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Preface - Status of Guide

This is the final working draft of the Speed Management Guide, one of the five actions in the Safer Journeys Safer Speeds Programme. It follows an Engagement Draft of the Guide, which was produced in December 2014, and it takes into account the feedback that was received.

The Speed Management Framework, which is the focal point of the Guide, will be demonstrated over the next 8-12 months on the highest risk parts of the network, and in the Waikato region in particular.

We want to ensure that the Speed Management Framework is robust before a wider roll-out, and that what it seeks to achieve is understood and supported by New Zealanders.

Another action in the Safer Speeds Programme – Changing the Conversation on speed – will complement the gradual roll-out of the Guide through a campaign that will build better sector and public understanding of risk, road classification and the necessity of speed management.

The Guide will be demonstrated through the existing legal mechanism of Speed Limits New Zealand. However, it is intended that the Setting of Speed Limits Rule will be reviewed in 2016 when the learnings from demonstrating the Speed Management Framework can be considered. Reviewing the Rule is another of the five actions in the Safer Speeds Programme.

This is a long-term programme over the next ten years and more. There is no expectation there will be wholesale changes to speed limits in the short-term. For many roads, no change to travel speeds – or speed limits – will be needed. It is for those corridors at the margins where current travel speeds or speed limits may be too low or too high that changes could be made.

In progressively applying this Guide to speed management, we will see more effective targeting to risk and investment in safety improvements. This will significantly improve the contribution that speed management makes towards the twin objectives of reducing deaths and serious injuries and improving economic productivity. The indicative timeframes for this trial period for the Guide are shown below.

Indicative timeframes

<table>
<thead>
<tr>
<th>August 2015</th>
<th>September 2015</th>
<th>August 2016</th>
<th>Early 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draft Speed Management Guide published</td>
<td>RCAs use the draft Speed Management Guide for urgent and high risk speed management reviews</td>
<td>Learnings from applying the Guide are considered</td>
<td>Final Speed Management Guide released and used by all RCAs when developing Activity Management Plans</td>
</tr>
<tr>
<td>Demonstration project begins applying Speed Management Framework in Waikato</td>
<td>Review of Setting of Speed Limits Rule begins</td>
<td>Setting of Speed limits Rule revised as appropriate</td>
<td></td>
</tr>
</tbody>
</table>
## Glossary

<table>
<thead>
<tr>
<th>Glossary</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rural (open) vs Urban</strong></td>
<td>For the purpose of this Guide “Urban” and “Rural” may be defined using the Statistics New Zealand classifications, or accepted definitions in regional planning documents (e.g. Auckland’s Metropolitan Urban Limits in the Auckland Plan). For Urban areas sub categories include: – Main Urban Areas, Satellite Urban Communities and Independent Urban Communities. For Rural areas, sub categories include: - Rural Areas with High Urban Influence, Rural Areas with Moderate Urban Influence, Rural Areas with High Low Urban Influence and Highly rural/remote areas. For more information go to: <a href="http://www.stats.govt.nz/browse_for_stats/people_and_communities/Geographic-areas/urban-rural-profile/defining-urban-rural-nz.aspx">http://www.stats.govt.nz/browse_for_stats/people_and_communities/Geographic-areas/urban-rural-profile/defining-urban-rural-nz.aspx</a> Note that for classifying roads by speed limit, motorways exist in both rural and urban environments. It is recognised that defining Urban and Rural is not always clear cut, particularly in high growth areas undergoing changes in function and use (including land use).</td>
</tr>
<tr>
<td><strong>Safe and appropriate speeds</strong></td>
<td>Travel speeds that are appropriate for road function, design, safety and use.</td>
</tr>
<tr>
<td><strong>Risk rating (Collective and Personal Risk)</strong></td>
<td>Crash risk is measured as either Collective Risk (or Crash Density) or Personal Risk (or Crash rate). For a full explanation including how they are calculated and risk bands, go to: <a href="http://www.kiwirap.org.nz/measures_risk.html">http://www.kiwirap.org.nz/measures_risk.html</a> See also the High Risk Rural Roads Guide.</td>
</tr>
<tr>
<td><strong>Star ratings</strong></td>
<td>A scoring system that rates built-in safety features that have been incorporated into the road’s design. These include wide lanes, shoulders, and safety barriers which are known to reduce the impact and severity of a crash. The safest roads are likely to be straight, divided, have good line-markings, wide lanes and sealed shoulders. Roadsides with no trees or ditches, and roads with few, if any, intersections are also deemed safer. For rural State Highway Star rating categories and examples go to: <a href="http://www.kiwirap.org.nz/scoring_bands.html">http://www.kiwirap.org.nz/scoring_bands.html</a></td>
</tr>
</tbody>
</table>
1 Introduction

1.1 Objectives, scope, priorities and success factors

1.1.1 Objectives

The objectives of this Speed Management Guide (“this Guide”) are to:

- Ensure a consistent sector-wide approach is adopted to manage speeds so they are appropriate for road function, design, safety, use and the surrounding environment (land use)
- Help Road Controlling Authorities (RCAs) and other system designers identify and prioritise the parts of their networks where better speed management will contribute most to reducing deaths and serious injuries, while supporting overall economic productivity.

This Guide contains a step by step Speed Management Framework (the Framework) to help RCAs plan, invest in and operate an effective speed management plan. It outlines how speed management can achieve both safety and efficiency, and it will enable RCAs to work with their communities to build support for an evidence-based, network-wide strategic approach to achieve these twin outcomes. It will also be of interest to transport stakeholders and people who may have an interest in speed management. For speed management to be successful it must have broad understanding and support.

To ensure this Guide meets the needs of all those involved in speed management, it has been prepared using a collaborative process co-ordinated by the Transport Agency in association with the Police, the Ministry of Transport, RCAs (through Trafinz and the RCA Forum) and the Automobile Association.

The guide is an integral part of the Safer Journeys Safer Speeds Programme. The overall goal of the Safer Speeds Programme, which sets the direction for speed management in New Zealand, in line with the Government’s Safer Journeys Road Safety Strategy 2010-2020, is to:

\[ \text{reduce death and serious injuries, and support economic productivity through travel speeds that are safe and appropriate for road function, design, safety and use.} \]

Through the use of this Guide, people will see speed being managed consistently and targeted to risk, which will help build understanding and support for safe and appropriate speeds. Volume 2 of this Guide contains a comprehensive toolbox of approaches, interventions and technical specification covering all parts of the Safe System\(^1\). Guidance on how to use the toolbox is also provided.

1.1.2 Scope

The scope of this guide is to:

- Outline a network-wide approach to managing speed, tied in with the One Network Road Classification (ONRC), so that travel speeds are appropriate for road function, design, safety and use
- Offer guidance for targeting to risk and prioritising investment.
- Outline a Speed Management Framework that encompasses all elements of the Safe System approach to reduce the risk of death and serious injury, while supporting overall economic productivity.
- Provide RCAs with guidance for setting speed limits.
- Identify best-practice and successful case studies, including demonstrations.
- Develop an evaluation framework to track effectiveness, and measure performance.

\(^1\) Speed Management Guide: Volume 2 – Toolbox and Appendices.
1.1.3 Priority areas for speed management

Speed management in the broader framework of activity management, is guided by these principles to help with the prioritisation process:

- Plan, invest and manage using a one network approach
- The transport system should move people and goods efficiently and safely
- Investment in the network should be based on a sound business case and offer good value for money
- Users of the transport system should expect levels of service appropriate for the function(s) of the road
- The impact of land use on the transport system needs to be managed, and vice versa.

Speed management is about achieving safe and appropriate speeds that reflect road function, design, safety and use. We need people and goods to move efficiently around our transport network; however, aligned to the ‘Safe System’ approach, and we need to see a reduction in deaths and serious injuries. Speed management requires input from policy makers, engineers, educators and the police to encourage and influence road users to adopt safe and appropriate speeds.

Speed management should be targeted where there is greatest potential to reduce deaths and serious injuries, particularly in the short-term. In both rural and urban environments this is likely to mean a focus on roads which have higher collective crash risk and/or higher personal crash risk. Over the longer-term, clearer categories of safe and appropriate speeds will increase consistency across the network and fully reflect the outcomes and functions of different road types.

In summary, priority for speed management activities should be on parts of the network where:

- there is a large differential between actual travel speeds, and safe and appropriate speeds
- there is a high personal or particularly collective crash risk within a network area
- speed management will make a difference

Using planning tools such as the ONRC and a better understanding of the various economic and safety considerations in different circumstances, safe and appropriate speeds can be achieved. The key components that need to be considered as part of Speed Management activities are shown in Figure 1.1.
1.1.4 Success factors for speed management

Establishing broader success indicators helps to establish if the speed management programme has had the required impact or not. Success factors for the overall speed management programme are shown below in Table 1.1.

