ATTACHMENT E

PROVISIONAL OPTION NOTES

for

Transit New Zealand's Provisional Passing and Overtaking Guidelines

Draft for Consultation
Version 4

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Record of Amendments

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Preface

This document is a transitional version prepared for Transit staff and Transit's network consultants. It assumes that the reader has some technical knowledge and experience with development and operation of New Zealand's rural two-lane state highway network. It has not been written with the general public as its target readership.

These provisional notes provide an indication of how Transit's Passing and Overtaking Policy could be implemented for option issues. They are intended to help with the development of projects in 2008/09 and beyond, while we complete consultation on these Guidelines.

As this is a provisional document, we welcome your feedback. Please forward your comments to larry.cameron@transit.govt.nz.

From 1 August 2008, Transit NZ will join with Land Transport New Zealand to become the New Zealand Transport Agency. The final version of the New Zealand Transport Agency's Passing and Overtaking Guidelines may vary from this document.

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E/PART A. INTRODUCTION

Purpose

Option Notes provide a detailed knowledge of the road and traffic characteristics specific to each option. These Option Notes will assist with the selection of the most appropriate option.

Layout

Option Notes have been divided into section headings that cover various Passing and Overtaking (PO) treatments. Within each section heading, traffic and road conditions are discussed for each option.

These Option Notes follow the categories within Table 3. Integration of Treatments and Measures and Table 4. Tool Kit of Options of these Guidelines.

Current Versions

For references or publications referred within Option Notes, current versions will apply if there are more than one version. For overseas publications with a New Zealand supplement, the New Zealand supplement will apply.

Non-Exclusive Lists

Any lists of treatments, measures and options described within these Option Notes are not exclusive lists.

Other influences, such as new products, advances in technology, different management systems and opportunities for network development may provide further opportunities for implementing Transit's PO Policy.

E/PART B. OVERTAKING TREATMENTS

Introduction

Overtaking treatments fall into two general categories.

1. Overtaking sight distance improvements:

   - Vegetation clearance.
   - Batter/crest relocation.
   - Pavement rehabilitation.
   - Realignments.

2. Overtaking enhancements:

   - Seal widening.
   - Overtaking at passing facilities in untreated direction.
   - Configuration of passing facilities.

These above-mentioned treatments should be considered within other scheduled Transit work, except for overtaking at passing facilities and configuration of passing facilities.

Except for seal widening, overtaking enhancements should be used in conjunction with passing treatments.

Note: Generally, the rate of overtaking increases up to about 600-700 vpd one-way flow (i.e. 10,000-12,000 vpd AADT) before reducing to about zero overtaking activity by about 1,000 vph one way flow (i.e. 17,000 vpd) (Harwood, St John & Warren, 1985).

E/B1. Overtaking Sight Distance Improvements

Vegetation Clearance

Initiatives include:

- Monitoring vegetation clearance as part of maintenance activities to ensure that existing overtaking zones are functional.
- Linking sections with insufficient overtaking sight distance to form an adequate sight distance to either increase the proportion of sight distance greater than 300 m along a route or to provide a maxima sight distance at regular frequencies. If the operating speed is lower than 100 km/hour, a shorter overtaking sight distance may be feasible for the maxima values. See C4 Available Sight Distance within these Guidelines.

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Vegetation Clearance continued

- Replacing vegetation and tending new vegetation to ensure growth meets Transit's Low Growth Vegetation Guidelines.
- Assessing whether improvements can be made to overtaking sight distance when undertaking clear zoning work.
- Improving overtaking sight distance in situations where traffic is likely to be bunched in one direction and there are at least 25 second gaps between platoons, e.g. upstream of passing facilities. This will allow drivers in the opposite direction to overtake between the gaps in traffic.

Note: See AUSTROADS Rural Road Design Table 8.4 (a): "Overtaking Sight Distance for Determining Overtaking Zones in MCV Routes when MCV speeds are 10 km/h less than the Operating Speed" and Table 8.4 (b): "Overtaking Sight Distances for Determining overtaking Zones on MCV Routes when MCV speeds are equal to the Operating Speed" for more detail of minimum sight distance relative to speed. Use B-Double values but do not exceed 1 km for maxima overtaking values.

