

2007-2011 Risk Maps

Risk Maps – how the sections were identified

For the purpose of comparing the level of risk of crashes between different parts of the network, the state highway network was broken up into road sections (known as 'links').

When the first KiwiRAP Risk Maps were developed using 2002-2006 fatal and serious crash data, the state highways were split into links using three criteria:

1. To increase the statistical reliability of the results, each link should be long enough to have a minimum of 20 fatal or serious crashes over the last five year period.
2. Links should be meaningful and distinct to drivers and riders, i.e. trips between locations that are understandable and recognisable, such as major towns or major intersections.
3. Links should have broadly similar road characteristics along their length, such as one lane in each direction without a median barrier, and traffic volume.

The same links that were developed and used for the first Risk Maps released in 2008 have been used, where possible, in developing the updated Risk Maps which follow.

The Risk Maps in this report include results for a total of 168 links, and 10,849 kilometres of the state highway network. The links range in length from 7.3 to 318 kilometres, with an average length of 65 kilometres.

Each of these links has been assigned a rating for both Collective (Crash Density) and Personal Risk (Crash Rate). The methodology used to do this is discussed in the following section.

MEASURES OF RISK AND WHAT THEY MEAN

For the purposes of displaying the safety risk of the state highway network, we look at two different measures of risk: Collective Risk and Personal Risk. The focus of both is on crashes where people have been killed or seriously injured. The crash statistics used for the calculations are for the five-year period between 2007-2011.

In this report the roads highlighted as being of higher risk than others are likely to have specific reasons why. The road, the vehicle, the speed and the driver/rider each contribute to risk.

The definitions of fatal and serious injuries are:

Fatal Injuries: Injuries that result in death within 30 days of the crash.

Serious Injuries: Fractures, concussion, internal injuries, crushings, severe cuts and lacerations, severe general shock necessitating medical treatment, and any other injury involving removal to and detention in hospital.

COLLECTIVE RISK (or Crash Density)

Collective Risk is a measure of the total number of fatal and serious injury crashes per kilometre over a section of road, as described in the equation below. (Collective Risk can also be described as the Crash Density).

$$\text{Collective Risk} = \frac{(\text{Fatal crashes} + \text{serious injury crashes}) / \text{number of years of data}}{\text{Length of road section (excl urban sections)}}$$

Collective Risk highlights which road links have a high number of fatal and serious crashes on them – which can be used to help determine where the greatest road safety gains can be made from investment

in engineering. Collective risk is perhaps of most interest to the road controlling authorities as this highlights where infrastructure improvements are most likely to be cost effective. It is also of interest to NZ Police from an enforcement perspective.

Because Collective Risk is measured in terms of the number of crashes per kilometre of state highway, you would generally expect that those with higher traffic volumes would have a higher Collective Risk.

However, as stated previously, all risk cannot be eliminated through infrastructure improvements alone. The driver or rider must always share responsibility for a safe road system. The Risk Maps strengthen the connection between infrastructure and personal responsibility by highlighting sections of road where safety improvements are warranted, but also where drivers and riders may need to take extra care to minimise their risk.

PERSONAL RISK (or Crash Rate)

Personal Risk is a measure of the danger to each individual using the state highway being assessed, as described in the equation below:

$$\text{Personal Risk} = \frac{(\text{Fatal crashes} + \text{serious injury crashes}) / \text{number of years of data}}{\text{Distance travelled} / \text{number of years of data.}}$$

Unlike Collective Risk, Personal Risk takes into account the traffic volumes on each section of state highway.

Personal Risk shows the likelihood of a driver or rider, on average, being involved in a fatal or serious road crash on a particular stretch of road. Personal Risk is of most interest to the public, as it shows the risk to road users, as individuals. A risk aware driver or rider will be better informed and more able to modify their behaviour to respond to the conditions. Personal Risk is typically higher in more difficult terrain where traffic volumes and road standards are often lower. In many cases infrastructure improvements on these roads are unlikely to be cost effective and other Safe System interventions such as safer road use and safe speeds need to be explored.

PRESENTATION OF RISK MAPS

The following section presents the Risk Maps covering the period from 2007-2011. The North Island has been split into four regional groupings, and the South Island into two regional groupings. For each region, there is a brief summary of the risks in each region (including identification of the riskiest sections) followed by two maps – one displaying Collective Risk and one displaying Personal Risk.






Where a link crosses regional boundaries, the kilometres are split between the two regions according to where the boundary lies along the link.

How are the various levels of risk defined?

The bands for the different risk levels were determined for the first production of KiwiRAP Risk Maps (2008) by spreading the number of links equally over the five risk categories.