<table>
<thead>
<tr>
<th>SPEED MANAGEMENT PROGRAMME SUCCESS FACTORS</th>
<th>HOW MEASURED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over the longer-term, all deaths and serious injuries, especially speed-related ones are reduced.</td>
<td>A sustained downward trend in speed-related deaths and serious injuries, particularly on highest risk routes.</td>
</tr>
<tr>
<td>Some projects in the 2015-18 National Land Transport Programme are applying the guide. By the 2018-21 NLTP, all RCAs would use the Guide.</td>
<td>Via NLTP programmes.</td>
</tr>
<tr>
<td>Public and stakeholders support RCAs in their approach to speed Management.</td>
<td>Communities respond well to interventions that are effective in managing speed and improving safety. There is an increase in public support for speed management.</td>
</tr>
<tr>
<td>RCAs progressively adopt a consistent approach to speed management, prioritised to risk, using the principles and interventions in the Guide.</td>
<td>Travel speeds become more consistent and appropriate for road function, design safety and use across all road classes. Highest risk corridors and network areas are prioritised.</td>
</tr>
<tr>
<td>Economic productivity and safety improves on higher classification roads where investment has been made</td>
<td>Throughput of people and goods improves</td>
</tr>
<tr>
<td></td>
<td>Travel time reliability improves</td>
</tr>
</tbody>
</table>

Table 1.1 Success factors for the speed management programme
2 Strategic context

2.1 Speed and economic productivity

Moving people and goods efficiently and reliably brings economic benefits to the country\(^2\), particularly on routes where the primary function of a route is flow (moving large volumes of people and freight), and where the main aim is to increase throughput and network efficiency. On routes with low volumes of freight and traffic, or where access, liveability or ‘place’ is the primary function, travel time is less important.

The relationship between travel speed and journey time is affected by several variables, such as traffic volumes, access and intersection density, and homogeneity in speed. Faster is not always the most efficient. For example, in congested urban motorway conditions, the travel speed that optimises throughput (and results in the lowest collective travel time) is around 80km/h\(^3\).

Assessing the economic benefit of speed management requires a picture of the entire road network to capture the function and economic relevance of each road in context of others. This Guide takes this into account in determining safe and appropriate travel speeds.

New Zealand now has a consolidated ‘one network’ approach that applies to the State Highways and local roads.

2.2 Speed and road safety

Speed continues to be a problem on the country’s roads and remains a major contributing factor in many fatal and serious crashes\(^4\). Speeding encompasses excessive speed (i.e. driving above the speed limits) and inappropriate speed (driving too fast for the prevailing conditions, but within the speed limit).

2.2.1 Safe system

The Safe System principles in a speed management context are:

1. **Human tolerance to physical force**: The human body has a limited ability to withstand crash forces without being killed or seriously injured. The fundamental principle of a safe system is the relationship between road users, vehicles, speeds and road infrastructure, and how much force the human body can withstand when each of these four elements interacts in the event of a crash. The speed people are travelling at when they crash will determine the severity of the consequences.

2. **Human fallibility** – People make mistakes and we need to recognise that we can only reduce, not eliminate mistakes. At higher speeds, loss of control is more likely and there is less time to recover from mistakes when they happen.

3. **Shared responsibility** – Those who design the road system and those who use the roads must all share responsibility for creating a transport system where crash forces don’t result in death or serious injuries.

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\(^2\) The Government Policy Statement on Land Transport gives strategic direction to Regional Land Transport Plans and the National Land Transport Programme. There is an expectation that safety investment should be transparent and clearly prioritised to risk and support both safety and economic productivity.

\(^3\) For example, see [https://www.nzta.govt.nz/projects/wellington-northern-corridor/smart-motorway/](https://www.nzta.govt.nz/projects/wellington-northern-corridor/smart-motorway/)

\(^4\) Between 2010 and 2013, 9632 people were killed or seriously injured. The total social cost of road trauma over this period was \$13.4 billion. Over the same period 1637 crashes were attributed directly to “Speeding”, either inappropriate speed for the road and conditions or speed in excess of the speed limit.
4. **All of system approach** – We need to improve all parts of the system – roads and roadsides, speeds, vehicles and road use – so that if one part fails, other parts can still protect the people involved.

2.2.2 **The challenges**

Current travel speeds do not always support safety or economic efficiency

There is inconsistent use of speed management practices around New Zealand, which confuses road users

Inappropriate speed is a factor in about 20% of all fatal and serious crashes, **but it contributes the outcome in every crash** – higher travel and impact speeds mean a greater risk of death and serious injury

We want to build public support for safe and appropriate speeds that are credible and consistent with road function, design, safety and use – the right speed for the right road

Open road deaths and serious injuries cluster around lower quality roads. Often people fail to adjust their travel speed to the quality of the road, not aware of the greater risk on poorer roads. It is also confusing for people to see different speed limits on the same class of roads that have the same look and feel. The network is not that self-explanatory.

In urban areas, mean travel speeds often are aligned with road function, but not to design and safety (especially at intersections) or use (the presence of people walking, cycling and motorcycling).

Improving basic features such as road markings and signage will help people to identify and understand the appropriate travel speed. The speed that is safe on a road under particular conditions (e.g. wet weather) should be intuitive. However, even with speed limit signs, road markings and the geometry of the road itself, many people do not fully appreciate that ‘not all roads are equal’ and fail to adjust their speed accordingly, because there is nothing to prompt them to do so. In reality most people want to get from A to B as quickly as possible. Sometimes there is pressure to drive too fast, often when tired or distracted – we are human and don’t always get it right.

We need to improve speed management to improve safety and efficiency but through the lens of everyday life situations that affect how we drive, ride or walk. Speed management remains relatively poorly understood, is regularly contested and attracts much emotion. Preconceptions colour and hold back the discussion around speed, however well-intentioned.

Travel speeds should reflect the safety features present on a roads and the mixture of road users. If a road does not have a high standard of safety features present, or if it is used frequently by pedestrians and cyclists, then the travel speeds and associated speed limits should reflect these conditions. This will also help drivers to understand safe and appropriate speeds better, and drive accordingly.

2.3 **The Safer Speeds Programme**

There are three-long term speed-related objectives in the second *Safer Journeys Action Plan (2013-15)*:

1. people will increasingly understand what travelling at safer speeds means
2. speed limits will better reflect the use, function and safety of the network
3. travel speeds will support both safety and economic productivity

If we achieve these three objectives we will see a reduction in all crashes, not just speed-related ones. The *Safer Speeds Programme* has been developed to support these objectives. It will increase national consistency in setting and managing speed limits and identify other changes that are needed to the way
speed is managed. It will include a partnership-based communication strategy to increase understanding of what travelling at a safe and appropriate speed means and will build support for a changed approach to speed management. The five key actions of the programme are:

1. **Deliver a campaign to change the conversation on speed** to build better sector and public understanding of risk, road classification and the necessity for speed management.
2. **Deliver a Speed Management Guide** to deliver a consistent approach to managing speed.
3. **Align the Setting of Speed Limits Rule** to the one network framework of safe and appropriate speeds, and reduce costs to RCAs while still providing for community input.
4. **Rebalance the penalty regime including providing for demerit points on safety camera offences** to ensure fairer penalties, increase deterrence, and ensure penalties more reflect road safety risk.
5. **Encourage and support Police to reduce the current speed enforcement threshold** to more consistently reflect speed limits and support the one network framework, to stop so many people breaking the speed limits, prevent low end speeding and improve traffic flow and throughput.

It is important to stress that achieving safe and appropriate speeds across the network is a long-term objective. In the short-to-medium term, speed limits on some roads will appear to be less consistent than they are today. Changing the conversation on speed will be an integral part of increasing public understanding of the objectives of the Safer Speeds Programme.

### 2.4 The Speed Management Framework

#### 2.4.1 The Speed Management Framework and the One Network Road Classification

The Speed Management Framework provides a single assessment method\(^5\) for determining safe and appropriate speeds on New Zealand’s entire road network. This provides an opportunity to better align travelling speeds with road function, design, safety and use because the ONRC takes traffic volumes, freight volumes and place functions into account. Figure 2.1 and Figure 2.2 illustrate the function, classification and typical daily traffic counts for various modes in both urban and rural areas respectively.

The Framework will also guide how roads are maintained, managed and operated. It will link into wider planning and investment programmes, and other systems and processes. The Safer Speeds Programme takes advantage of this new and more consistent way of describing and managing road function.

