

and a cost/reported accident of $700,000.

The calculated accident savings are about $1.3 million at year 10.

Upgrading and system costs

The case study used results from section 2 of *Vehicle Dimensions and Mass Amendment Rule 2010: Study on the impact of the rule change on NZTA's bridge stock*, Opus International Consultants, April 2010 for bridge upgrading works and from an early version of *Addendum 2: VDM Rule amendment impact on state highway pavements*, Opus International Consultants, April 2010 for pavement impacts. For HPMV loadings the bridge assessment indicated:

- 16 bridges of a total 206 bridges analysed on the core state highways require upgrading at a total cost of $16 to $28 million
- eight bridges require upgrading at a total cost of $9 to $16 million for the nominated HPMV route of state highways 1, 1B, 1 and 29.

A total cost of $15.54 million is used in the case study for upgrading bridges on state highways 1, 1B and 29, and in addition an allowance of $20 million is provided for local roads in Auckland. Bridge upgrade costs are spread evenly over the first seven years. It is assumed that there will be no additional bridge maintenance costs.

For pavements in the case study, earlier cost estimates based on a damage exponent of 4 have been used. The additional pavement costs attributed to HPMV weight increases in the study are $365,000/year for years one to 10, $219,000/year for years 11 and 12, and $91,000/year for later years. Costs for the additional pavement wear resulting from the increased length of HPMVs and as-of right vehicles are $987,972/year in year one rising to $1,068,423/year in year 10, $641,054/year for years 11 and 12, and $266,374/year in later years.

Vehicle capital costs

A vehicle retro-fit cost of $5000 per combination vehicle (a total cost of $608,900) is allowed for in year three. After this it is assumed that HPMV capability, both for extra weight and length, will be available with no addition to standard purchase prices as the fleet is renewed over time.

HPMV permit costs

Agency costs for the case study area are assumed at $300,000 in years one and two only for three full time equivalent staff in the regions. NZTA's set up costs are considered sunk. Ongoing resource costs of a permit are assumed at $1000/permit for about 44 permits per year.

Enforcement costs

No additional enforcement activity or cost is assumed for HPMVs or as-of-right vehicles in the case study because implementation of the 2010 VDAM amendment is assumed to provide higher standards of operator assurance systems for compliance as a condition of permits.

Benefit cost ratio

The benefit cost ratio of implementing the 2010 VDAM amendments on state highways 1, 1B and 29 between Auckland, Hamilton and Tauranga is estimated at 2.3, using a 30-year analysis period and a discount rate of 8%. This includes efficiency gains from increased length for as-of-right vehicles.

Sensitivity analysis

Sensitivity analysis of input values indicates that uptake numbers and vehicle operating costs have the most impact. Uptake numbers would need to drop by 50% and vehicle operating costs by 15% to reduce the benefit cost ratio to 1.0.