

Road closures: An operational perspective

The case for increased use of road closures as a safe and efficient TTM option in Aotearoa





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Figure 1: STMS at work in Halifax Street, Nelson

Introduction

Greater use of temporary road closures in both urban and rural settings has become a topic of increasing importance in New Zealand, polarising elected officials, contractors, and the general public. The debate centres on three critical issues: acceptance by the public of road closures and the impact of road closures on safety and network efficiency.

Aotearoa has a vision of zero deaths and serious injuries on our roads. A key premise of this vision is that in every situation a person might fail, the transport system should not. As a responsible PCBU, Downer’s role in strengthening the transport system involves ensuring, so far as is reasonably practicable, the health and safety of our people and the public. We believe that safety and efficiency are not mutually exclusive and well-planned and executed temporary road closures enable optimal outcomes for road workers and road users.

This paper delves into the advantages of temporary road closures drawing on case studies across Aotearoa and public discourse to present a case for greater consideration and acceptance of road closures as an option for TTM.

Key considerations

Collective effort is required to embed the safe system approach endorsed by the New Zealand Government. This collaborative, ‘safety first’ focus aligns with the principles of the draft NZ guide to temporary traffic management (NZGTTM), which puts risk assessment and planning before decisions on control types and equipment are made.

Under these proposed new ways of working, the focus will shift to all parties working together to manage risk on temporary traffic management sites, and developing an optimal solution for road workers and road users. Downer is an early adopter of this guide and supports the shift to a more collaborative approach to traffic management planning.

Differences between rural vs urban environments

The challenges of working in rural and urban road environments vary, but the general principles behind good traffic management do not change. This includes the importance of early and ongoing communications and engagement.

The operational issues that need to be considered when assessing TTM options such as road closures and detours through rural environments are stock management, safe speeds, and driver expectations.

We need to consider a range of options

TTM controls need to be assessed on a case-by-case basis. However, we believe there is a case to increase the use of road closures based on proven operational safety and efficiency improvements. We foresee the level of acceptance of road closures is likely to increase taking into account legislative, social, and performance factors.

Case for change

There were 43 fatal crashes and 287 serious injury crashes at worksites between 2017 and 2021. And in 2018, 377 people were killed on our roads, with thousands more seriously injured.¹

¹ <https://www.nzta.govt.nz/safety/what-waka-kotahi-is-doing/nz-road-safety-strategy/>

Safety benefits

Reduction of third party traffic passing our teams

Temporary road closures serve to eliminate the critical risk of third party traffic passing through an active work zone, enhancing the safety of workers and the travelling public. Limiting vehicles to construction traffic in work zones, and providing construction crews with enlarged work zones, also minimises the risk of people and plant interaction (e.g. reversing and other plant movements).

The presence of external parties increases the complexity of vehicle movement plans (VMPs) as we have less control of externalities. Removing external factors such as through traffic through road closures enables greater control of our worksites as it eliminates variables from planning activity.

The increased work space between activities reduces other safety concerns associated with close exposure to hazardous materials (e.g. dust expelled from pavement milling or crews handling hot bitumen). Further, a safer, less stressful environment enhances staff resilience and wellbeing.

We have seen increasing levels of aggressive behaviour from the public on work sites across the country – with our temporary traffic management (TTM) personnel bearing the brunt of the public's aggression. Abuse of STMSs in flood-ravaged Hawkes Bay reached the point where two people had a pistol and sawn off shotgun pointed towards them. This behaviour is unacceptable and an unnecessary risk to our people.

Threats to road workers has helped drive a temporary traffic signal shortage across the country – already stretched from cyclone repair works.

Reducing interaction with the public can reduce the potential for conflict or violence toward our TTM teams and should factor in a risk-benefit assessment of controls.



Figure 4: Emergency road closure on Tāmaki Drive in Auckland Jan 2023 – a high impact road with 30k VPD – opened one-way within 48 hours.

Emergency response considerations

It is generally acknowledged that it is safer (and faster) to complete emergency response work with our roads closed. So why is it harder to gain acceptance by the public and RCAs when the work is planned?

Our observation is that the public is typically more accepting of journey impacts caused by temporary road closures in emergency situations. This cognitive dissonance is likely linked to risk perception and altered emotional and attitudinal states (enhanced fear of likelihood of harm).

The effectiveness of emergency management messaging may also be a factor. In emergency situations, priority is given to the most people possible using appropriate language and mediums, and the audience is likely to be more receptive to receiving information.

During the state of emergency over Auckland Anniversary Weekend 2023, cross-agency collaboration and empowerment of Downer staff on the ground enabled us to respond to emerging issues and open and close roads quickly, as required.



Figure 5: Emergency works in Taranua following Cyclone Gabrielle.