Current speed frameworks and speed management processes were developed when there was no overarching road classification system. While speed limit reviews involve a consistent process that takes land use and road use into account, they do not give sufficient weight to road classification, design, geometric characteristics, network efficiency or the Safe System approach. The result is that on some routes, travel speeds are not appropriate to road use and function.

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\(^5\) Chapter 4 steps through this in detail.
The Speed Management Framework includes a set of best practice principles to inform decisions in an effort to ensure that outcomes support the broader goal of national consistency. This is especially important where some roads don’t easily fit into various classifications and different lengths along a road may be classified with different functions. The Framework draws on the four key principles from the Dutch Sustainable Safety programme:

\[\text{Figure 2.1: Typical ONRC Functions, Classifications and Daily flows for urban areas}\]

\[\text{Figure 2.2: Typical ONRC Functions, Classifications and Daily flows for rural areas}\]

\[^6\text{A cyclist symbol is included in the schematic for the high volume nationally strategic to reflect the current use. Over time safer provisions will be made for people who cycle on these routes, such as separated facilities.}\]
1. Functionality – Differentiate speeds and speed limits according to a hierarchical classification, with clear differences between levels, to support self-explaining road systems.

2. Predictability and consistency – Support road user expectations through consistency and continuity of design, speed limit setting, enforcement, communication, adherence to standards and collaboration between partners.

3. Homogeneity – Keep like with like (mode separation) and encourage speeds within a narrow band to increase both safety and efficiency.

4. Credibility – Identify and manage safe and appropriate speeds for an entire route (and manage out of context risks by exception) to support the overall credibility of the limits and of enforcement.

The Framework sets out safe and appropriate speed ranges taking into account road function, design, safety and use. By 2016 we aim for agreement to adopt, and commitment to apply it firstly in high risk areas. By then, this Guide should begin to underpin all speed management activity, such as engineering and investment decisions, land use planning, fleet management, communication and enforcement, and become embedded into planning, engineering and network management.

With these in mind, the proposed safe and appropriate speeds for different types of road fall within the ranges shown in Figure 2.3. The proposed speed ranges are not in themselves speed limits, and no changes to the default limits are proposed. Risk can be reduced by investing in infrastructure improvements to make a road safer at current speeds, or by managing speeds down through a combination of road design, risk targeted enforcement and safe behaviour, all reinforced by the speed limit appropriate for the road.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Straight open road /urban motorways</th>
<th>Curved open road</th>
<th>Winding open road</th>
<th>Urban (not motorway)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1 High volume national</td>
<td>100–110km/h (depends on design and safety risk)</td>
<td>60–80km/h</td>
<td>60–80km/h (depends on safety risk)</td>
<td>50km/h (where safety risk allows, e.g. fewer intersections)</td>
</tr>
<tr>
<td>Class 2 National, Regional, Arterial</td>
<td>80-100km/h</td>
<td>60-80km/h (investment to bring the road up to 3 star equivalent)</td>
<td>60-80km/h</td>
<td>30-50km/h (mode separation for active users)</td>
</tr>
<tr>
<td>Class 3 Primary and secondary collector</td>
<td>60-80km/h (depending on volumes)</td>
<td>60-80km/h</td>
<td>30km/h (if high volumes of cyclists/pedestrians)</td>
<td>10km/h for Shared Spaces</td>
</tr>
<tr>
<td>Class 4 Access and low-volume access All winding/tortuous</td>
<td>60-80km/h (depending on roadside development)</td>
<td>60-80km/h</td>
<td>30km/h if high volumes of cyclists/pedestrians Recognise access and place</td>
<td>10km/h for Shared Spaces</td>
</tr>
</tbody>
</table>

*Figure 2.3: Recommended Safe and appropriate speed ranges for Road Classes*

The maximum legal speed limit in New Zealand is 100km/h
The Framework makes provision for higher speeds than are currently legal, when roads are in future designed to higher standards that prevent fatal and serious crashes, and when enforcement thresholds are closer to the limits. There are presently few kilometres of road that would be safe at a 110km/h speed limit.

2.4.2 Investment approach for speed management

The Transport Agency’s Investment Assessment Framework (IAF) gives effect to the Government Policy Statement. The IAF is underpinned by the Business Case Approach, which is used to guide the planning, investment and project development processes. It is a principles-based approach that clearly links strategy to outcomes, and defines problems and their consequences thoroughly before solutions are considered. This approach ensures a shared view of problems and benefits early in the transport planning process without requiring that the work has to be done in a particular way.

The Speed Management Framework should underpin all planning and investment decisions aimed at reducing risk and improving network efficiency. Speed Management Plans would outline the highest personal and collective risk routes where there is the greatest risk of death and serious injury, the safe and appropriate speeds for those routes according to their classification and level of risk, and suitable treatments. Speed Management Plans then feed into Activity Management Plans, Regional Land Transport Plans and ultimately the National Land Transport Programme (NLTP).
3 Current state: Speeds relation to road function, design, safety and use

New Zealand roads are not created equal: they fulfil different functions, and have different volumes of traffic and freight. The geometry (curvature), intersection or access frequency and sight distance varies, as does the design standard and level of safety. Roads that appear similar superficially can have quite a different mix of road users, who are vulnerable at different speeds, and whose presence affects the level of risk on the road.

One would expect travel speeds to accommodate the character of the road and the mix of road users, but the evidence below shows that actual travel speeds on New Zealand roads do not always match road function, design, safety or use, especially on lower quality roads and on curved or winding roads. Crash risk is clearly not evenly spread across road types. The crash risk, speed and road type patterns are different for rural and urban roads. On open roads, outside urban boundaries, the mismatch is with road function, design and level of safety. On urban roads, the main mismatch is with design, safety (especially at intersections) and the mix of vehicles and unprotected road users.

3.1 Risk on open roads – by classification

Figure 3.1 shows that mean travel speeds (measured geospatially) vary little by road classification on open roads. It is primarily on the low volume access roads that travel speeds are lower. Slightly lower mean travel speeds on high volume roads are presumed to be an effect of congestion.

High classification, high volume roads move most traffic and freight and are generally designed and maintained to the highest standards. These economically important roads have low or low-medium personal risk, but still can have relatively high collective risk, because of the volumes of traffic.
At the other end of the spectrum, 67% of the open road network is access roads with overall low collective risk, and relatively few crashes, deaths and serious injuries, but a high or medium high average personal risk for the few people who travel on them - in spite of lower speeds.

The roads in the middle of the classification have relatively medium or high risk scores. On these roads, speeds are high, but the roads are often of lesser quality, and likely to become more so under the ONRC, as New Zealand channels road infrastructure investment into the highest volume roads.

The proportion of vehicle kilometres travelled (Vkt), road length and frequency of crashes are unevenly spread across road categories from high volume strategic roads through to low volume access roads. Yet on these very different road types, motorists largely travel at the same speed, insensitive to the difference in risk. Collector and Regional Strategic roads have the highest risk scores. On these roads, speeds are generally too high for the quality of the road.

Two-thirds of all crashes where speeding is attributed as a cause are on open roads. Open road crashes are more likely to be speeding related on lower classification roads, although all but the highest volume roads tend to have speeding related crashes on them.

3.2 Risk on open roads – by geometry

Road geometry is a significant predictor of risk on the open road. Research indicates a strong relationship between crash frequency, severity and speed. The relationship is strongest on winding roads, when they are designed and maintained to lower standards10. Given the topography of New Zealand, many roads have tight curves and sight distance that mean speeds are only safe well below the current default limits.

Current travel speeds do not accommodate this risk well. Mean travel speeds vary with geometry, but as highly curved roads have the highest average personal risk, in many cases drivers and riders are not reducing speed enough to accommodate the road design.

However the more significant finding is that, because most travel occurs on straight and slightly curved roads, this is where the majority of fatal and serious injury crashes and road trauma occur (Figure 3.2).

![Figure 3.2: Mean travel speeds related to road curvature](image)

10 Taylor et all, TRL, 2001, 2002
Assessing these two evidence sets together, open road travel speeds vary little according to function or geometry. There are individual exceptions, but speeds are more likely to be too high for personal safety on curved roads or on lower classification roads that are not designed or maintained to high safety standards.

Figure 3.3 shows in a general way where risks are likely to be higher. Higher volume straight and curved roads, primarily National and Regional Strategic and Arterials, tend to have the higher collective risk (i.e. crash density is high). Low volume roads have higher personal risk (i.e. individual risk is high). Winding or tortuous roads have higher collective and personal risk. As travel speeds don’t vary much for the different road types, there may be many places where travel speeds are too high for the risks present.