Many of the higher collective risk links are in the higher populated, higher volume regions (such as the upper North Island regions) where the state highway network is also more dense with shorter road links. Conversely, some of the higher personal risk lengths are in the less populated and less dense road network areas with longer road links required to meet the required minimum number of crashes criteria. As a result, the higher collective risk links typically are shorter than the higher personal risk links resulting in less kilometres in the higher collective risk bands than in the higher personal risk bands.

The risk thresholds for the bands have remained the same in order for comparisons to be made between those first Risk Maps (covering crashes in the 2002-2006 period) and the Risk Maps in this report for the 2007-2011 period.

| RISK RATING | COLLECTIVE RISK Average annual fatal and serious injury crashes per km | PERSONAL RISK Average annual fatal and serious injury crashes per 100 million vehicle-km | COLOUR |
|--------------------|--|--|---|
| Low | ≤0.039 | <4 |  |
| Low-medium | 0.04≤0.069 | 4≤4.9 |  |
| Medium | 0.07≤0.10 | 5≤6.9 |  |
| Medium-high | 0.11≤0.189 | 7≤8.9 |  |
| High | 0.19+ | 9+ |  |

SUMMARY OF RESULTS

The Collective Risk and Personal Risk tables show the results for each region. The results illustrate what percentages and how many kilometres of state highway network fall within the five risk categories.

Collective Risk

| Region | High | Medium-high | Medium | Low-medium | Low |
|--|----------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| Northland and Auckland | 10% 118 km | 22% 270 km | 28% 332 km | 25% 306 km | 15% 178 km |
| Waikato and Bay of Plenty | 7% 179 km | 19% 455 km | 29% 717 km | 26% 632 km | 19% 458 km |
| Gisborne and Hawke's Bay | 2% 14 km | 11% 87 km | 15% 125 km | 32% 262 km | 41% 339 km |
| Taranaki, Manawatu-Whanganui and Wellington | 5% 83 km | 25% 406 km | 26% 420 km | 19% 310 km | 24% 388 km |
| Tasman, Nelson, Marlborough, West Coast and Canterbury | – – | 8% 217 km | 9% 252 km | 23% 660 km | 61% 1,755 km |
| Otago and Southland | – – | 3% 64 km | 8% 149 km | 20% 382 km | 68% 1291 km |
| National Network | 4% 393 km | 14% 1,500 km | 18% 1,996 km | 24% 2,553 km | 41% 4,409 km |

*percentages may not add to 100% due to rounding

Symbol – : no data

Personal Risk

| Region | High | Medium-high | Medium | Low-medium | Low |
|--|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| Northland and Auckland | 28% 335 km | 19% 230 km | 12% 144 km | 10% 125 km | 31% 370 km |
| Waikato and Bay of Plenty | 18% 452 km | 7% 159 km | 39% 943 km | 21% 524 km | 15% 364 km |
| Gisborne and Hawke's Bay | 45% 370 km | 21% 171 km | 16% 133 km | 14% 117 km | 4% 37 km |
| Taranaki, Manawatu-Whanganui and Wellington | 13% 212 km | 11% 171 km | 26% 412 km | 19% 298 km | 32% 515 km |
| Tasman, Nelson, Marlborough, West Coast and Canterbury | 16% 470 km | 16% 457 km | 28% 815 km | 27% 769 km | 13% 373 km |
| Otago and Southland | 16% 311 km | 2% 43 km | 42% 792 km | 22% 424 km | 17% 316 km |
| National Network | 20% 2,149 km | 11% 1,232 km | 30% 3,239 km | 21% 2,256 km | 18% 1,975 km |

*percentages may not add to 100% due to rounding



NATIONAL RANKING

Collective Risk

The table below shows the national ranking for the riskiest 30 links described as having high or medium-high Collective Risk.