Case study: Ellaerslie Panmure Highway

Ellaerslie Panmure highway is a key link in the Central Urban Network with an average of over 30,000 vehicles travelling it per day. It links Key industrial and shopping areas with Mt Wellington Highway and Lunn Ave.

Due to the challenges of resurfacing a site with businesses, residents, bus routes and a complex intersection Auckland Transport and Downer have been trying to deliver this work for approx. 3.5 years

During the early stages of planning the collaborative partnership of Auckland Transport and Downer, knowing that the best way to tackle the job was for minimum overall duration whilst managing the key stakeholders a number of traditional methods were explored including one-way diversions and two-way traffic, all of which created issues for individual stakeholders (Public Transport services and businesses).

The team arranged a meeting with all key parties, it was ascertained that Public Transport services had the largest amount of challenge when it came to disruption of their services.

A provisional idea was floated that if we could fully close the road but safely escort the bus services through the worksite, this would have minimal impact on their service route and solve the key stakeholder impact. In addition, allowing the work to be delivered in a safer environment i.e. not dealing with live traffic through the site and allowing productivities to be greater than using a traditional traffic management approach.

We also utilised the network traffic data from our supply chain partner Mooven to identify where opportunities were to put road closures in earlier than traditionally accepted. A noticeable change on this was the ability to get on the road on a Sunday at 4pm as data showed that traffic volumes were no higher than at 8pm that night.

The team planned the work over 3 phases which again, minimised impact on businesses (Bunnings, Z etc.) and maintained access to key routes such as Lunn Ave for all but one shift.

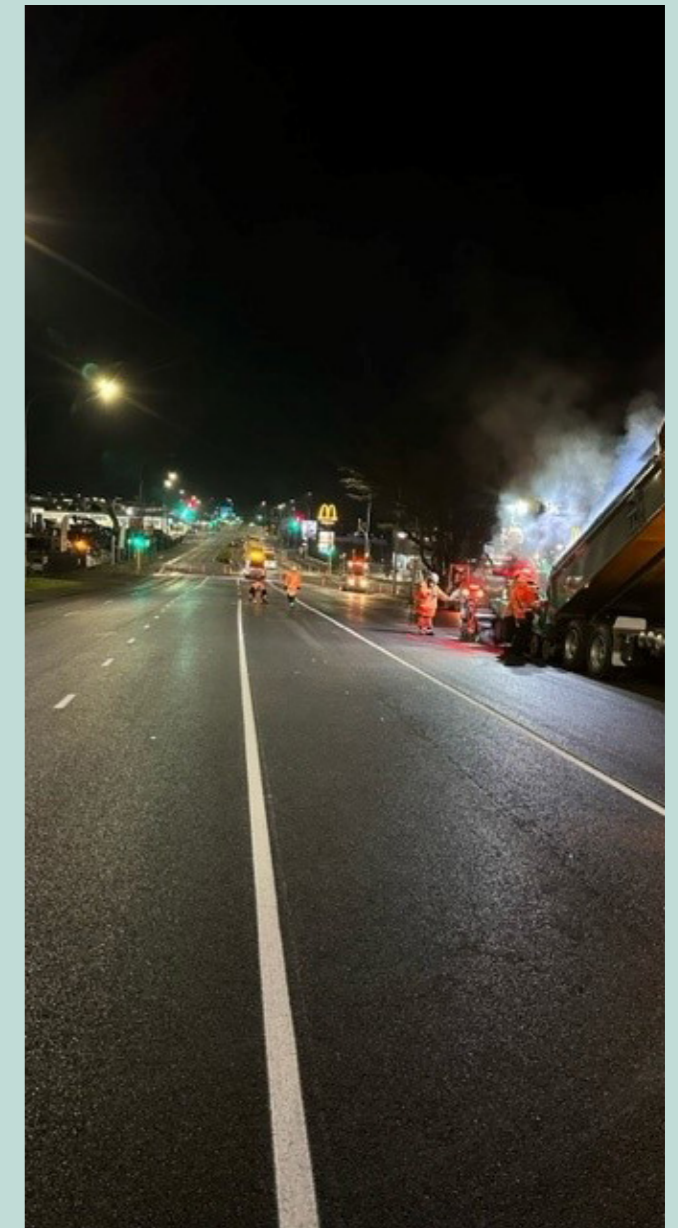
Had we have approached this conventionally the work would have taken 10 shifts but using the approach above the work was completed in 6 shifts.

Quantities

- Total wearing course and milling 11512 m² - 1100 tonnes of mix and 1100 tonnes of millings for recycling.
- Total structural asphalt and milling 1764 m² - 415 tonnes of mix and 415 tonnes of millings for recycling.