Figure 3.3: Risk for type of road classification (NRSC 2014, The Safe Speeds Programme)

3.3 Risk on urban roads

Between 2009 and 2013, 48 percent of all fatal and serious crashes occurred on urban roads with a speed limit equal to or less than 70km/h. In urban areas, mean travel speeds align better to function overall, but less well to design and safety (at intersections) and use (the presence of unprotected active road users). The mean travel speeds on urban roads are typically lower than both the speed limit and the free travel speeds (Figure 3.4). The difference is due to travel speeds being constrained by congestion, intersections, urban activity, parking, access points and other road users.

Twelve percent of urban roads carry 57% of urban traffic measured in vehicle kilometres travelled (VKT), and have 52% of urban fatal and serious crashes. These are the highest-volume urban routes where the primary function is flow – moving people and goods.

On access roads the average personal risk is higher than arterial roads: 54% of urban roads are access or low-volume access roads with a medium high personal risk. They have 5% of urban vkt but 10% of the urban fatal and serious crashes. These roads have an important connectivity function.
Figure 3.4: Urban mean speeds by road classification (NRSC 2014, The Safe Speeds Programme)

Speeding related urban crashes are more likely to occur on roads in the middle of the classification (Figure 3.5). Speeds on these lower volume roads are less likely to be affected by congestion, and travel speed surveys also report higher free speeds on these roads.

The relatively high percentages of death and serious injuries on urban roads, even at lower speeds, are because urban crashes are more likely to involve intersection conflicts, resulting in side-on crashes, which have a relatively high probability of serious injury at an impact speed of 50km/h.

The other dominant safety issue on urban roads is pedestrian and cyclist crashes, which, at an impact speed of 50km/h have a high probability of serious injury, and an elevated probability of death. Ninety percent of all pedestrian and cyclist injury crashes occur on urban roads, and over half of these are on major arterials.

Figure 3.5: Urban fatal and serious crashes 2008-12, speeding related (NRSC 2014, The Safe Speeds Programme)
4 The Speed Management Framework

This chapter details the key steps in the Speed Management Framework, and illustrates them with worked examples. Figure 4.1 presents the detailed Framework schematically and shows its three main components:

- How the Transport Agency will use national data sets on ONRC, travel speeds and risk to create a draft Speed Management Plan for each RCA
- Sense testing and local engagement by RCAs, assisted by the Transport Agency, to refine their draft Plan before it is approved.
- Integrating the final Speed Management Plan into Activity Management Plans for the next NLTP.

The key change in approach this Guide signals is to begin with a strategic, one-network based approach and then, by applying a series of techniques, drill down to identify where there is the greatest misalignment between actual travel speeds, and safe and appropriate travel speeds. The overarching aims are to achieve regionally and nationally consistent outcomes and to prioritise effort and available resources to risk.

The best outcomes will result if community and stakeholder groups are engaged, kept informed and are part of the process.

4.1 Developing a draft Speed Management Plan

The Transport Agency will provide for each RCA (or where appropriate, a region) a draft Speed Management Plan of their network, which will:

- show where current travel speeds differ most from the Framework’s safe and appropriate speeds
- identify where the greatest benefits from applying speed management will be achieved.

The draft Plan will help an RCA to ascertain:

- Where infrastructure improvements should be targeted to improve safety and efficiency.
- Where a review of the speed limits should be considered.
- Where enforcement might be targeted
- Where no action is required.

This section explains how these data sets are processed to generate a draft Speed Management Plan.

4.1.1 Define network area and overlay ONRC

The first step in developing a draft Speed Management Plan is to clearly define its spatial scale and then overlay the ONRC. This provides an opportunity to better align travel speeds with road function because the classification takes traffic volumes, freight volumes and place functions into account as part of an integrated one network approach. The classification helps the Transport Agency and other RCAs to plan, invest, maintain and operate the network in a strategic, consistent and affordable way.

4.1.2 Mapping of speed limits

Both posted speed limits and actual travel speeds need to be identified and compared. The Transport Agency is developing a geospatial platform, which will allow a centralised Register of Speed Limits to be created as well as enabling actual travel speeds to be recorded. This will enable trends to be better monitored and progress towards safe and appropriate speeds across the network to be measured.
Figure 4.1 The Speed Management Framework

Define network area and overlay ONRC

Map current speed limits across network

Using the tables in this Guide, safe and appropriate speeds are identified by combining the following risk assessment methods:
- Infrastructure Risk Rating (IRR)
- Road Network Risk
- High-Risk Intersections Guide Risk

Map safe and appropriate speeds across network

Identify corridors and areas of the network where the current speed limit does not align with safe and appropriate speeds

Overlay actual travel speed data

Draft Speed Management Plan
Identifies where to prioritise first, based on:
- One Network Road Classification
- Infrastructure Risk Rating
- Difference between actual travel speed and safe and appropriate speed
- Collective Risk
- Potential for reduction in deaths and serious injuries

Factor in:
- Transport strategies
- Strategic priorities
- Growth strategies
- Network operating plans
- Local knowledge
- Community views

Higher ONRC levels with high crash risk

Corridors or areas justifying investment at existing or higher speed limit

Interim lowering of speed limit in high risk corridors or areas awaiting available funding

Local consultation

Speed Management Plan
Infrastructre investment
Targeted enforcement
Speed limit reviews

Activity Management Planning
2018-21 NLTP

Monitor, evaluate and review

Lower ONRC and low collective risk

Low priority corridors or areas that require no physical speed management

Lower ONRC with speed limit matched to risk

Corridors or areas identified for permanent speed limit reduction

NZA supplied national data sets

Sense test, moderation and local engagement

Implementation
4.1.3 Identify safe and appropriate speeds

The **safe and appropriate speed** is based on a speed being appropriate for the road **Function, Design, Safety and Use** (i.e. it takes both safety and efficiency into account).

Tables 4.1 and 4.2 provide a classification method to identify what safe and appropriate speeds might be. They take into account the road function, safety performance and a suite of factors that impact on safety risk, such as alignment, the nature of roadside hazards and adjacent land use. It is important to stress that this is a long term objective to align both travel speeds and speed limits to road function, design, safety and use. There is no expectation there will be wholesale change in the short-term.

Speed management activities need to be prioritised based on their likely impact on reducing deaths and serious injuries while still considering the strategic objectives of the ONRC. For this reason, crash risk within your study area (whole network, corridor or local area) needs to be understood first.

A draft Speed Management Plan will show where it is best to invest in safety improvements to make high risk corridors safer at current travel speeds and where it is more efficient to manage speed down. All options are studied.

The safe and appropriate travel speed for any particular road is derived from the following tables. The criteria specified in the tables apply as follows:

- Starting in the top row of the applicable table (urban or rural), the road section is assessed for meeting all criteria in each of the ‘Function / Feature’, ‘Road Safety’ and ‘Infrastructure Risk Rating’ assessment categories.
- If the road section does not meet one or more of the criteria then the next row and so on is considered until all criteria are satisfied.

Worked examples are provided in Section 4.1.6.

**Infrastructure Risk Rating (IRR)**

The Transport Agency has developed an Infrastructure Risk Rating (IRR) model. IRR is a predictive road assessment methodology designed to proactively assess road safety risk and will be a significant input to the speed limit setting process.

The road safety risk is assessed by coding each road and roadside feature that feeds into the IRR model so that a risk rating is determined. The Infrastructure Risk Rating model will continue to be refined as learnings from applying it are considered.

IRR utilises the following nine key features that impact on safety risk:

1. Road stereotype
2. Alignment
3. Carriageway width
4. Roadside
5. Land use
6. Intersection density
7. Access density
8. Traffic volume
9. Speed

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11 The IRR Coding Manual is attached as a supplement to this Guide.
IRR is assessed by coding the nine influencing factors for each road under consideration. The factors are combined to give an IRR score, which is then classified in five risk categories i.e. ‘low’, ‘low-medium’, ‘medium’, ‘medium-high’, ‘high’. An IRR categorisation of ‘low’ indicates that the assessed safe and appropriate speed is likely to be safe for the road function, design and use whereas an IRR categorisation of ‘high’ indicates that the assessed safe and appropriate speed is unsafe for the road function, design and use. Because speed forms part of the IRR calculation, practitioners are able to test different speed limits to determine whether a particular limit is appropriate for the road function, design and use.