Batter/Crest Relocation

This improvement relates to both vertical and horizontal sight distance. Batter relocations would not require pavement reconstruction, whereas crest relocations would also require pavement reconstruction.

For both treatments, excavations on road sections with rolling road gradient are recommended, as excavation effects should be less marked than for mountainous conditions.

Pavement Rehabilitation

As part of scheduled pavement rehabilitation work:

- In overtaking zones, provide extra seal width up to the current seal width strategy for that road section. See seal widening below.
- Consider improving the overtaking sight distance to provide an overtaking zone.

Realignment

Where passing facilities are not proposed within a new road realignment:

- Consider increasing the overtaking sight distance relative to the level of projected AADT and road gradient. See C3 Available Sight Distance within these Guidelines.
- Consider overtaking opportunities within new realignments that are downstream of passing facilities to increase the effective length of passing facilities.

E/B2 Overtaking Enhancements

Seal Widening

Overtaking may be restricted by insufficient seal width, particularly for vehicles that overtake recreational, heavy or light towing vehicles. Increased sealed shoulder width may be up to 1.5 m and be part of a scheduled maintenance upgrade.

Initiatives include:

- Providing extra seal width as AADTs reach threshold levels of 1,000 vpd (R4/R3 seal width treatment boundary) and 4,000 vpd (R3/R2 seal width treatment boundary)
- Ensuring that overtaking zones comply with the seal width strategy's target width for the road section.
- Providing extra seal width on unsealed shoulders (up to the seal width strategy's target width for the road section) in locations where overtaking is mainly in one direction, e.g. uphill, clear sight distance in one direction.

Where the current seal width already matches the seal width strategy, providing isolated sections of wider seal width at known overtaking locations. The increased seal width may still not be wide enough to be a wide sealed shoulder. This work must be approved by Transit's Scope and Standards Review Committee.

Overtaking in Untreated Direction

If there is sufficient overtaking sight distance, provide the minimum 1.5 m sealed shoulder width on the opposing traffic lane in the untreated direction. Yellow line markings within passing lanes should not restrict overtaking if there is no adverse safety history or potential risk.

Note: For 200 and 400 vph one-way flows, about 30 % and 20 % respectively of all overtaking/passing manoeuvres at a passing facility were in the opposite direction. At these traffic flows, there were no adverse safety issues. Higher flows may have been safe but there was insufficient data to determine statistical significance (Harwood, St John & Warren, 1985).

Anecdotal evidence from state highway videos suggests that overtaking in the opposite direction is likely to occur where the three following features occur, namely:

- Few upstream and/or downstream overtaking or passing opportunities.
- The passing facility has good sight visibility along its length.
- There are low opposing flows.

Passing Facility Configuration

For flows less than projected 10,000 vpd and downstream of the facility, reduced bunching in the treated direction can affect overtaking in the untreated direction downstream of the passing facility.

Initiatives include:

- Where possible, avoid opposing passing facilities with merges facing each other. See AUSTROADS Rural Road Design Fig 13.1 Overtaking Lane Configurations for separation/overlapping distance between opposing merges.
- Ensuring the location of passing facilities does not reduce upstream or downstream overtaking opportunities, particularly for interim and long-term strategies at low flows.
- Alternating passing facilities to allow overtaking in the opposite direction at passing facilities.
- Spacing passing facilities and overtaking opportunities to minimise any overlap of effective lengths.

Note: Transit discourages full length side-by-side passing facilities. They are not generally recommended on road sections with less than projected 10,000 vpd. Exceptions are:

- Where it is difficult to have alternating passing facilities, such as valleys between two sections of mountainous terrain.
- If there are no nearby sites that allow alternating facilities from one side of the road to the other.

E/PART C. PASSING TREATMENTS

Introduction

Passing treatments lie within two general groups.

1. Low volume (< 4,000-5,000 vpd)

    - Shoulder widening
    - Crawler shoulder.
    - Slow vehicle bays.
    - Short passing lanes (600-800 m long excluding tapers).

2. Moderate volume (4,000-25,000 vpd)

    - Wide-shouldered two-lanes.
    - Passing lanes in series.
    - Crawler lanes.
    - 2+1 lanes.