Key Outcomes

- Improved safety for site teams and customers by operating under a road closure and minimising the risk of vehicles breaching the work site.
- Reduced total number of shifts and minimising risk of being off the road late therefore not impacting morning commuter traffic.
- Reduced noise impact to stakeholders - earlier starts meant that the noisy works were finished earlier in the evening.
- Quality benefits higher productivity shifts enable fewer transverse joints, longer paving runs etc which has whole life asset benefit and improve reputation for both Auckland Transport and Downer NZ.
- No complaints from stakeholders or travelling public.
- Minimised carbon emissions.
- Sets up a blueprint of future works.



Efficiency and productivity benefits

Enhanced workspace and resource utilisation

Having a section of road closed creates a larger working area and the ability to use right sized (often larger) equipment. It also allows us to optimise methodologies to suit the conditions, with more options available, e.g. access from different angles rather than narrow corridors. For pavement works, it can reduce the number or change the position of construction joints, resulting in enhanced construction efficiency.

It also takes significantly less time to install TTM during a closure as it requires less people and plant (e.g. no centre line cone delineation). Effective allocation of scarce resources (people and plant) is an important consideration for our sector.

Addressing the scarcity of qualified resources

A shortage of qualified and trained traffic management personnel is a major challenge for our sector, along with the cost of training new entrants and a high churn rate. While traffic management competency and road safety knowledge in general has improved in recent years, there is still a need to improve decision making when selecting and applying effective evidence-based TTM solutions that reduce the risk of fatality or serious injury.

The newly-formed TTM Industry Steering Group (ISG), which includes Downer's Betty Mitrova, is helping shape the future of TTM by leading the development of learning and engagement opportunities within the sector, including a Risk Assessment for TTM Micro-Credential for a range of audiences (managerial and operational influencers, project staff, trainers and assessors, as well as those who are at the coal face of determining optimal TTM solutions).

With assistance from Parallax, Downer has developed a bespoke training package that blends theory and practical training to generate meaningful understanding of risk-based decision making in TTM. The intent is to provide a genuine context and framework for good risk-based design and TTM delivery and establish this within the NZQA Qualifications Framework to allow accredited achievement and a national standard.

Enhanced road corridor utilisation

Road closures also improve workflow and provide the opportunity for a range of construction activity to be completed in the same closure. Activities that are normally staggered over several months with frequent and repetitive traffic management can be completed at the same time, shortening project timelines, reducing congestion, and maintaining typical travel time reliability. Through greater asset owner and multi-contractor collaboration, works programmes could be better aligned

to take advantage of a safe, closed working environment, maximising road corridor use. This opportunity requires transparency of pipeline and works programmes by This one network approach was successfully implemented by Christchurch City Council and Waka Kotahi on SCIRT to align horizontal works programmes, including the ultra-fast broadband roll-out programme by utility network operators.

Case study – Stock Road Area Wide Pavement Treatment (AWPT) optimising closure

Over the 2022/23 rehabilitation season, Tasman Alliance completed Stock Road AWPT, including drainage, shoulder widening, isolated rehabilitation, and granular overlay under a road closure. The detour route provided a shorter duration than a vehicle waiting at a stop paddle for 10 minutes, meaning little disruption to the traveling public. The work site progressed faster than a traditional traffic management site. However, the quality benefits were the most apparent. The final surface not having traffic overnight, allowed the grader operator to directly continue work from the previous day, which created a much better surface. To quantify the benefit, we were able to complete additional general maintenance activities during the road closure, namely a wilding exotic removal programme. This activity would take eight days under a traditional traffic management approach. Under the closure, it took the crew 4.5 days to complete, which translated to \$19K cost savings, and 3.5 days less disruption to the travelling public

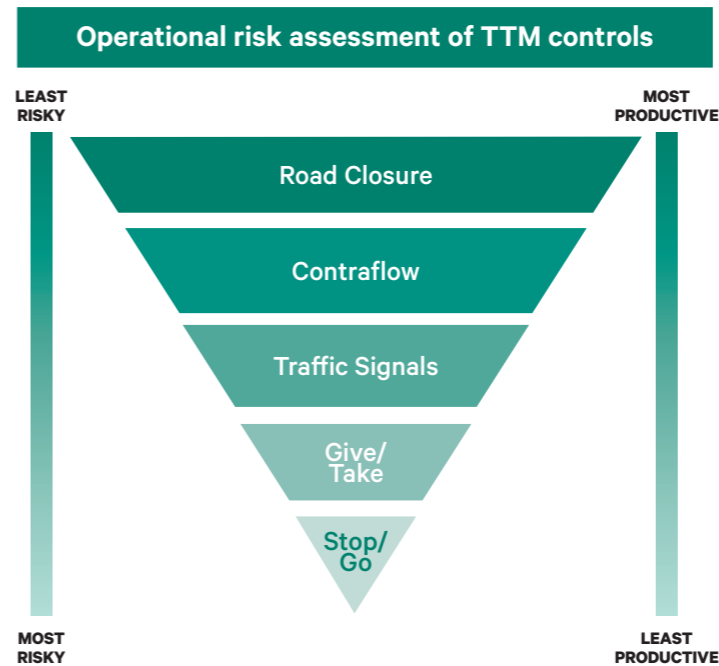


Figure 5: Hierarchy of controls - road closures eliminate risk for our people and remove barriers to productivity