Table 4.1: Proposed Safe and Appropriate Speeds classification method – Urban Roads

<table>
<thead>
<tr>
<th>Function / Feature</th>
<th>Road Safety Metric</th>
<th>Infrastructure Risk Rating</th>
<th>Safe and Appropriate Speed (km/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• ONRC is Class 1 or 2</td>
<td>• Road Network Personal Risk ≤ Low-Medium;</td>
<td>• ‘Low’ or ‘Low Medium’</td>
<td>• 80</td>
</tr>
<tr>
<td>• ONRC is Class 1 or 2</td>
<td>• HRIG PERSONAL RISK OF ALL INTERSECTIONS ≤ Medium, and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ONRC is Class 1 or 2</td>
<td>• No intersections have an ‘actual’ High Collective Risk i.e. 3 or more fatal and serious crashes in past 5 years.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ONRC is Class 1 or 2</td>
<td>• ‘Low’ or ‘Low Medium’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ONRC is Class 1 or 2</td>
<td>• Non-commercial adjacent land use</td>
<td>• ‘Low’ or ‘Low Medium’</td>
<td>• 60</td>
</tr>
<tr>
<td>• ONRC is Class 1 or 2</td>
<td>• Road Network Personal Risk ≤ Medium-Low-Medium;</td>
<td>• ‘Low’ or ‘Low Medium’</td>
<td></td>
</tr>
<tr>
<td>• ONRC is Class 1 or 2</td>
<td>• HRIG PERSONAL RISK OF ALL INTERSECTIONS ≤ Medium-High, and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ONRC is Class 1 or 2</td>
<td>• No intersections have an ‘actual’ High Collective Risk i.e. 3 or more fatal and serious crashes in past 5 years.</td>
<td>• ‘Low’ or ‘Low Medium’</td>
<td></td>
</tr>
<tr>
<td>• ONRC is Class 1 or 2</td>
<td>• ‘Low’ or ‘Low Medium’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ONRC is Class 1 or 2</td>
<td>• ‘Low’ or ‘Low Medium’</td>
<td>• 60</td>
<td></td>
</tr>
<tr>
<td>• ONRC is Class 1 or 2</td>
<td>• Road Network Personal Risk ≤ Medium-High,</td>
<td>• ‘Low’ to ‘Medium’</td>
<td>• 50</td>
</tr>
<tr>
<td>• ONRC is Class 1 or 2</td>
<td>• HRIG PERSONAL RISK OF ALL INTERSECTIONS ≤ Medium-High, and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ONRC is Class 1 or 2</td>
<td>• No intersections have an ‘actual’ High Collective Risk i.e. 3 or more fatal and serious crashes in past 5 years.</td>
<td>• ‘Low’ to ‘Medium-High’</td>
<td>• 40</td>
</tr>
<tr>
<td>• CBDs or town centres with high place function and concentration of active road users</td>
<td>• ‘High’</td>
<td>• ‘High’</td>
<td>• 30</td>
</tr>
<tr>
<td>• Parks</td>
<td>• Any rating</td>
<td>• Any rating</td>
<td>• 20</td>
</tr>
<tr>
<td>• Shared spaces with High place function and concentration of active road users</td>
<td>• Any rating</td>
<td>• Any rating</td>
<td>• 10</td>
</tr>
</tbody>
</table>

Note 2: Commercial land use excludes Industrial land use activities.
Note 3: No road safety metrics are used in the assessment of roads with a safe and appropriate speed of 40km/h or less, but the corridor’s look and feel should be conducive to achieving the safe and appropriate speeds.
## Table 4.2 Proposed Safe and Appropriate Speeds classification method – Rural Roads (incl rural towns)

<table>
<thead>
<tr>
<th>Function / Feature</th>
<th>Road Safety Metric</th>
<th>Infrastructure Risk Rating</th>
<th>Safe and Appropriate Speed (km/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• ONRC is Class 1&lt;br&gt;• Median Divided&lt;br&gt;• No direct property access&lt;br&gt;• Grade separated intersections</td>
<td>• Road Network Personal Risk ≤ Low-Medium;&lt;br&gt;• Road Network Collective Risk ≤ Medium-High;</td>
<td>• ‘Low’</td>
<td>• 110(^{12})</td>
</tr>
<tr>
<td>• ONRC is Class 1 – 3</td>
<td>• Road Network Personal Risk ≤ Medium;&lt;br&gt;• Road Network Collective Risk ≤ Medium-High;&lt;br&gt;HRIG(^{1}) Personal Risk of all intersections ≤ Medium, and&lt;br&gt;No intersections have an ‘actual’ High Collective Risk i.e. 3 or more fatal and serious crashes in past 5 years.</td>
<td>• ‘Low’ or ‘Low-Medium’</td>
<td>• 100</td>
</tr>
<tr>
<td>• Any ONRC</td>
<td>• Road Network Personal Risk ≤ Medium-High;</td>
<td>• ‘Low’ to ‘Medium’</td>
<td>• 80</td>
</tr>
<tr>
<td>• Any ONRC&lt;br&gt;• Not in a rural town(^{2})</td>
<td>No road safety metric used in the assessment</td>
<td>• ‘Low’ to ‘Medium-High’</td>
<td>• 60</td>
</tr>
<tr>
<td>• ONRC is Class 1 – 2&lt;br&gt;• Rural town(^{2})</td>
<td>• Road Network Personal Risk ≤ Low-Medium&lt;br&gt;• Road Network Collective Risk ≤ Medium-High&lt;br&gt;HRIG Personal Risk of all intersections ≤ Medium, and&lt;br&gt;No intersections have an ‘actual’ High Collective Risk i.e. 3 or more fatal and serious crashes in past 5 years.</td>
<td>• ‘Low’ or ‘Low-Medium’</td>
<td>• 80</td>
</tr>
<tr>
<td>• ONRC is Class 1 – 3&lt;br&gt;• Rural town(^{2})</td>
<td>• Road Network Personal Risk ≤ Medium&lt;br&gt;HRIG Personal Risk of all intersections ≤ Medium, and&lt;br&gt;No intersections have an ‘actual’ High Collective Risk i.e. 3 or more fatal and serious crashes in past 5 years.</td>
<td>• ‘Low’ to ‘Medium’</td>
<td>• 60</td>
</tr>
<tr>
<td>• Rural town(^{2})</td>
<td>• Road Network Personal Risk ≤ Medium-High,&lt;br&gt;HRIG no more than one intersection has a Personal Risk ≥ Medium-High.</td>
<td>• ‘Low’ to ‘Medium’</td>
<td>• 50</td>
</tr>
<tr>
<td>• Rural town(^{2})&lt;br&gt;High place function and&lt;br&gt;concentration of active road users</td>
<td>No road safety metric used in the assessment</td>
<td>• ‘Low’ to ‘Medium-High’</td>
<td>• &lt;50</td>
</tr>
</tbody>
</table>

**Note 1**: HRIG – NZ Transport Agency High-Risk Intersection Guide, 2013  
**Note 2**: Not classified as Urban according to Statistics New Zealand definition.

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\(^{12}\) It is possible that some of the newest 4-5 star roads currently being built could be suitable for travel speeds up to 110km/h. Setting limits higher than 100km/h is currently not permitted and would require a change to the law (Land Transport Rule: Setting of Speed Limits, 2003) and thus would need government approval and public consultation.
Variable speed limits have been used at urban schools for some time. More recently a number of successful trials of rural variable speed limits have been carried out around rural schools and high risk intersections, and are in various stages of implementation. Table 4.3 outlines where different variable speed limits should be used:

**Table 4.3 Variable speed limits**

<table>
<thead>
<tr>
<th>Variable Speed limit</th>
<th>Conditions for use</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-70&lt;sup&gt;13&lt;/sup&gt;</td>
<td>Where a vehicle side impact risk exists, but where the risk is not continuous. Typically this would be at high risk intersections, activated by potentially conflicting traffic (using the <em>High Risk Intersection Guide</em>) or at rural schools activated during commuting times (using the <em>Safer Journeys to School Guide</em>).</td>
</tr>
<tr>
<td>40</td>
<td>Where a significant pedestrian risk exists, but where the risk is not continuous. Currently the only applications of this option are at urban and rural schools (See Traffic Note 37). Future applications may include town centres (potentially 30 km/h) using a Network Operating Plan.</td>
</tr>
</tbody>
</table>

**Table 4.4 Interim speed limits**

<table>
<thead>
<tr>
<th>Interim Speed limit</th>
<th>Conditions for use</th>
</tr>
</thead>
</table>
| 70 and 90<sup>14</sup> | The tables above do not include permanent 70km/h or 90km/h speed limits as these are interim interventions where:  
- The crash risk is sufficiently high to justify a temporary change in the speed limit until safety improvements or perceptual countermeasures can be made.  
- Investment cannot be justified and if existing speeds are sufficiently high that a drop to 80km/h (from 100) or to 60km/h (from 80) cannot be practically achieved in the short-term.  
70km/h and 90km/h speed limits are interim interventions only because:  
- At higher travel speeds, people have trouble differentiating speed limit differences of just 10km/h. The advantage of using 20 km/h increments between 60 and 100 km/h are that fewer and more recognisable speed categories are easier for people to understand and recall. This should mean less need for speed limit changes and repeater signs.  
- We need to create a more consistent and intuitive speed management system across the whole network, where people have a greater understanding and appreciation of risk than is manifest at present and there is a greater differentiation between levels of the speed limit hierarchy. Countries which have fewer speed limit options tend to have a greater differentiation of road environments |

### 4.1.4 Actual travel speed

Understanding the actual travel speed of roads in your study area is important for two reasons:

1. Through the speed management process the strategy and priority for change can be assessed
2. Baseline data for measuring on-going effectiveness can be obtained before changes are made

Travel speed data will provide baseline information to enable you to see where the biggest differences are between actual speeds and safe and appropriate speeds (as well as between actual speeds and speed limits). They are also useful in establishing how credible a speed limit is with the public. There is now a wider range of data sources for measuring speeds using modern technology<sup>15</sup>.