Low and moderate volume options are described below in more detail. Preferred options are stated but other options may be more appropriate under specific conditions. See Strategy Refinement within these Guidelines for details of these specific conditions.

See the Background Technical Report (Transit, 2006) for more detailed evaluation of individual passing treatments based on capacity, safety, operational efficiency and cost effectiveness.

E/C1. Low-Volume Passing Treatments

Shoulder – Widening

If slow vehicle bays and short passing lanes are not viable, short lengths of 2.0-2.4 metres of sealed shoulder are to be considered, particularly on steep gradients. The desired speed differential between platoon leader and following traffic should be at least 10 km/hour before considering this option.

Crawler Shoulder

A 2.4-3.5 m sealed shoulder width should be considered. Provide diagonal markings if the seal width is 2.5 m or more.

Generally, apply this treatment over prolonged gradients where a crawler lane is not feasible, but where there are typically both 1-2 following vehicles and a high proportion of slow moving vehicles, i.e. heavy commercial, recreational and light towing vehicles.

See Strategy Refinement within these Guidelines and Rural Road Design Section 13.4 .2 Climbing Lanes. For more detail on the location of crawler shoulders.

Slow Vehicle Bays

For low traffic volumes on hilly and mountainous road gradient, consider slow vehicle bays up to 300 m long. For 300 m long SVBs efficient operation requires:

- Less than 60 km/hour mean traffic speed (50 km/hour heavy commercial and light towing vehicles) with one following vehicle.
- Less than 50 km/hour operating speed (40 km/hour heavy commercial and light towing vehicles) with two following vehicles.

See Koorey & Gu, 2001 for more detail on conditions where slow vehicle bays become less effective and suggested optimum SVB lengths relative to the operating speed and queue length.

If projected AADTs suggest a long-term traffic demand that requires a higher level of infrastructure than SVBs, allow future provision to form a short 600-800 m long passing lane (excluding tapers) or longer length.

For long road sections in either flat or rolling road gradient with slow moving farm equipment, consider a series of slow vehicle bays with 2-4 km spacings.

Short Passing Lanes

A 600-800 m long passing lane is recommended for low-volume passing treatments. The extra length compared to slow vehicle bays enables faster vehicles to pass slower vehicles in the platoon, after they have both passed the platoon leader.

E/C2. Moderate-Volume Passing Treatments

Wide – Shouldered Two-Lanes

Wide–shouldered roads would provide 2.0-2.4 m wide shoulders. This treatment generally relies on slower vehicles voluntarily using the wide shoulder. As traffic flow increases, there is a reluctance to use the wide shoulder, as it is more difficult to re-enter the traffic stream at the end of the shoulder length.

However, there may be some situations, such as slow moving farm equipment, high numbers of pedestrians and/or cycles where short sections of wide shoulder can be used in preference to passing lanes in series or 2+1 lanes.

Passing Lanes in Series

Passing lanes in series are recommended for:

- State highways with flat or rolling road gradient and projected AADTs of 4,000-12,000 vpd.
- Hilly or mountainous road gradient and projected AADTs of 4,000-25,000 vpd.

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Passing Lanes in Series continued

A long-term framework of passing lane lengths and spacings is described within these Guidelines in Table 3 Long-Term Framework for Passing & Overtaking Treatments.

Crawler Lanes

Where high numbers of slow moving vehicles (i.e. heavy commercial, recreational and light towing vehicles) are common, crawler lanes (also known as climbing lanes) are recommended. See AUSTROADS Rural Road Design, Section 13.4.2. Climbing Lanes.

Unlike slow vehicle bays, crawler lanes are longer and rely on a passing behaviour rather than voluntary use. See Part D Strategy Refinement within the main body of these Guidelines for more detail on site conditions.