01

Road closures require the least labour resource to implement. They allow the contractor to maximise productivity and work faster whilst completely eliminating the risk of moving traffic.

02

Stop/Go traffic management is labour intensive and puts people at risk by exposing them to the risk of being hit by moving vehicles.

03

Traffic control is a key safety control. It shouldn't be a competitive advantage or a cornerto cut to save money. It will be procured as a provisional sum, following best practice from the world bank.

Key efficiency benefits of a road closure:

- Effective allocation of scarce resources (people and plant)
- Enhanced daily productivity (and shorter construction timeframes)
- Minimised disruption to the public during installation and removal of TTM setups.

Sustainability benefits

Transport is a key sector in Aotearoa and a significant contributor to our emissions footprint, with almost 17% of greenhouse gas emissions coming from transport. Road closures are a more sustainable option to stop/go traffic control, as they reduce the amount of static or idling vehicles on roads, resulting in lower emissions. They also reduce the use of temporary materials, such as temporary road surfacing, contributing to waste reduction and associated cost savings.

Case study: Manukau Road - a game-changing approach to Auckland road maintenance

One of the largest resurfacing projects to be completed by Downer as part of Auckland Transport's Auckland Central Road Corridor Maintenance (RCM) contract, Manukau Road Resurfacing involved a highly efficient, innovative approach to traffic management that reduced time on-site by almost half, resulted in a 27% reduction in operational emissions, and minimised disruption to road users.

Drawing on innovative traffic data technology from Mooven, a highly collaborative planning process, and early engagement with subcontractors and stakeholders, this project was a game-changer for road maintenance delivery in Auckland.

Downer completed 31,000 m² of road surface milling and pavement on Manukau Road over two weekday nights and two "super" weekends during the July 2021 school holiday period – reducing the original 18-day programme to six days. Historically, the reseal programme had been delivered through shift work, which would have meant up to three weeks of night works. The team planned to complete resealing under one-way detours to manage tidal traffic flows.

Our approach to the project realised multiple benefits:

- Reducing the programme from 18 days to six effectively freed up resource for other network maintenance activities
- Fewer paving joints (64%) by adopting a methodology with less stages and shifts
- Reduced stakeholder disruption, with a 93% satisfaction rate.

To ensure the planned works were a success, it was critically important to explain the 'why' to customers in advance, so they understood the rationale – requiring significant engagement and targeted communications. The benefits of our customer-focused approach included:

- Less disruption to road users, as well as residents, businesses, community facilities, and events (reduced time on-site by 45%)
- Less complaints, more compliments (93% customer approval rating)
- Enhanced reputation for Auckland Transport.

Quality benefits

Road closures enable a higher quality outcome with less disruption. This includes an ability to deliver a right first time quality pavement through optimised trafficking, which increases the likelihood of product success and minimises the cost of rework.

Case study: Northern Network Transportation Project (NNTTP)

The George Bolt Memorial Drive / Tom Pearce Drive intersection upgrade was a \$9M component of the \$58M NNTTP for Auckland International Airport Limited (AIAL) to future proof road infrastructure north of Auckland Airport.

The drive to innovate came primarily from the opportunity to reduce the timeline of the conforming design, due to reductions in traffic demand from Covid-19. Using an innovative EME2 asphalt and a meticulously planned 'Super Weekend' methodology, we reduced pavement construction from eight weeks to a single weekend.

The 'Super Weekend' involved full road closures, detours, and round-the-clock working to complete construction at one of Auckland's busiest roads.

The higher stiffness of EME2 reduced overall required pavement depth by up to 25%, while the compressed Super Weekend approach enabled delivery of fewer, larger pavement sections with fewer higher quality joints.

