New Zealand guide to temporary traffic management:

Lowest total risk

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Organisations are encouraged to submit case studies, to develop industry knowledge and understanding of lowest total risk. This will help ensure that mitigation of one risk doesn't inadvertently increase another risk to an unacceptable level.

Example 1: Road closure

This example is one of the most extreme detours, in length and time, caused by a road closure in Aotearoa New Zealand. It's an example of how to work through the concept of total risk. It's not a justification for never closing a road.

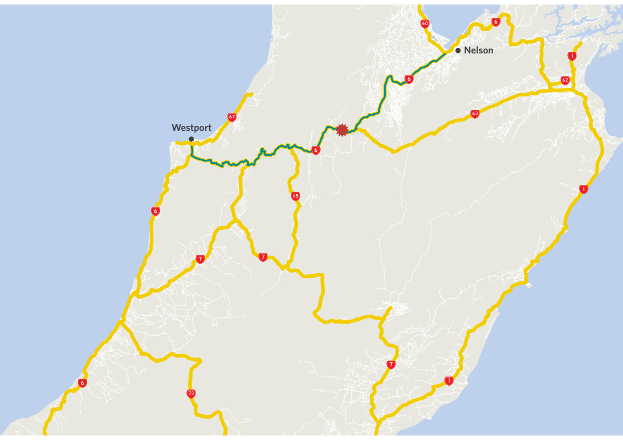

Figure 2: Nelson to Westport direct journey

Figure 3: Google Maps Street View of SH6

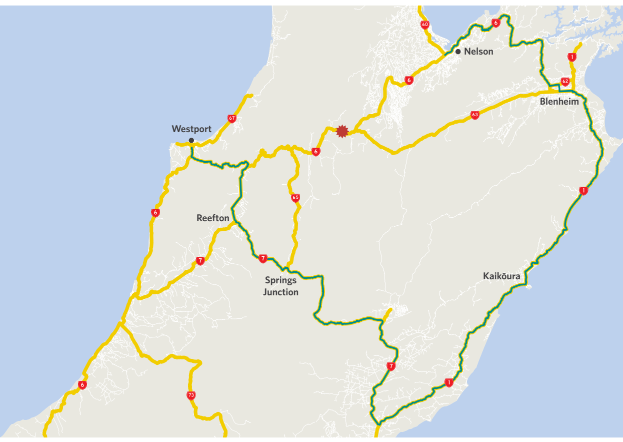

Figure 4: Nelson to Westport detour journey

This example is based around replacing a culvert on SH6 2km south of the SH63 junction. There isn't a local detour route for this closure and so the detour is very long and time consuming. See figure 2 for a map of this journey and the worksite location.

The cross section of the road is 7m edge of seal to edge of seal, with edge lines, and non-traversable shoulders. Any works would require a lane closure and it isn't wide enough to provide separation between workers with work vehicles and passing traffic. See figure 3 from Google Street View of the road.

The base case is to complete the work one lane at a time with no exclusion zone separating traffic and the work site. This is inconsistent with the hierarchy of controls, as there's no attempt to protect the workers from the travelling public.

Using the hierarchy of controls, the first option is to close the road and eliminate risk to the workers. However, the only alternative route is via Blenheim, Kaikoura, Springs Junction, Reefton etc. This detour is 360km and 5 hrs longer for the public. See figure 4 for a map of this journey and the worksite location.

Therefore, eliminating the risk to workers by closing the road results in a significant increase in journey distance and time for the public. In this example:

Total risk = worker risk reduction + road users risk increase.

This is a transfer of risk from workers, who benefit from the closure, to the public, who're disadvantaged by the closure. Without completing formal risk assessment to look at this in detail, it is assumed that this is not an acceptable transfer of risk for this example, and so we need to look at alternative solutions.

Remember the cost of an option is not a justifiable reason to not implement an option (HSWA 2015).

Referring to the hierarchy of controls we have the following options:

Eliminate

While we might not be able to shut the road for long periods of time, closures with periodic openings could be an option. For example, closed for 50 mins with 10 min opening every hour – the timing based on work and traffic volumes. The public waiting for an hour is much less time than a 5-hour detour. The duration of the opening needs to be matched to the traffic volumes so that there isn't anyone left waiting to go through after the opening closes.