2+1 Lanes

A 2+1 lane road is recommended for flat and rolling gradients with projected 10,000-25,000 vpd. This option is suitable where a majority of these conditions exist:

- One-way projected flows less than 1,200-1,400 vph, (unless ITS assisted merging is used then 1,700-1,800 vph depending on heavy commercial vehicle flows).
- High rate of crash severity.
- Flows on local roads and access crossings can be easily controlled by an expressway standard of access control and at-grade intersections.
- Existing structures are high-cost, such as overpasses for District roads and bridges, and have a long service life. With 2+1 lanes, the road can transition to two lanes so that high cost items do not have to be upgraded prematurely.
- If the route is identified for tolling, the tolling legislation should enable development of the road section to be progressively staged from 2+1 lanes through to four-lanes.
- Overtaking zones as part of any interim strategy can be developed later into passing lanes
- The road section is at least 8 km long and would not interfere with intersections at either end of the road section.
- For geotechnical reasons, it may be appropriate to undertake the earthworks as a four-lane formation and therefore total construction costs may be similar between 2+1 lanes and four-lanes, e.g. swampy ground, engineered embankments. However, this would have to extend over most of the road section length.

For long-term passing strategies in flat and rolling terrain, 2+1 lanes would most likely be developed in 10-20 km lengths (8 km minimum). In these situations the highest demand locations are to be addressed first, rather than developing the road section as a whole.

Four-Lanes

The Policy does not cover four-lane options, but some state highway sections may be referred on for further investigation as a four-lane project. Generally, this will apply to state highway sections in flat and rolling terrain that do not fit the 2+1 lane criteria outlined above.

In some situations, the benefits of early four-laning may either outweigh the cost difference between 2+1 lanes and four-lanes, or help to develop a consistent four-lane layout along a route.

E/PART D. CENTRELINE TREATMENTS

Introduction

The choice of centreline treatments has to balance overtaking using the opposing lane against reduction in head-on crashes.

Centreline treatments in order of level of infrastructure are:

- Yellow line markings (both single and double).
- Wide profile markings.
- Gap separation.
- Central median cables.
- Guard rails.

Yellow Line Markings

Apply yellow line markings progressively as traffic volumes increase, up to 10,000 vpd. Only apply in locations with adverse crash history or identified risk from previous experience.

Consider curves with restricted vertical and horizontal sight distance at the end of overtaking zones.

Note: Do not apply yellow line markings as a threshold treatment, e.g. greater than 4,000 vpd.

Wide Profile Markings

Consider wide profile markings in addition to yellow line markings on sections of state highway where:

- Yellow line markings alone are unsatisfactory, and
- It is not viable to provide additional carriageway width for gap separation, central median cable or guardrails.

Gap Separation

Consider a gap separation of 1.2 m (minimum) to 1.75 m (preferred) for flows above 10,000 vpd where there is no adverse history of overtaking, rear-end and turning related crashes.

For gap separation less than the preferred 1.75 m width, consider extra sealed shoulder so that gap separation can be replaced later with a 1.75 m wide median for central median cables, if required.

Central Median Cables

Consider central median cables for locations with an adverse history of serious or fatal head-on crashes and high traffic flows above 10,000 vpd.

Guardrails

Consider applying guardrails as an alternative where there is insufficient space to allow lateral displacement of median cables.

Use guardrails where regular maintenance of restraint cables is impractical and any possible reduction in available stopping sight distance will not adversely affect safety.

E/PART E. ROADSIDE/EDGELINE TREATMENTS

Introduction

Roadside/edgeline treatments are used to help reduce the incidence of loss of control crashes off the roadway. This type of crash is sometimes associated with the provision of passing lanes and slow vehicle bays (Koorey et al, 1999).

While there is no supporting New Zealand research, this type of crash may also occur at overtaking zones, but to a lesser extent.

These treatments in ascending level of infrastructure are:

- Clear zoning.
- Increased signs and markings.
- Wide profile markings.
- Chip seal.
- Increased sealed shoulder width.
- Side restraint cables.
- Guardrails.

Curve improvements are considered to be a separate project rather than minor safety works like the above-mentioned treatments. Therefore curve improvements/realignments have been excluded.

Direction and Location

For tack-on passing facilities, the most likely crash locations have been identified, particularly loss of control type crashes (Koorey et al, 1999). These locations are:

- 0-2 km both upstream (untreated direction).
- Within passing lane (untreated direction).
- 0-2 km downstream (both directions).
- 2-4 km downstream (treated direction).
- 8-10 km downstream, especially if 0-2 km upstream of the next downstream passing facility in the same direction (treated direction).