This avoids two common construction quality challenges, pavement section size and number:

- Full road closures enable pavement installation crews to work across the entire road corridor enabling construction of a much larger area of pavement in a single homogenous section.
- Increasing the area of pavement construction sections reduces the number of sections required to cover the whole intersection – in this case, from four sections in the intersection box to one.
- Reducing the number of surface sections reduces joints between sections, maintaining quality. Surface section joints are a potential area for surface degradation, so reducing the number of joints increases the quality and durability of the pavement surface

Further benefits of the Super Weekend included:

- Reduced road user disruption, including no TTM on working days, and uninterrupted shop access
- Reduced TTM costs through reduced delivery timeframe and no need for individual lane closures, contraflows or stop-go setups
- By enlarging construction sections and reducing construction times, the Super Weekend methodology reduced safety risks associated with undertaking road works in a constrained space directly adjacent to live traffic over an extended period.

A combination of EME2 and the Super Weekend methodology resulted in swider benefits including: reduced energy use and carbon footprint relative to the conforming design, a reduced duration, and increased lifespan.



Economic benefits

Quicker projects are cheaper. Through road closures, the pace of construction can increase, resulting in an earlier overall completion. The cost savings associated with road closures compared to alternative traffic management methods has been quantified on various projects, including Hamilton Infrastructure Alliance (IA), as highlighted below.

Case study: Hamilton Infrastructure Alliance (IA) delivering value for money

In the 2020/21 construction season, the IA planned to complete a large percentage of its renewals programme under road closures. Historically, the Hamilton City Council (HCC) reseal programme had been delivered using stop/go traffic management. The positive cost impact of adopting road closures as a preferred means of delivery, resulted in the IA generating cost savings for HCC of approximately \$90,000.

A significant contributor to realising these savings was increased productivities. Under the traditional set up, the surfacing team would plan to typically complete two or three sealing sites per day. Under a road closure, productivity almost doubled to four or five sites per day.

When you consider that the average temporary traffic management cost per site totalled \$1,027 (across 82 sites), by adopting road closures as a primary approach, we avoided having 16 site specific traffic management setups (at a saving of \$16,000) and reduced the programme duration by five days, resulting in a total programme saving of approximately \$90,000.



Public perception and communication

The case of our NOCs: factors affecting road user satisfaction

Based on findings from Waka Kotahi's State Highway User Survey conducted in the third quarter of 2022, the feeling of calm is of highest impact on overall satisfaction followed by length of time, surface condition, physical comfort, and feeling safe from the risk of accidents or crashes. Road closures was the lowest rated attribute impacting satisfaction.

When a marked detour route was used, the ease of following and time taken was an issue for one in five, compared to surface smoothness for three in ten.