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<sup>13</sup> These require specific approval by the Transport Agency

<sup>14</sup> A 90km/h speed limit requires specific approval by the Transport Agency

<sup>15</sup> There are two key types of actual speed information: Geospatial speed measured using in-car GPS information (used for the AA roadwatch site). This is important for measuring the overall and realistic travel speed along a route considering all factors such as alignment, congestion,
In the absence of travel speed data, operating speeds can be simulated using an Austroads (2009) model, which predicts theoretical operating (85th percentile) speeds for light vehicles on different types of roads, based on real world observations. This data will be provided for your use.

The 85th Percentile speed and mean speed are normally used to quantify the actual operating speeds on roads and so determine relative risk. However, speed variability and distribution also influence crash risk, so also need to be considered. Risk is reduced when there is low speed variability or distribution.

4.1.5 Applying a risk filter

The draft Speed Management Plan will present an RCA with a choice of options based on different filters of what might be considered high risk. It could, for example, highlight what the riskiest 5%, 10% or 15% of a local or regional network would look like respectively. This will enable RCAs to test the pace and appetite for change at the community, stakeholder and political levels. We anticipate that change will be gradual, at a pace that is underpinned by community support and understanding. An example of a draft speed management plan is shown in Figure 4.2.

![Figure 4.2 An example of a draft speed management plan. Source: Ableys, 2015](image)

For many parts of the network, current travel speeds and/or speed limits will be suitable for the function, design and use. The focus is on corridors and network areas where current travel speeds may be too high or too low for the function, design, and use, which typically manifest as poor road safety performance.

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intersections etc. Travel time measured using ANPR, Bluetooth or Wi-Fi surveys. This is not technically a speed measure but it is strongly related to travel speed along a route. This helps to understand the travel time implications of any speed management activity.
4.1.6 Worked examples

The following examples illustrate how two typical roads are assessed using the tables.

Urban worked example 1: Fendalton Road, Christchurch

Fendalton Road in Christchurch is a divided two-way, four-lane road with a posted speed limit of 50km/h. It is classified as an Arterial Road (Class 2) under the ONRC and has a straight to curved alignment. The terrain is flat and the adjacent land use is predominantly residential.

Fendalton Road is not identified as a Freight Priority Route within the ONRC, therefore the possible safe and appropriate speeds for this road are 60km/h or 50km/h (refer Table 4.1).

The safe and appropriate speed assessment of Fendalton Road against the 60km/h criteria is shown below.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Requirement</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjacent Land Use</td>
<td>Predominant land use is non-commercial</td>
<td>Residential</td>
</tr>
<tr>
<td>Road Network Personal Risk</td>
<td>≤ Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>HRIG Personal Risk</td>
<td>All intersections ≤ Medium-High and no ‘actual’ High Collective Risk</td>
<td>Maximum rating is Medium</td>
</tr>
<tr>
<td>Infrastructure Risk Rating</td>
<td>Low to Low-Medium</td>
<td>Medium</td>
</tr>
</tbody>
</table>

The assessment demonstrates that the existing characteristics of Fendalton Road do not comply with all the criteria for a safe and appropriate speed of 60km/h. Therefore it is assessed against the next safe and appropriate speed criteria of 50km/h, as shown below.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Requirement</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjacent Land Use</td>
<td>Predominant land use is non-commercial</td>
<td>Residential</td>
</tr>
<tr>
<td>Road Network Personal Risk</td>
<td>≤ Medium-high</td>
<td>Medium</td>
</tr>
<tr>
<td>HRIG Personal Risk</td>
<td>No more than one intersection has a Personal Risk ≥ Medium-High</td>
<td>Maximum rating is Medium</td>
</tr>
<tr>
<td>Infrastructure Risk Rating</td>
<td>Low to Medium</td>
<td>Medium</td>
</tr>
</tbody>
</table>

Fendalton Road complies with all the criteria for a safe and appropriate speed of 50km/h.
Rural worked example 2: Whitford-Maraetai Road, Auckland

Whitford-Maraetai Road in Auckland is an undivided two-way, two-lane road. The posted speed limit is a mix of 80km/h and 100km/h. It passes through gently rolling terrain and the adjacent land use is mostly farmland. Whitford-Maraetai Road carries about 8,000 vehicles per day and is classified as National Strategic (Class 2) under the ONRC. It has a straight to curved alignment.

The possible safe and appropriate speeds for the section of Whitford-Maraetai Road under consideration are 100km/h, 80km/h and 60km/h (refer Table 4.2). The safe and appropriate speed assessment of Whitford-Maraetai Road against the 100km/h criteria is shown below.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Requirement</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONRC</td>
<td>Class 1-3</td>
<td>Class 2</td>
</tr>
<tr>
<td>Road Network Collective Risk</td>
<td>≤ Medium-High</td>
<td>High</td>
</tr>
<tr>
<td>Road Network Personal Risk</td>
<td>≤ Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Infrastructure Risk Rating</td>
<td>Low to Low-Medium</td>
<td>Medium-High</td>
</tr>
</tbody>
</table>

Whitford-Maraetai Road does not satisfy all criteria, so cannot have a maximum safe and appropriate speed of 100km/h. Therefore it is assessed against the next safe and appropriate criteria of 80km/h. As the assessment is carried out for a safe and appropriate speed that is less than the current speed limit, the Infrastructure Risk Rating assessment component is assessed using a speed of 80km/h.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Requirement</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONRC</td>
<td>Class 1-3</td>
<td>Class 2</td>
</tr>
<tr>
<td>Road Network Personal Risk</td>
<td>≤ Medium-High</td>
<td>Medium</td>
</tr>
<tr>
<td>Infrastructure Risk Rating</td>
<td>Low to low-Medium</td>
<td>Medium</td>
</tr>
</tbody>
</table>

Whitford-Maraetai Road complies with all the criteria for a safe and appropriate speed of 80km/h.
4.2 Sense testing the draft Speed Management Plan

Understanding your road network is an important step in managing speed. This means understanding higher level planning considerations and the strategic nature of the various routes using the ONRC. High strategic routes for freight and other purposes are likely to require a different approach to speed management than minor routes with less strategic priority. Understanding crash risk across the network (both collective and personal) will help to prioritise areas of need.

For local rural and urban roads, District Plans and City Plans also provide guidance on road types and their function within an RCA’s jurisdiction. In complex urban environments, classifying corridors that change in function, use and appearance along their length (as many arterials do) can be problematic. Network Operating Planning can help identify priority corridors for different modes and the appropriate levels of service, including speed management.

Likewise, peri-urban areas experiencing rapid growth can also be a challenge. It is through sense testing a draft Speed Management Plan that an RCA can identify and work through these issues and ensure effective engagement with their community.

Engagement

It is important at the start of the process to determine and establish key roles, responsibilities and accountabilities and how you will engage with your communities, including how you will measure people’s understanding and support. The reasons for engaging early and effectively with your communities and key stakeholders are to:

- understand their perspectives, attitudes and behaviours about speed and in particular speeding
- gauge the level of understanding and support for what you wish to achieve
- be open, and transparent about what you want to achieve and how your communities can help
- foster good relationships while developing and implementing your speed management plan
- build support for your speed management plan and avoid negative reaction when you implement changes
- help develop a workable speed management plan that will be accepted by the community

In practice, on strategically important open roads with high traffic or freight volumes, high safety ratings (i.e. low risk), and on high volume urban routes, consistent and homogeneous speeds support both safety and network efficiency. Designing and engineering these corridors to reduce risk and support higher speeds is more likely to be cost effective, especially if travel time reliability is improved.

On these corridors, network efficiency objectives would be identified and taken into account. On corridors that are high risk, and where excess speed is identified as a contributing cause, enforcement and road user education will also play an important role, in the interim at least, and should be integrated into planning.