Therefore, except for 2+1 lanes, consider roadside/edgeline treatments for passing facilities and overtaking zones from 2 km upstream through to 4 km downstream in the above-mentioned directions. The emphasis of treatment should progressively decline with greater distance from the passing facility or overtaking zone.

For 2+1 lanes, consider roadside/edgeline treatments along the whole length with emphasis on the one-lane sections (Bergh & Carlsson, 2000).

Possible At-Risk Curves

For upstream and downstream curves, consider treatments for:

- A series of low speed curves with more than 10 km/hour speed difference.
- Isolated curves with more than 15 km/hour speed difference.
- Curves with less than 500 m radius, especially 300-500 m radius curves.

Clear Zoning

Clear zoning involves providing a safe run-off width up to 9 m from the edgeline, including hazard removal and run-off slopes. Depending on crash history or experience, consider implementing clear zoning:

- At merge transitions for overtaking zones (treated if one-way otherwise both directions and ends of zones).
- Within passing lanes and slow vehicle bays in both directions and 0-2 km upstream (untreated direction) and 0-2 km downstream (both directions) and 2-4 km downstream (treated direction).
- For 2+1 lanes in both directions but hazard removal only for 9 m on two-lane sections (Bergh & Carlsson, 2000).

AUSTROADS Rural Road Design clear zoning requirements allow a reduced width on low volume roads in difficult terrain.

Increased Signs & Markings

If not present, consider increasing the use of markings and signs. Initiatives include:

- RRPMs (not suitable in areas requiring regular snow clearing).
- Edgeline marker posts.
- Chevron sight boards.
- Curve warning and advisory speed signs.

Wide Profile Markings

Wide profile markings are an alternative but higher level of infrastructure to RRPMS. Wide profile markings are not suitable in areas requiring snow clearing.

Chip Seal

For 300-500 m radius curves, a localised chip seal with suitable micro-texture may be appropriate. If there are a number of low speed curves, consider longer lengths of chip seal.

Increased Sealed Shoulder Width

Consider increased sealed shoulder width for:

- 2+1 lanes on one-way sections.
- Passing lanes and slow vehicle bays on isolated downstream and upstream curves.

Side Restraint Cables	Consider applying side restraint cables as an alternative where clear zoning and run-off slopes are not viable.
Guardrails	Place guardrails where regular maintenance of restraint cables is impractical and any possible reduction in available sight distance will not cause any adverse effects.

E/PART F. INTERSECTION TREATMENTS

Introduction

Downstream intersections can adversely affect through-traffic flows and therefore affect downstream benefits for passing facilities or overtaking zones.

Upstream intersections can create or reduce bunching effects, depending on priority, which can affect the operation of both existing and proposed passing facilities and overtaking zones.

Intersection treatments focus on optimising performance and benefits, and include:

- Locating passing facilities and overtaking zones with respect to current or proposed intersections and high-volume driveways.
- Providing for through-traffic.
- Rationalising intersections.

See Planning Notes for additional information on intersections.

Location of Overtaking Zones & Passing Lanes

The relative location of any upgraded intersections should consider:

- Overtaking zones.
- Interim strategies for passing facilities.
- At-grade intersections within or close to 2+1 lanes.

Overtaking zones may eventually replace passing lanes, particularly if the viability for a passing lane is marginal at lower AADTs.

For mixed passing and overtaking strategies, the location of the passing facility or overtaking zone should maximise the effective length in both directions. So try to avoid large intersections downstream and upstream within the effective length.

For 2+1 lanes, non-critical transition zones (abutting diverge zones) are preferred locations for at-grade intersections. Traffic is more likely to be bunched, allowing a higher incidence of critical gaps. At initial stages of development, consider locating short lengths of 2+1 lanes centrally within a section to optimise benefits in both directions.

Provision for Through Traffic

This provision would apply to rural intersections immediately upstream and downstream of passing facilities, as there is likely to be a higher chance of closely following vehicles. Therefore, this option would apply mainly at the mixed passing and overtaking stage.

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Provision for Through Traffic continued

Depending on the level of demand, turning provision consists of:

- Shoulder bypasses.
- Turning bays.
- Rural roundabouts.
- Grade-separated interchanges.