| RANK | LINK | REGION RISK | BAND |
|------|--|-----------------------------------|-------------|
| 1 | SH 1 from Huntly to Hamilton | Waikato | High |
| 2 | SH 1 from Warkworth to Wellsford | Auckland | High |
| 3 | SH 2 from Featherston to Upper Hutt | Wellington | High |
| 4 | SH 2 from Mount Maunganui (SH 29) to Paengaroa (SH 33) | Bay of Plenty | High |
| 5 | SH 22 from Drury to Pukekohe | Auckland | High |
| 6 | SH 1 from Paraparaumu to Levin | Manawatu/Whanganui and Wellington | High |
| 7 | SH 29 from Kaimai Ranges to Tauranga | Waikato and Bay of Plenty | High |
| 8 | SH 2 from Napier to Hastings | Hawkes Bay | High |
| 9 | SH 2 from Pokeno (SH 1) to Mangatarata (SH 25) | Waikato | High |
| 10 | SH 17 (SH status revoked in 2012) | Auckland | High |
| 11 | SH 1 from Auckland to Takanini | Auckland | High |
| 12 | SH 58 from Porirua to SH 2 | Wellington | High |
| 13 | SH 1 from Piarere to Putaruru | Waikato | High |
| 14 | SH 2 from Katikati to Tauranga | Bay of Plenty | High |
| 15 | SH 1 from Cambridge to Piarere (SH 29) | Waikato | Medium-high |
| 16 | SH 1 Warkworth to Twin Tunnels | Auckland | Medium-high |
| 17 | SH 1 from Putaruru to Tokoroa | Waikato | Medium-high |
| 18 | SH 1 Northern Motorway (Auckland to Albany) | Auckland | Medium-high |
| 19 | SH 16 from Parnell to Hobsonville | Auckland | Medium-high |
| 20 | SH 1 from SH 74 to SH 73 Christchurch | Canterbury | Medium-high |
| 21 | SH 2 from Wellington to Upper Hutt | Wellington | Medium-high |
| 22 | SH 16 from Helensville to SH 18 | Auckland | Medium-high |
| 23 | SH 3 from Palmerston North to Woodville | Manawatu/Whanganui | Medium-high |
| 24 | SH 1 from Ruakaka to Wellsford | Northland and Auckland | Medium-high |
| 25 | SH 2 from Paeroa to Katikati | Waikato and Bay of Plenty | Medium-high |
| 26 | SH 1 from Dunedin to SH 87 | Otago | Medium-high |
| 27 | SH 1 from Wellington to Paremata Roundabout | Wellington | Medium-high |
| 28 | SH 1 from Hamilton to Cambridge | Waikato | Medium-high |
| 29 | SH 50 and SH 50A Taradale Rd to Pakipaki | Hawkes Bay | Medium-high |
| 30 | SH 3 from Hamilton to Te Awamutu | Waikato | Medium-high |

Personal Risk

The table below shows the national ranking for the riskiest 30 links described as having high or medium-high Personal Risk.

| RANK | LINK | REGION RISK | BAND |
|------|---|--------------------------------------|-------------|
| 1 | SH 31 from Kawhia to SH 39 | Waikato | High |
| 2 | SH 43 from Stratford to Taumarunui | Taranaki and Manawatu/ Whanganui | High |
| 3 | SH 37 from SH 3 to Waitomo Caves | Waikato | High |
| 4 | SH 94 from Te Anau to Milford | Southland | High |
| 5 | SH 41 from Taumarunui to Turangi | Manawatu/Whanganui and Waikato | High |
| 6 | SH 77 from Ashburton to Darfield | Canterbury | High |
| 7 | SH 2 from Featherston to Upper Hutt | Wellington | High |
| 8 | SH 30 from Te Kuiti to Atiamuri | Waikato and Bay of Plenty | High |
| 9 | SH 34 from Edgecumbe (SH 2) to Kawerau (SH 30) | Bay of Plenty | High |
| 10 | SH 2 from Wairoa to SH 5 Napier | Hawkes Bay | High |
| 11 | SH 16 from Wellsford to Helensville | Auckland | High |
| 12 | SH 6 from Haast to Wanaka | West Coast and Otago | High |
| 13 | SH 1 from Kaitiaki to Ohaeawai | Northland | High |
| 14 | SH 12 from Dargaville to Ohaeawai | Northland | High |
| 15 | SH 7 from Hanmer Springs to Reefton | Canterbury and West Coast | High |
| 16 | SH 87 from Kyebrum to Mosgiel | Otago | High |
| 17 | SH 35 from Opotiki to Tokomaru Bay | Bay of Plenty and Gisborne | High |
| 18 | SH 63 from Renwick to Kawatiri | Nelson/Marlborough | High |
| 19 | SH 14 from Whangarei to Dargaville | Northland | High |
| 20 | SH 2 from Matata to Opotiki | Bay of Plenty | High |
| 21 | SH 2 from Gisborne to Wairoa | Hawkes Bay and Gisborne | High |
| 22 | SH 36 Tauranga to Ngongotaha | Bay of Plenty | High |
| 23 | SH 82 from Kurow to SH 1S | Canterbury | High |
| 24 | SH 38 from Wairoa to Waikaremoana | Hawkes Bay | High |
| 25 | SH 6 and SH 67 from Murchison to Westport | Nelson/Marlborough and West Coast | Medium-high |
| 26 | SH 4 from Taumarunui to Raetihi | Manawatu/Whanganui | Medium-high |
| 27 | SH 65 from SH 6 to Springs Junction | Nelson/Marlborough and West Coast | Medium-high |
| 28 | SH 93 from Clinton to Matura | Otago and Southland | Medium-high |
| 29 | SH 1 from Kaikoura to Waipara | Canterbury | Medium-high |
| 30 | SH 12 from Dargaville to SH 1 | Northland | Medium-high |