Total risk = road closure eliminates risk to workers during the 50 mins, then they move to safety for the 10 mins + public are kept on the same route. The delay is inconvenient rather than a risk if it's well communicated and there's no risky U-turns etc. This is a total risk reduction.

The increase in cost because of a longer construction period isn't a justifiable reason to not implement this approach. (HSWA 2015)

Another eliminate option is to do this work at a low flow time such as at night. However, working at night increases risk to workers because of fatigue, loss of visibility and colder temperatures.

Total risk = this is a risk reduction for workers but not as much as a daytime eliminate option + public are kept on the same route. The delay is inconvenient rather than a risk if it's well communicated and there's no risky U-turns etc. This is a total risk reduction.

Substitute

It may be possible to replace the culvert pipe using pipe jacking methods. This would likely require a re-design of the works to include temporary works, different specification pipe, different installation equipment etc. This approach would require the jacking operation and public impacts to be risk assessed and compared with the other options.

Total risk = risk to workers for the jacking operation + change in risk to the public (network users) who're kept on the same route. This is potentially a total risk reduction.

Isolate

Installing a barrier system may be an option to enhance protection of workers while enabling public to pass the worksite. The barrier system needs to be correctly designed and installed to be effective. Given the narrow road, a barrier system with very small deflection, would be required.

> Total risk = this is a risk reduction for workers but not as much as the eliminate option + public are kept on the same route with no delay. This is a total risk reduction.

Engineering

Installing measures to reduce speeds for public entering, passing and exiting the site. This might include use of VMS as additional advanced warning, narrowing lanes, or use of coned chicanes. These controls do not physically separate and protect the workers from the public but do reduce the consequence of harm if an incident happens.

> Total risk = this is a risk reduction for workers but not as much as the eliminate/substitute/isolate options, plus public are kept on the same route with no delay. This is a total risk reduction, though a small reduction.

Administrative

This could be having a small number of workers on the site that are trained in working near live traffic. These controls do not physically separate and protect the workers, nor do they reduce the consequence of harm should they be struck by a member of the public.

> Total risk = this does very little to risk reduction for workers + public are kept on the same route with no delay. This is unlikely to be a total risk reduction.

PPE

This could be making sure workers have high visibility clothing. PPE controls do not physically separate and protect the workers, nor do they reduce the consequence of harm should they be struck by a member of the public.

> Total risk = this does very little to risk reduction for workers + public are kept on the same route with no delay. This is unlikely to be a total risk reduction.

Assuming that it's not practical to install the pipe without trenching, the recommended option is to use a closure with periodic openings as this is an eliminate approach, the highest in the hierarchy of controls.

Remember, this is one of the most extreme detours, in length and time, caused by a road closure in Aotearoa New Zealand. It has been selected to provide an example of how to think through the concept of total risk. It's not a justification for never closing a road.

Example 2: Footpath closure

This example is based around a utility provider doing repair works at a cabinet on a verge. There's a footpath past the cabinet and there's a busy two lane, two-way road alongside – a typical suburban arterial road. The base case is to close the footpath, providing space for the technicians to work and access their vans. This also keeps the public away from live electricity cables. However, there's no alternative footpath or verge for the pedestrians to walk along. Closing the footpath and verge, means that pedestrians will cross the road to continue their journey, but drivers are not expecting pedestrians to cross the road at this location. In this example the total risk is:

Total risk = risk to public of accessing live cables + risk to pedestrians crossing the road + risk to drivers who attempt to avoid unexpected pedestrians + risk to workers of an out-of-control vehicle

By closing the footpath to improve worker safety and ensure the pedestrians don't hurt themselves with live cables, they're being exposed to alternative risks – crossing the road.

This example has not been worked up in detail but is used to highlight the numerous risks at the site.

Other possible controls, such as installing a temporary footpath or guiding pedestrians through the site using appropriate staffing, are likely to be lower total risk solutions.

Te Kāwanatanga o Aotearoa
New Zealand Government