For rural intersections within and immediately downstream of passing facilities, provision for following vehicles to pass turning vehicles markedly reduces traffic conflicts (Mutabazi, Russell & Stokes, 1999).

At lower volumes (i.e. up to 10,000-12,000 vpd), this reduction in conflicts could be achieved by providing either sealed shoulder widening or turning lanes in accordance with safety criterion under AUSTROADS 2005.

Consider the location of intersections relative to both ends of overtaking zones.

Rationalisation

Consider intersection rationalisation if:

- The road section has either a long-term Mixed Passing and Overtaking Strategy or a long-term Passing Strategy; and
- Current or proposed connectivity between District roads.

For road sections with a Mixed Passing and Overtaking long-term strategy, consider intersection rationalisation if the State highway/District road intersections would compromise performance or safety either along the passing facility and/or near the diverge or merge zone.

For road sections with a Passing Only long-term strategy, consider intersection rationalisation along the whole length of the road section.

As part of any evaluation consider current or possible future adverse crash history at the intersection.

Remedial Measures

When rationalising and providing for through traffic, consider:

- Removal of intersections if there is an alternative District roading network with nearby intersections.
- Conversion to either left in/left out, or T-junctions, if adequate performance for a four–legged intersection cannot be easily achieved.
- The effect on any driveway crossings close to a proposed T junction, e.g. possible future deceleration and acceleration lanes may be affected by existing crossings.

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Remedial Measures continued

- Future turning restrictions on access crossings and intersections due to central median barriers.
- Amalgamation of existing crossings into one single access crossing.

E/PART G. RESOURCE PLANNING MEASURES

Introduction

Adjacent and nearby land use needs to be balanced against the proposed development and operation of the state highway network.

In no particular order, resource planning measures are:

- Access controls, e.g. LARs, motorway classification.
- Submissions on planning documents.
- Encouragement of alternative District roading networks.
- Designations on new and wider state highway alignments.

Access controls may also be required on District road approaches for current and proposed high-volume intersections. Work with the appropriate City or District Council to determine if access controls are needed.

Access Controls

Apply limited access road status to all state highways with a long-term strategy within the Mixed Passing and Overtaking Stage. Limited Access Roads control the number location and geometric layout of access crossings. Consider including both a purpose for the access crossing (which would define the number of movements/day) and a review clause.

See Transit's PPM for indicative crossing spacings and planning considerations for crossing applications. At some locations, spacings may have to be increased due to poor sight distance between crossings, e.g. poor alignments.

Consider providing segregation strips on both sides of the state highway boundary, particularly in conjunction with new designations. Ensure that the segregation strips are:

- Full length, including diverge and merge areas of existing and proposed passing facilities and overtaking zones.
- Up to 300 m upstream of the diverge taper.
- Up to 300 m downstream of the merge taper.
- Up to 500 m from the extremities of the existing and proposed high-volume intersections planned for upgrade.

Submissions on Planning Documents

See Planning Notes for submissions on District/Regional Planning documents, involving:

- Updates to District Plan policies and rules that will assist the implementation of the PO Policy and Regional PO Plans.

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Submissions on Planning Documents continued

- Support for the PO Policy and Regional PO Plans within the Regional Land Transport Strategy and where appropriate, prioritise funding accordingly.

Alternative District Roading Networks

Encourage alternative District roading networks to be undertaken in conjunction with intersection rationalisation and District structure plans.

If no alternative roading network is proposed, consider applying a threshold for the number of permitted access points.

All permits given for new crossing applications must include a review clause and take into account the likely provision and timing of alternative roading networks.

Designations on New & Wider SH Alignments

Consider designations on new or wider alignments for:

- Proposed 2+1 lanes (motorway status).
- Realignments (if access controls cannot be easily implemented).
- Proposed upgrades of high-volume intersections.
- Possibly, special user requirements and utilities.

While some 2+1 lanes on straight sections of alignment could be developed within a two-lane designation width, a four-lane designation width is preferred, as most 2+1 lane roads will eventually require upgrading to four-lanes.

For extra designation width, consider the possible layout for any future four-lane carriageway:

- An extension of one side of the carriageway.
- An extension of both sides of the carriageway.
- Adjacent new two-lane section.

