1 SH1 Longswamp to Rangiriri
Median barrier

Safe System
case study

Life saving investment in road safety

The Longswamp to Rangiriri section of State Highway 1 looks different since construction of the Waikato Expressway began in 2016. But it is important to acknowledge a critical decision to undertaken interim safety improvements in the early 2000s. This decision is estimated to have prevented at least 28 deaths and serious injuries in the 11 years before the new expressway.

Median barriers such as those installed on SH1 Longswamp to Rangiriri improve safety on rural roads by separating opposing traffic flows, virtually eliminating the potential for head-on crashes.

SH1 Longswamp to Rangiriri median barrier

Longswamp to Rangiriri was a 9km section of State Highway 1 (SH1) with a curvilinear alignment that stretched through a rural environment between two sections of expressway standard highway (four lane, two-way). It had a 100km/h speed limit with a passing lane (2.6km long) for southbound traffic, and two passing lanes (2.8km and 1.6km long) for northbound traffic. At the time, this section of SH1 was carrying 17,500 vehicles per day. The road was undivided and, as a result, there were numerous high severity crashes involving vehicles crossing the centerline. The objective of the project was to reduce crash severity with flexible median safety barriers, while retaining overtaking opportunities.

An interim upgrade commenced in 2004 with the objective of reducing crash severity with a flexible median barrier, whilst retaining overtaking. It included a 2+1 cross-section with segments of two lanes in one direction and one lane in the other, which alternated to maintain opportunities for faster traffic to overtake slower traffic. The result was a cost-effective separation of opposing traffic that maximised the use of the existing seal width, whilst minimising the amount of seal widening needed. Roadside barriers were also installed in high risk locations to shield motorists from unforgiving roadside hazards.

Flexible median barriers are a key part of creating a Safe System

A Safe System has a forgiving environment that protects people from harm when they make mistakes.

Analysis indicates that once traffic flows on rural roads exceed 6,000 vehicle per day fatal and serious injuries are more often a result of head-on crashes than any other crash type.

Flexible median barriers are described as a Primary Safe System treatment because of their ability to significantly reduce the occurrence of fatal and serious injuries. By separating opposing traffic flows, while retaining opportunities for overtaking where passing lanes are provided, high severity crashes are less likely to occur because people are physically separated from what may otherwise be a head-on collision.

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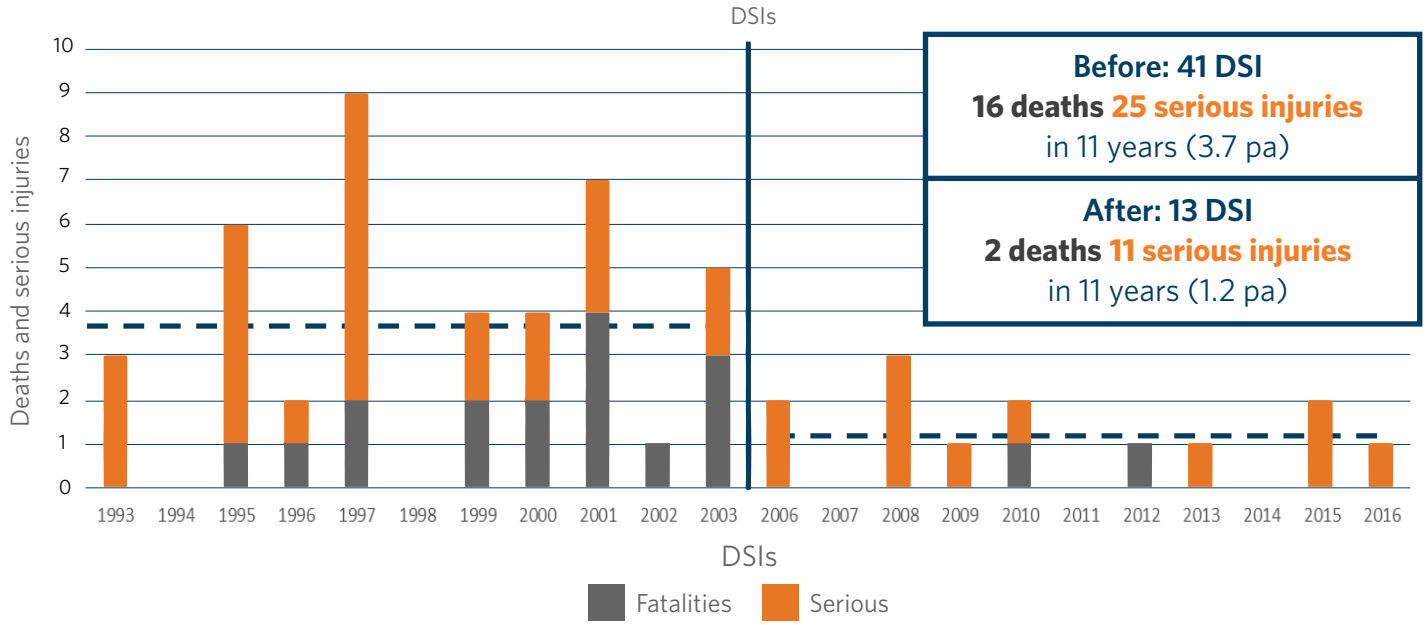
Safety performance