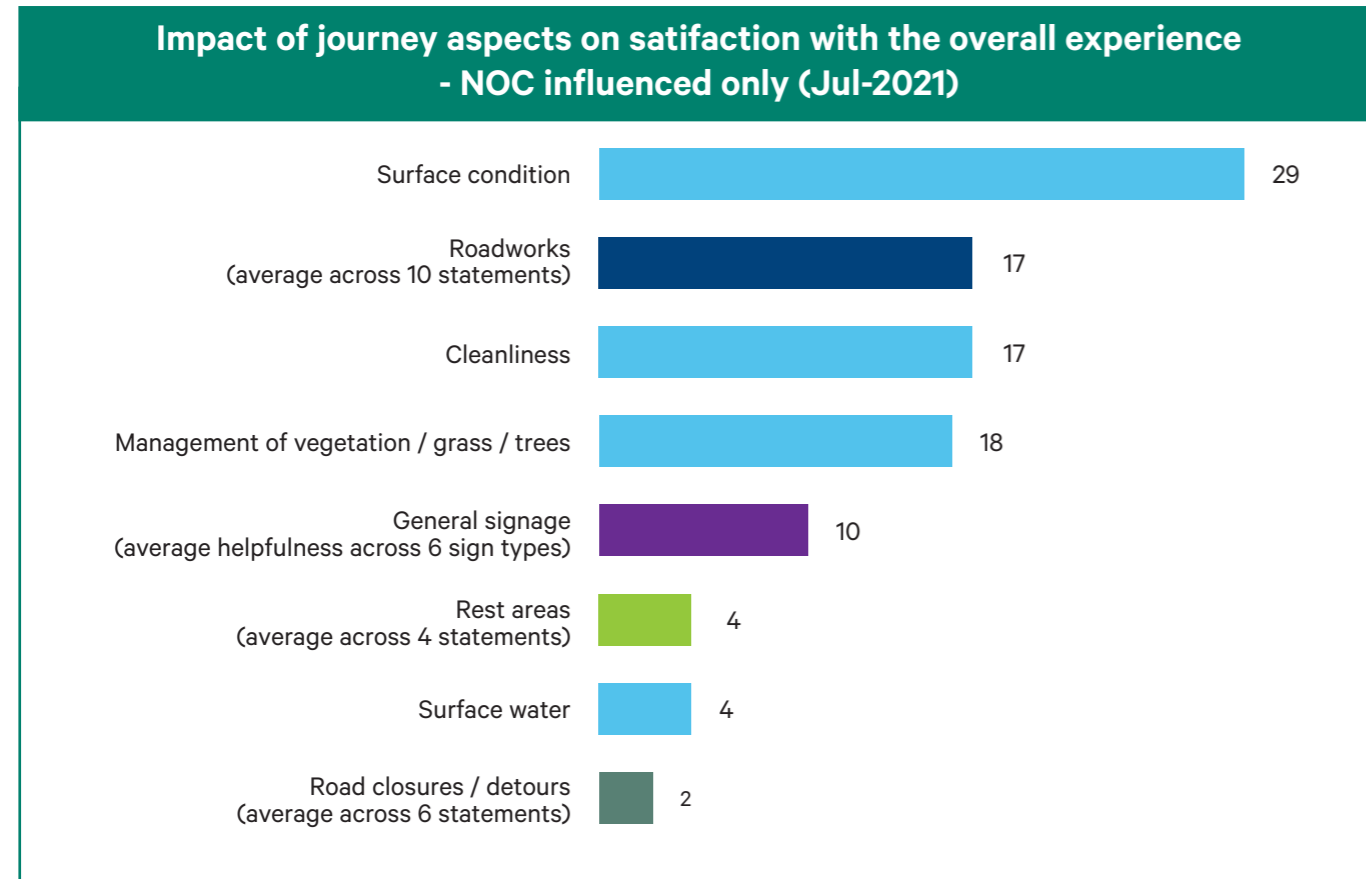


Figure 2: Impact of journey aspects on satisfaction from Waka Kotahi User Survey Report December 2022