E/PART H. EDUCATION MEASURES

Introduction

Education measures can help to influence driver behaviour and include:

- Target audience or
- General public.

Target Audience

Where possible, target audiences should be considered as part of regional initiatives with Land Transport and other industry groups.

About 50% of surveyed crashes at passing facilities involved long vehicles, such as heavy commercial vehicles and towing vehicles. Males 25-45 years old were over-represented (Luther et al., 2004).

Possible initiatives for facilities that generate high volumes of heavy commercial vehicles include:

- Resource consent conditions (new and upgraded facilities).
- Driver education programmes (all facilities).
- Work practice improvements (all facilities).

These initiatives should consider:

- Use of passing facilities and overtaking zones on delivery and pick-up routes.
- Staggered shift times for drivers.
- Minimisation of heavy commercial vehicles following closely in convoy.
- Independent telephone hot-line number and individual vehicle identification numbers to report heavy commercial vehicle driver behaviour.

For camper-van traffic, an educational brochure should be considered by industry groups for inclusion within newly rented camper-vans, caravans and similar types of recreational vehicles.

General Public

General public programmes should be considered in conjunction with Land Transport NZ and other industry groups. Possible activities include:

- For heavy commercial and towing vehicles, observing their speed limit of 90 km/hour at passing facilities and overtaking locations.
- Public information on using passing facilities and overtaking zones.

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General Public continued

- Review of best practice for overtaking and passing manoeuvres within Road Code for recreational and heavy commercial vehicles and cars.
- Including questions within standard and heavy commercial driving tests.
- Inclusion in defensive driving courses.
- Promoting best practice driver behaviour at passing facilities or overtaking zones for vehicles towing boats, caravans or heavy trailers.
- Liaison with Heavy Freight and Tourist Coach industry groups.
- Implementing an education programme as part of voluntary speed controls on heavy commercial vehicles instead of using mandatory controls.
- Providing feedback to Land Transport NZ, Ministry of Transport and NZ Police on education issues highlighted, as a result of State Highway Forecast public consultation.
- At lower volumes, except for slow vehicle bays and passing panes, adequate signage and markings for use of other types of passing treatments, (slow vehicle bays and passing lanes already have adequate signage outlined within MOTSAM).

E/PART I. ENFORCEMENT MEASURES

Introduction

Enforcement measures can help to influence driver behaviour and include:

- Problem locations or
- General public.

Problem Locations

Where possible, problem locations should be considered as part of regional initiatives with NZ Police and other industry groups. Possible activities include:

- Enforcement of speed limit on heavy commercial vehicles and other towing vehicles at problem passing lanes and/or overtaking zones (as opposed to speed enforcement on all vehicles).
- Enforcement of speed limit on all vehicles at crash prone locations.
- Providing feedback as part of regular Land Transport NZ regional safety meetings.
- In conjunction with ITS measures, at overtaking zones, possible speed cameras for light towing and heavy commercial vehicles, with a 90 km/hour speed limit.

General Public

General public programmes should be considered in conjunction with NZ Police and other industry groups. Possible activities include:

- Enforcement of speed limit for all road users at locations with a high incidence of overtaking, rear end and head-on crashes.
- Possible stricter demerit points system for drivers of speeding heavy commercial and light towing vehicles.
- Liaison with Ministry of Transport, Land Transport NZ and NZ Police about research into legislation and enforcement relating to bunching effects.
- Providing feedback to Ministry of Transport, Land Transport NZ and NZ Police over any enforcement issues highlighted as a result of State Highway Forecast public consultation.

E/PART J. TRAVEL DEMAND MANAGEMENT MEASURES

Introduction

TDM measures can help to influence driver behaviour, particularly for specific road sections. Consider TDM measures for:

- Road sections with projected AADTs close to or requiring an increased level of infrastructure, (i.e. transition AADT intervals between different levels of strategy 4,000 - 5,000 vpd, 10,000 - 12,000 vpd and 20,000 - 25,000 vpd).
- Routes with current and projected high volumes of recreational, heavy commercial and/or light towing vehicles.
- Routes with high traffic volumes, during weekends and public holidays.
- Commuter routes through peri-urban areas.
- Road sections with a long-term Passing Only Strategy.