In some cases, where there is strong case for investment to improve safety and efficiency but for which funding is not yet available, an interim lowering of the speed limit may be the appropriate response to lower the level of risk. It is important that RCA’s clearly communicate that these roads will be improved when investment is available, and to give some indication of when this is likely to happen.

On less strategically important roads that have a high risk, or on low volume urban roads with high risk, lower traffic volumes mean that high cost engineering treatments will be difficult to justify. Safety can be improved through lower cost measures, which may include corridor or area speed limit reviews. They are
an effective way to communicate risk to road users and support broader objectives related to access and place and establish self-explanatory speed environments where people understand the safe and appropriate speed that they should travel on those types of roads\textsuperscript{16}. The framework sets the envelope for speed limits in these situations.

As well as speed limit reviews, safety treatments include low cost advisory signs, threshold treatments, or perceptual treatments, combined with improving access for people who walk and cycle. Enforcement on high collective or personal risk routes can also be factored in.

In urban areas, high risk mixed use arterial corridors should be a particular focus for managing speeds as they account for a high proportion of total deaths and serious injuries, particularly at intersections and particularly for active road users. It is not always possible to separate modes on these busy corridors.

Pedestrians and cyclists may travel on corridors which have a high level of personal risk. This should be taken into account, particularly if those corridors are part of a strategic cycling or walking network.

Speed management should be targeted where there is greatest potential to reduce deaths and serious injuries, particularly in the short-term. Over the longer-term, clearer differentiation for safe and appropriate speeds will increase consistency across the network.

\section*{4.3 Prioritise and Programme Action in a Speed Management Plan}

Priority for speed management activities should be on parts of the network where:

- there is a large differential between actual travel speeds, and safe and appropriate speeds
- there is a high personal or particularly collective crash risk within a network area
- speed management will make a difference

The nature of the speed management intervention depends on the road category within which each road sits and the level of risk that exists for the road (refer to the Toolbox in Volume Two of this Guide). For example, a high strategic corridor would warrant infrastructure investment to maintain higher travel speeds, whereas a high priority lower category area may be best suited to speed limit changes and further education and enforcement. The broad approaches that should be taken for different types of networks are presented in Table 4.5 below.

<table>
<thead>
<tr>
<th>Speed maintained or increases</th>
<th>Speed reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where high strategic fit (via ONRC)</td>
<td>Lower strategic fit (via ONRC)</td>
</tr>
<tr>
<td>Engineering improvements (e.g. shoulder widening, barriers, curve alignments, surface improvements, intersection treatments)</td>
<td>Lower cost perceptual countermeasures to support lower speeds</td>
</tr>
<tr>
<td>Signs and other communication to indicate priority route</td>
<td>Appropriate road user behaviour</td>
</tr>
<tr>
<td>May need interim speed limit reduction if funding needed to meet infrastructure works (e.g. interim 90 km/h on open road)</td>
<td>Speed limit appropriate for the road</td>
</tr>
<tr>
<td>Variable speed limits to improve flow on congested high volume roads.</td>
<td></td>
</tr>
</tbody>
</table>

\textbf{Table 4.5 Treatments with highest potential to reduce Deaths and Serious Injuries}

- On lower volume networks where personal risk is high and collective risk is low it may be better to consider low cost speed management measures such road markings, signs and communication

\textsuperscript{16} Examples include residential areas in Hamilton and in Newtown, Wellington.
(changing the conversation around speed) where the focus is more likely to be on safety and raising awareness of risk and where efficiency is less important.

- On higher volume corridors with high collective risk and low personal risk, the focus is more likely to be on improving the road to make it safer and more efficient at current or higher travel speeds. In these cases the corridor may need investment and upgraded so that it reflects safe system practices, such as median and side barriers and grade separated intersections.

- On straighter roads, enforcement continues to be important in reducing excess speeds and death and serious injury, especially on routes with high collective or personal risk.

![Speed Management Treatment Strategy](image)

Figure 4.3: Treatment Philosophy based on risk (Source: Campion, A)

**Programming** is another key point in your engagement plan, where you should be testing your network proposals with stakeholders and your community. A critical part of this is sharing the information, data and analysis; outlining short, medium and long-term objectives; and in particular how your proposals will contribute to both the safety and efficiency of your network. Your Speed Management Plan should be an integral part of your AMPs, road safety action planning and Regional Land Transport Plan.

The guide provides the framework to enable a consistent approach, but it is up to each RCA, along with discussions with their neighbouring RCAs and the Transport Agency to determine the pace of change across their networks. For some this may mean significant investment in safety infrastructure on high volume strategically important routes. For others it may mean a drop in the posted speed limit on high risk areas of their network, supplemented by low cost treatments.
A robust business case should be developed for your Speed Management Plan to ensure value for money from each dollar invested. A business case approach is now embedded in the Transport Agency’s Investment Assessment Framework for the National Land Transport Fund. Programmes that are developed using this Guide and tested through a business case approach are likely to support a stronger case for investment than those which do not.

4.4 Measuring performance - Evaluation Framework for Speed Management

Evaluation of speed management activities ensures information is captured to measure progress and value. This practical evaluation framework focusses on monitoring and evaluating speed management activities at an individual project and/or regional level. However, it can also be used to develop a consistent approach across regions so activities can be evaluated nationally too.

Monitoring and evaluation of speed management activities is essential for:

- tracking progress towards key performance indicators (KPI’s)
- communicating progress and effectiveness to policy makers, local authorities and the wider public.
- demonstrating accountability for investment
- identifying areas for remedial action during the implementation stage
- identifying outcomes which were not intended (either positive or negative)
- measuring the effectiveness of new approaches that contribute to the knowledge base

The key measures of success we want to see progress on are that:

- Speed management as a whole becomes more consistent and prioritised to risk, and road users see the same types of risks consistently identified and targeted no matter who manages the road network.
- Travel speeds will align to the framework over time, and become more appropriate for road function, design, safety and use, starting with the highest risk routes to build public understanding and support.
- Mean speeds will moderate on lower classification or less safe roads. Deaths and serious injuries will reduce, while economic productivity is maintained or enhanced across the road system overall.
- The road system as a whole will become more self-explaining and consistent over time, and speed management will be more credible to the public.

Monitoring and evaluation are on-going processes, which should be integrated into all project stages including:

- at the beginning (checking programme logic and design along with baseline data collection),
- during (process, implementation and monitoring evaluation) and;
- at the end of the project or following implementation (outcome evaluation).

Although monitoring and evaluation may use similar data sources, they are different:

- **Monitoring** involves assessing progress and collecting information before, during and after a project
- **Evaluation** shows the effectiveness of speed management activities already implemented, using monitoring and other data. It also critically analyses the merit or worth of the activities

It is important early on to identify and agree who will carry out both monitoring and evaluation activities, when these activities will occur, and the kind of data and level of evidence needed for the particular project or speed management activity. Having KPIs ensures progress is tracked, and ‘success’ clearly defined.
4.4.1 How to monitor and evaluate

A logic model is a good starting point to show the key aspects of speed management that should be considered for evaluation. Figure 4.4 below shows an example of how the implementation of speed management activities produces certain short-term outcomes (e.g. speed changes) which, over time will result in additional longer-term outcomes (e.g. reduced speed related deaths and serious injuries). The types of evaluation to consider for the various stages are also shown.

Figure 4.4 Indicative short-term outcomes of speed management activities

Once the logic or rationale has been established, the detail of how specific items should be measured can be considered. The following two tables present the implementation and outcome measures separately.
## Evaluating the implementation of Speed Management activities

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description/Rationale</th>
<th>How to measure/key considerations</th>
</tr>
</thead>
</table>
| **Number and type of Speed Management Activities Implemented** | Identify the frequency of implementation for different types of speed management, e.g. engineering, speed limit, enforcement | Documented in various RCA reporting requirements  
A single speed management Activity Log is required.  
**When?** As activities are planned and implemented |
| **Consistency and quality of speed management activities** | The quality of Speed Management activities and alignment with the Guide | Should be carried out via independent audit process.  
**When?** During planning and after initiatives are implemented |
| **Dollar Spend on speed management activities** | A measure of investment in speed management e.g. proportion of regional spend and from which budget (i.e. safety budget, operational, maintenance)? | Part of RCA speed management Activity Log  
**When?** budgeted (before) and Actual (after) |
| **Barriers to implementation** | Provides data if speed management activities were not implemented as planned (e.g. public resistance, lack of resources). Can also be used to plan for risk ahead of activities | Part of RCA speed management Activity Log  
**When?** Both before and after implementation |
| **% of network with Safe and Appropriate speed limits** | Regional or district proportions of the network with limits that align to the national framework – a measure of national consistency and credibility | **When?** Yearly as part of Activity Log |
### Evaluating the outcomes of speed management activities