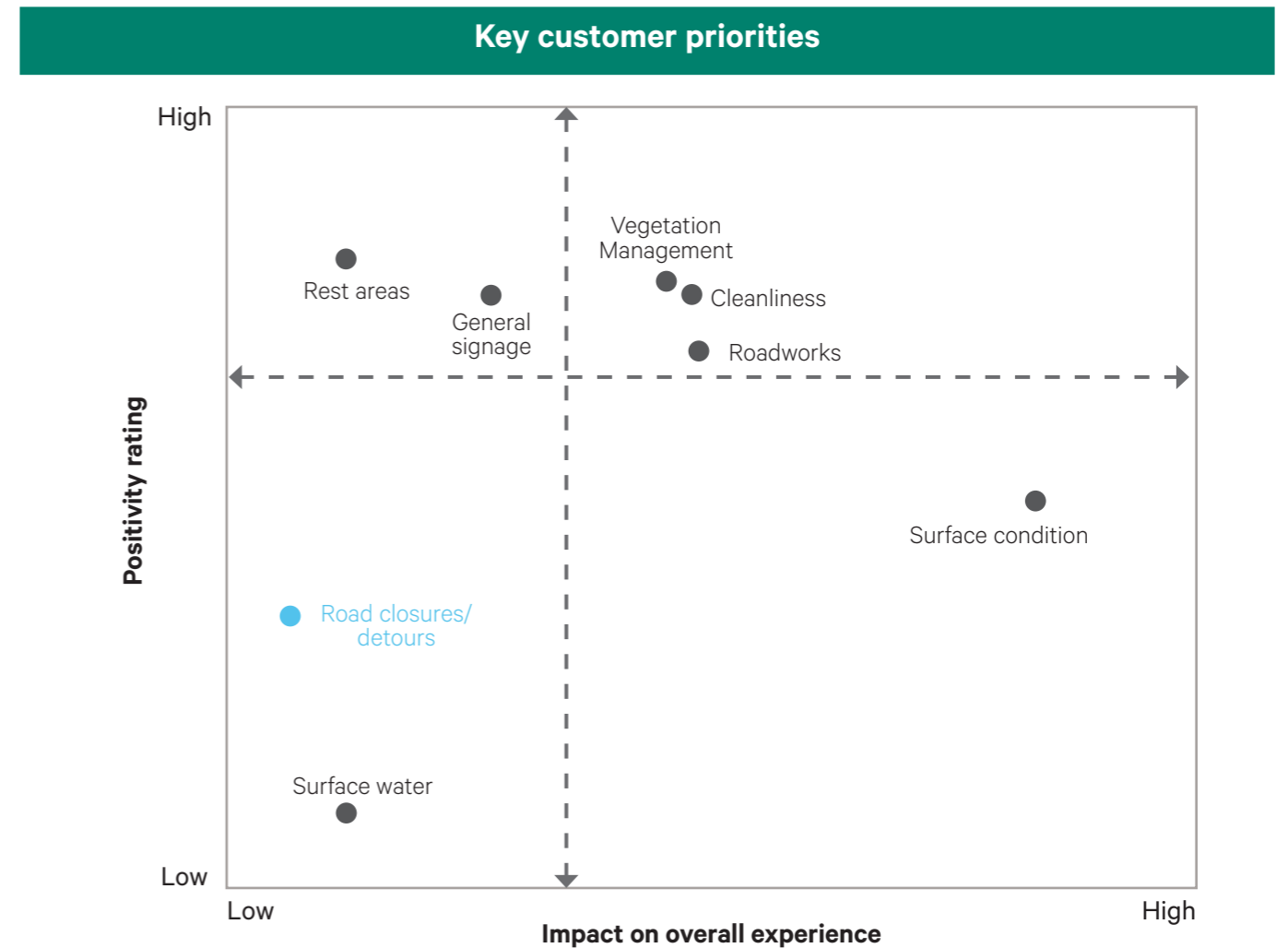
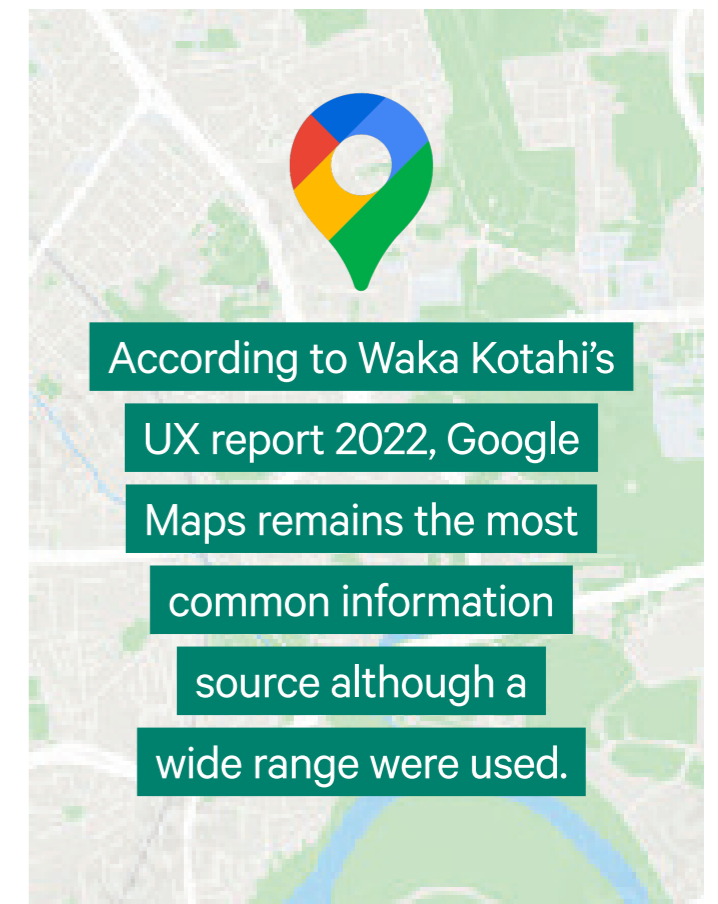


Figure 3: Key customer priorities from Waka Kotahi User Survey Report December 2022

Effective communication strategies

Communicating the why early

It is critically important to explain the 'why' to customers in advance so they understand the rationale for the works, as well as allowing them sufficient time to explore alternative routes prior to the closure. This is doubly important for residents or businesses who reside within the limits of the planned closure. Key to success is advanced communication with PT companies so bus routes can remain open and residents have access throughout the work activities. These key stakeholders need to have a clear and constant understanding of how their "day-to-day" routines will continue unhindered by the works, which requires targeted clear communication and progress updates. It is important to keep RAMM tables updates so people can go online and view live traffic data.



Case study: SH3 Midhirst overbridge

Midhirst overbridge was programmed for renewal in the 2022/23 season. Due to the narrow and curved nature of the road, stop/go traffic management was not possible. Additionally, it was established that what was initially programmed as an asphalt renewal only, would require additional treatments to alter the geometry of the bridge, requiring a combination of both construction and surfacing crews.

Traditionally, work would have been programmed during the day only, under scheduled stop/go, resulting in:

- A six-day construction period (two construction and four asphalt)
- Significant (and unsafe) traffic build up in this high traffic volume area of the network
- A lower quality product due to cold joins associated with the methodology, as well as the risk of cold asphalt mix due to cartage truck delays in the stop/go queues
- Poor journey management and a negative road user experience.