Critical road sections will usually be close to or requiring an increased level of infrastructure, as well as having any combination of last three bullet point conditions

Transit TDM Manual

Travel Demand Management measures can be applied to help reduce the growth in peak hour traffic. Consider specific TDM measures on an individual case basis to ensure they are appropriate to the local context. See Transit's draft TDM Manual (currently under consultation) for detailed information on TDM for rural state highways.

TDM Strategies

Regional PO Plans must consider Transit's TDM Strategy, if available for the region. Where possible, Transit initiatives should link in with other organisations' regional initiatives for TDM, particularly those included within regional land transport strategies.

Transition AADT Intervals in PO Policy's Long-Term Framework

A reduction in peak hour traffic volumes, particularly on routes with projected flows close to sites between different PO Strategies, would extend the service life of any interim strategy and delay significant upgrade costs.

HCVs, RVs & Light Towing Vehicles

Submit TDM measures, including revised work practices, as part of resource consent conditions for activities that temporarily or permanently generate large numbers of recreational, heavy commercial and/or light towing vehicles. See also Education Measures within these Option Notes.

Peak Weekend and Public Holiday Flows

Real time driver information can help promote peak spreading. If appropriate, investigate separation of peak local and recreational traffic activity, along with alternative hours, routes and modes.

Commuter Routes in Peri-Urban Areas	The provision of alternative transport modes (i.e. walking, cycling, public transport) along commuter routes is encouraged, especially in peri-urban areas with higher levels of infrastructure than rural areas. TDM measures may also include assessment on land development within the District (and if appropriate, Transit submissions) so that walking, cycling and public transport are more viable along state highway commuter routes through peri-urban areas.
Road Sections with Passing Only Strategy	Where a long-term Passing Only strategy is required, those road sections are to be included within Transit's TDM strategy for the region. Unless broader based national or regional initiatives will cover the road section, a specific TDM strategy would be required for the road section.

E/PART K. INTELLIGENT TRANSPORT SYSTEM MEASURES

Introduction

Intelligent transport systems can help to influence driver behaviour, particularly at specific high demand sites. Intelligent Transport System measures include:

- Variable message signs.
- Video monitoring linked to web camera.
- Speed cameras, especially for heavy commercial and light towing vehicles.

ITS Strategies

Regional PO Plans are to consider Transit's ITS Strategy, if available for the region.

Where possible, Transit initiatives should link in with other organisations' regional initiatives, particularly those initiatives included within Regional Land Transport Strategies.

Variable Message Signs

Consider using variable message signs for:

- Locations of high peak demand, where the existing facility functions adequately for the majority of the time.
- One location in a series is operating inefficiently, but the rest of the section length does not require an upgrade.

Variable message signs should be used to help merge behaviour. Merge behaviour will vary under different traffic conditions. Under nearly congested but free flowing conditions, an early merge is recommended. Under congested conditions with reduced speeds, a late merge is recommended.

Allow for variable messages signs being mobile, especially while the effectiveness for a site is being confirmed.

Note: This measure has been trialled in the USA for merging lanes at construction sites on state highways and requires further New Zealand research. Trials in the USA suggest flow capacity at the merge is 1,750 (static merge) - 1,830 vph (simulated dynamic merge). (Cited in Beacher et al, 2004.)

Video Monitoring

Video monitoring is best used in conjunction with variable message signs and other applications including speed enforcement, incident management and performance monitoring.

Continued on next page

Video Monitoring continued

Preferably, where an existing ATMS exists in an adjoining urban area, peri-urban areas should be considered for extension of video monitoring linked to ATMS. However, there are few locations outside of Auckland and Wellington where ATMS is in use.

Web camera solutions are more appropriate for the majority of rural state highway locations.

Speed Cameras

Consider speed cameras with special induction loops to detect long vehicles for enforcement of speed limits on heavy commercial and light towing vehicles at problem passing and overtaking locations.

Note: This measure would require further NZ research. However, Transit has already trialled the use of special induction loops that identify long vehicles in the Nelson-Marlborough region. Dual loops, while not trialled, may be another possible configuration. In that situation, VMS signs were used to slow long vehicles before a tight curve but the same application could be used for speed cameras.

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