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
<th>How to measure/key considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Speed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Point speeds</td>
<td>Mean, 85th Percentile, Speed distribution</td>
<td>Tube counters, radar or induction loops at key locations When? Before and after speed management activities to measure change</td>
</tr>
<tr>
<td>Geospatial speeds</td>
<td>In-car GPS derived speeds, can be accessed through national database</td>
<td>This method is still being developed for national use When? Before and after speed management activities to measure change</td>
</tr>
<tr>
<td>Difference between posted and mean speeds</td>
<td>Compare point speed with the planned or changed posted speed limit. Mean speed should match posted speed and 85% speed should be within 10% of the posted speed</td>
<td>Analysis using data already collected When? Immediately after speed management changes and 6-12 months following.</td>
</tr>
<tr>
<td><strong>Traffic Efficiency</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic volumes</td>
<td>Traffic volume should be measured as Annual Average Daily Traffic (AADT), the two-way daily traffic that passes a point (e.g. 10,000 vehicles per day)</td>
<td>Tube counters, radar or induction loops at key locations When? Before and after speed management activities to measure change. Most RCAs have on-going measurement databases for this</td>
</tr>
<tr>
<td>Travel times</td>
<td>The time it takes traffic to travel between locations</td>
<td>This method is being developed for national use. At specific locations travel times can be measured using GPS, ANPR or Wi-Fi surveys. When? Before and after speed management activities to measure change</td>
</tr>
<tr>
<td>Level of service</td>
<td>A description of the road quality based on a framework of important items (e.g. KiwiRAP)</td>
<td>Crucial for speed setting process in the Guide. When? As part of the speed management process and should be measured afterwards</td>
</tr>
<tr>
<td><strong>Road User Perceptions &amp; Behaviour</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Awareness of speed management activities</td>
<td>Awareness of speed limit change or engineering</td>
<td>Focus groups and/or surveys with local residents or road users via meeting, mail or online When? Before and after</td>
</tr>
<tr>
<td>Perceptions of speed management activities</td>
<td>Perceived effectiveness, compliance and likelihood of enforcement; level of support</td>
<td>Focus groups and/or surveys with local residents or road users via meeting, mail or online When? Before and after</td>
</tr>
<tr>
<td>Other road user counts and latent demand</td>
<td>Numbers of cyclists or pedestrians using the road. Latent demand means that more cyclists or pedestrians might use the road if conditions were different.</td>
<td>This is important where speed management activities have impacts (positive or negative) on other road users. Estimate latent demand via surveys, destination audits and school/workplace travel surveys When? Should be carried out for all urban activities.</td>
</tr>
<tr>
<td>Road User Behaviour</td>
<td>Behaviour of other road users, such as pedestrians and cyclists</td>
<td>Pre-post observation of pedestrian and cyclist behaviour. Gains an understanding of how ‘user friendly’ road environments are for walkers and cyclists. Very important in urban areas. Usually by direct observation or video. When? Should be carried out before and after all urban speed management activities.</td>
</tr>
<tr>
<td><strong>Crashes, deaths and injuries</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed-related crashes</td>
<td>Injury crashes where speeding or travelling too fast for the conditions has contributed.</td>
<td>When? Before and after all speed related all speed management activities using established crash databases (i.e. CAS and reports from CAS)</td>
</tr>
<tr>
<td>Crash data</td>
<td>Analysis of all crashes on network, by F,S,M and non-injury</td>
<td>When? Before and after all speed related all speed management activities using established crash databases (i.e. CAS and reports from CAS)</td>
</tr>
</tbody>
</table>
4.5 Case Studies

The purpose of these case studies is to show some real examples of how the framework would be applied. We are in a transition phase to embed the Safer Speeds Programme. These case studies offer a chance to consider lessons learned and to address the challenge of building public understanding and helping RCAs to develop a consistent network-wide approach to speed management, targeted to areas of greatest risk.

4.5.1 Case study 1 Waikato Expressway- Example 1 Ngaruawahia Section

4.5.1.1 The problem
State highway 1 into Ngaruawahia was previously an undivided highway with high traffic volumes, significant roadside hazards and at grade intersections resulting in a high crash rate (Figure 4.5).

![Figure 4.5: State Highway 1 Approaching Ngaruawahia](image)

4.5.1.2 The approach
This is a crucial piece of infrastructure for Waikato and New Zealand, as it is central to providing safer and more efficient transport links between the business and freight hubs of Waikato, Auckland and Tauranga. The Ngaruawahia project formed part of the larger Waikato Expressway programme of work, which is one of seven roads of national significance for New Zealand.

The Ngaruawahia section of the expressway was completed in December 2013 and now enables SH1 to bypass the road into Ngaruawahia Township. The new section is a 5 star road with median separation and wire rope barriers. There are also grade separated intersections and safe roadsides (Figure 4.6).

![Figure 4.6: State Highway 1 Waikato Expressway near Ngaruawahia](image)

4.5.1.3 Outcomes and Learnings
The safety improvements on the new section of SH1 are significant compared to the previous route into Ngaruawahia, however, under a default speed limit of 100km/h both roads currently have the same speed limit. Utilising the method outlined in this guide, it is possible that this section of SH1 could be considered for a posted speed limit of 110km/h.
4.5.2 Case study 2 Waikato Expressway- Example 2 Rangiriri to Longswamp

4.5.2.1 The problem
Prior to 2004, the nine kilometre section of SH1 from Longswamp to Rangiriri (midway between Auckland and Hamilton) was a two to three lane, undivided, high-volume road with a history of head-on crashes (star rating of 3.1); 7 fatal crashes and 5 serious crash in 5-years, including 8 head-on crashes.

4.5.2.2 The approach
As part of the Safe System approach, the Transport Agency installed median barrier systems, including wire ropes, where appropriate (star rating increased to 4.2). This was an interim safety measure until the road can be upgraded to four lanes as part of the Waikato expressway. Speed limits were temporarily reduced to 50km/h and 80km/h between Mercer and south of Meremere for two years (2004-2005), until the safety improvements could be installed. Following the upgrade in 2006 speed limits were restored to 100km/h.

4.5.2.3 Outcomes & Learnings
Since the installation of a central wire rope barrier there have been no fatal head-on collisions on this section (Figure 4.8). Fewer fatal and serious crashes were also seen during the lower speed limit period, indicating that the temporary reduction in speed limit on this high-risk section was effective as an interim measure. This example shows that wire rope barriers are effective in reducing deaths and serious injuries, and that speed limits could be increased/restored once the risks are mitigated using engineering features.

Figure 4.7: Before Typical road layout Rangiriri to Longswamp  After: Wire rope barriers Rangiriri to Longswamp

Figure 4.8: Deaths and serious injuries from pre and post wire rope barrier Rangiriri to Longswamp
4.5.3 Case Study 3: Point England Self-Explaining Roads

4.5.3.1 The Problem
In 2006, Point England in Auckland had a history of crashes and poor behaviour. Pedestrian, cyclist and loss of control crashes were almost twice the rate of other areas in Auckland. Speeding, rat-running and large variations in speed were a result of very little distinction between the ‘look and feel’ of the local and collector roads. All roads in the area (regional arterial, collector and local roads) had a speed limit of 50km/h. Using the new speed management framework, Point England is a good place to consider a reduction in speed limits complimented by infrastructure treatments.

4.5.3.2 Speed management approach
An area-wide Self-Explaining Roads (SER) approach was undertaken (2006 -2010); to establish clear differences in the ‘look and feel’ of local and collector roads to facilitate speeds and behaviour more consistent with road function and use. Data was gathered to understand the existing road hierarchy, and the form and function of each road. Community workshops and meetings were held. The interventions were as follows:
- **local roads**: To limit visibility, trees were planted trees in the centre of the road and landscaped islands were installed intermittently along the kerb side and delineation and other markings were removed.
- **Collector roads**: This included the installation of centrelines, edge lines, cycle lanes, pedestrian crossings and landscaped pedestrian refuges and a high standard of road delineation and consistent road width.

4.5.3.3 Outcomes and Learnings
An SER approach can result in clear differences in road hierarchy and speed profiles that match road function. This can be achieved in the absence of enforcement or changes to posted speed limits. Self-Explaining Roads can be cost-effective. The cost of treatments was comparable with traditional speed calming measures across the area. The range of available innovative low-cost treatments continues to expand and should always be considered as part of speed management.

Despite considerable community engagement before the project, an important learning was that all local stakeholders need to understand the purpose of such projects (e.g. emergency services, and all local government departments). Continued community engagement post-treatment would also have ensured the new infrastructure was supported, and that residents could provide on-going feedback.