Through proactive stakeholder engagement, we knew that a full weekend closure was the preferred option in terms of journey management, so TNOC investigated the feasibility of completing the work in 72 hours, with staggered shifts and crews working around the clock. Construction and asphalt crews completed the work over an initial 36-hour closure (Friday 7pm to Sunday 7am), with the road open during the day on Sunday before closing again overnight (Sunday 7pm to Monday 5am). The new approach increased efficiency, improved safety, minimised disruption, and saved costs, as below:

Approx. cost of traditional approach: \$453,600

Cost of 24/7 weekend closure: \$428,700

Savings: \$24,900

Changing mindsets

There is a clear need to educate the public on the benefits of road closures and address common – misconceived – concerns, such as inconvenience, in communication strategies and messaging. Most communication strategies use the “short term pain for long-term gain” approach.

Use of road closures from a safe system perspective requires a shift from Waka Kotahi’s historical journey focused approach to providing consistency and cohesion for customers transitioning between places, regions, authorities and modes. These two objectives are not mutually exclusive.

Communication messaging should focus more on the positive impact of road closures on safety in line with a safe system approach. The media also has a role to play in achieving the country’s Vision Zero target and supporting positive safety messaging.

Case study: SH58 Weekend Closure

SH58 Harris to Moonshine design required a full width pavement reconstruction of 150m length, 600 m3 cut to waste, and 1400T grader laid asphalt reinstatement. Previously, we delivered the same scope of works on Stage 2A using stop/go over two weekends and found:

- Significant impacts on SH58 traffic
- Site productivities were lower than normal due to reduced truck movements caused by queuing
- Increased health and safety risk for work force
- No option for additional works due to limited stop/go length.

Based on these learnings we elected to implement road closure with works over a single weekend, with the following results:

- Improved customer experience for SH58
- Improved construction efficiencies
- Reduced health and safety risks from public traffic (some frustrations directed towards TTM staff)
- Trial for the wider network to gauge the effects of the closure (Data discussed further in upcoming slides)
- Additional benefit to others ‘piggy backing’ onto the closure.

Intelligence-led

We monitored the network over two months prior to the road closure to understand typical journey patterns and times. By being intelligence led we sought to deepen our understanding of the network and potential impact of the road closure.

Post road closure, we held a lessons learnt workshop with key stakeholders including Waka Kotahi WTOC, Wellington Transport Alliance, Waka Kotahi Communications & Engagement, Waka Kotahi Transport Services – Project, various councils in the region, and Ventia (Transmission Gully).



The workshop highlighted the importance of:

TTM planning:

- Clarity and timing of TMP approval procedures, including formalising the procedure information requirements and close out 1 month prior to works
- Including PT operators (Metlink) and rail maintenance (KiwiRail) in planning in case of block of line or service outage
- Longer lead times and closer coordination with other contractors to ensure thorough planning of shared space
- More targeted information on VMS boards
- Considering all user groups and approaches in
- Reviewing location of closure points for overall safest outcomes

Managing the network:

- Active monitoring via WTOC
- Morning and afternoon Site Rep meetings
- Sharing the impacts across other approaches (through phasing of lights)
- VMS messages to manage symptoms of the network while closure is in place
- Inform drivers when respite is expected and alternate routes to help alleviate impacts on local roads.

Public communication:

- Using varied channels with more frequent contact on social media to enable customers to confidently predict and plan their journeys
- Capturing events more effectively/continuously
- Targeted tools for residents (e.g. printed dashboard passes to reduce interactions with TTM staff)
- VMS messaging that specifies location.

Conclusion

Safe roads are a foundation of a safe New Zealand. Influencing road user mindsets and behaviours will be critical on our road to zero. As PCBUs, local government, or citizens, we all have a responsibility to support safe transport choices and an obligation to prevent harm on our roads.

On road works across the country, we have seen that what is good for safety is good for efficiency when it comes to road closures. Asset owners can further realise the benefits of efficiency through improved economic, environmental, and social benefits.

From experience, the key factors for successful road closures include proactive and ongoing stakeholder engagement and clear messaging – including the benefits.

As a signatory to the Construction Sector Accord, Downer is committed to working with government to create a high performing construction sector for a better New Zealand. We are open to learning from one another, being bold, and having brave conversations to achieve the safest outcome for road users and our people on our Road to Zero.

Coordinated leadership is critical to address sector challenges or “roadblocks” in our path, such as skills and labour shortages and unclear regulations.

Author bios



Lyall Hedges

Lyall is General Manager for Transport Central, responsible for Downer operations in the lower North Island of New Zealand, and brings over 30 years’ industry experience, including governance of many of our collaborative maintenance contracts with local councils and Waka Kotahi.



Drew Hayes

Drew is Alliance Manager on Tasman Alliance – a collaborative contract between Downer and Tasman District Council. He brings over 16 years’ industry experience and offers a holistic view of transport infrastructure having been both contractor and client side as an Engineering Officer with Nelson City Council.