The chart below compares the number of deaths and serious injuries on Longswamp to Rangiriri over the 11-year period before and after the barriers were installed. There were 41 deaths and serious injuries in the before period and 13 deaths and serious injuries in the after period, resulting in a reduction of 68% and virtually eliminating head on crashes.

68% reduction

14 lives saved

14 serious injuries saved



Note: This is a simple before and after analysis and ignores any underlying trends and traffic growth.

The analysis period ends in 2016 when construction of the Waikato Expressway started along the same section of State Highway 1.

The decision to implement interim safety improvements at the time, despite plans to build the Waikato Expressway in the future, was lifesaving. Results indicate that, based on historic trends, the interim improvements saved at least 14 lives and prevented 14 serious injuries over the 11 years prior to the new expressway.

Cost and delivery timeframes

The project took approximately 18 months to deliver from design to construction at a cost of $6 million (approximately $667,000 per kilometer).

Barrier strike predictions vs performance

While Crash Analysis System (CAS) data provides details of crashes where the flexible median barriers had been struck, there is not a direct correlation between barrier repairs and CAS reports. In fact, the CAS data appeared to represent only around half the barrier strike incidents.

Performance indicator	Prediction	Performance	Variance from prediction
Barrier strike rate per 1.5Mvkt	1/1.5 Mvkt	0.91/1.5 Mvkt	-9%
Barrier strike interval	1 every 10 days	1 every 10.4 days	-4%

Monitoring shows that the incidence of barrier strike appeared to decrease within a short period after installation improvements to the delineation since installation and/or driver familiarity with the median barrier is believed to have contributed to the reduction in the incidence of barrier strikes.

Vehicle operating speed

Although influencing operating speeds was not a primary outcome for the project, before and after studies demonstrate that the operating speeds reduced by approximately 2km/h after the barriers were installed. The table below describes the before and after operating speeds.

Survey period	Single lane speed	Two lane speed
Before	97km/h	102km/h
After	95km/h	100km/h

Key tips for practitioners

- On corridors where flexible median barriers are installed there will likely be barrier strikes. However, the barriers will significantly decrease high severity crashes.
- Median barriers virtually eliminate head-on crashes and can also reduce run-off-road crashes by around 40%.
- In most cases the cost to widen the road to allow for full median barrier deflection will not be cost-effective. It is better to install the barrier in a narrower median, knowing that residual risk of impact due to deflection is very uncommon.
- Even in cases where some design compromises are required, a narrow median barrier will significantly reduce the severity of crashes along a section of road.
- To minimise the amount of pavement works and associated costs, roadside barriers should be offset into the unsealed shoulder or berm.
- Installation of audio tactile pavement markings (rumble strips) along median and outer edge lines, can potentially reduce the number of barrier strikes and therefore decrease associated maintenance costs.
- The most frequent place where barrier strikes tend to can occur is on curves within single lane sections where there is barrier on both sides.
- Where a passing lane is being retained, offsetting the central median slightly towards the two-lane side may reduce barrier strike from the one lane side.