CASE STUDY

TĪRAU TO WAIOURU REHABILITATION ACCELERATED PROGRAMME (TWRAP)

NZ TRANSPORT AGENCY WAKA KOTAHI | Downer Relationships creating success | STELLAR PROJECT DELIVERY SPECIALISTS

SUMMARY

This case study presents a comparison between the Tīrau to Waiouru Rehabilitation Accelerated Programme (TWRAP) and the traditional business-as-usual (BAU) network outcome contracts (NOC) delivery model. It evaluates the impact on cost, efficiency, safety, and long-term value for the operations and maintenance of pavement rehabilitation across New Zealand's state highway network.

BACKGROUND

Between July 2022 to April 2024, approximately 5,670 potholes were identified and repaired on the section of SH1 between Tirau and Waiouru that sits within the Central Waikato Network Outcomes Contract (CWNOC) area. NZ Transport Agency Waka Kotahi (NZTA) identified that this section of SH1 required significant pavement renewal investment and the extensive pothole programme was a result of over a decade of underinvestment due to funding constraints. This underinvestment compromised levels of service and increased the demand for reactive maintenance. In response, NZTA set the challenge of delivering New Zealand's largest and most ambitious road maintenance project.

A network asset investment strategy was developed by Downer Group NZ and presented to NZTA. The NZTA Board agreed to fund the increased investment through an accelerated (or boost) programme. This effectively compresses five years of funding into an accelerated 18-month delivery programme.

The core project objective was to deliver a stronger, more durable roading network. One that is less prone to potholes, requiring fewer interventions in the future, and therefore minimizing disruption to motorists and freight operators.

Under the BAU model, pavement rehabilitation is typically delivered under stop/go traffic management allowing all vehicles to travel through part of the work site. On high-volume state highways, this exposes both road workers and road users to elevated risks while also leading to significant delays - especially during the summer months when the weather is most favorable for pavement works but traffic volumes are highest. Due to reduced working space and the significant volume of traffic driving through the partially completed worksite under a stop/go setup, productivity and quality are often heavily compromised, with rework often required before sites are completed due to traffic damage. This is often exacerbated by inclement weather during the construction period.

Additionally, the current design approach does not meet NZTA's desired 25-year design life. Under the current NOC BAU process, designs are typically selected from a standard catalogue of options and are only required to meet the network's serviceability standards, with no obligation to achieve a specified design life.

Where feasible, TWRAP utilised full road closures in stages to:

- Facilitate intensive road rebuilding and complete the programme in the shortest practical timeframe
- Reduce the overall period in which road users are affected by temporary traffic management
- Increase productivites
- Lower overall costs and enhance safety for both road workers and users
- Reduce carbon emissions by completing the work in approximately half the usual time
- Enable the construction of a high-quality asset without the need for extensive rework.

The TWRAP has been designed to accommodate projected traffic growth and deliver long-term resilience, ensuring these SH1 sections are fit for future demands.

The accelerated programme model represents a pioneering effort in Aotearoa's pavement renewal sector - aligning closely with the NZTA's new Integrated Delivery Model (IDM) to enhance future infrastructure delivery practices.

This case study sets out the findings from the project team's strategic review of the most effective ways to optimise delivery through innovative methodologies and operational efficiencies under the accelerated model.

INTRODUCTION TO TWRAP MODEL AS TRANSFORMATIVE APPROACH

TWRAP is an accelerated construction programme designed to provide a long-term solution for addressing pavement maintenance needs across the network. In response to the ongoing challenge of underinvestment, the programme aims to reinvest in the network and restore it to the expected level of service by delivering five years' worth of planned works within just two construction seasons (18 months).

This accelerated construction activities plan includes an increased focus on resilience, requiring a 25-year design life, rather than meeting minimum serviceability standards.

OVERARCHING STRATEGY

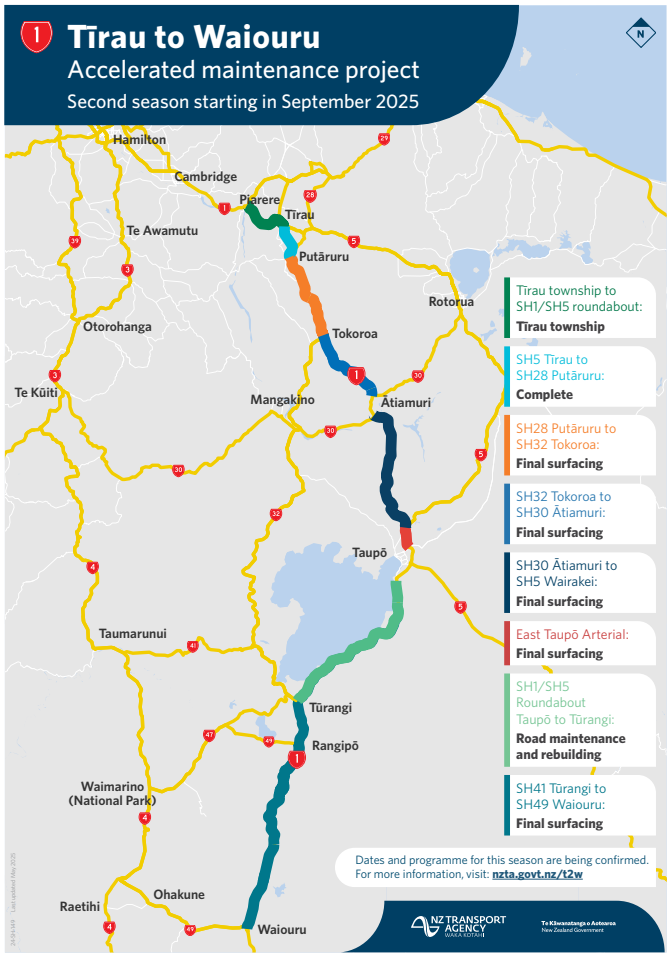
For TWARP State Highway 1 was divided into eight zones with efficient detour routes capable of handling heavy vehicles:

- Zone 1 – Tīrau township to State Highway 1/State Highway 5 roundabout.
- Zone 2 – State Highway 5 Tīrau to State Highway 28 Putāruru
- Zone 3 – State Highway 28 Putāruru to State Highway 32 Tokoroa
- Zone 4 – State Highway 32 Tokoroa State Highway 30 Ātiamuri
- Zone 5 – State Highway 30 Ātiamuri to State Highway 5 Wairakei
- Zone 6 – East Taupō Arterial
- Zone 7 – State Highway 1/State Highway 5 Roundabout Taupō to Tūrangi
- Zone 8 – State Highway 41 Tūrangi to State Highway 49 Waiouru

Within these zones, TWRAP has been enabled to:

  - Manage the closure of large sections of state highway to reduce temporary traffic management costs, improve productivity, and enhance safety for both road users and workers.
  - Implement concurrent zone closures where suitable detour routes are available.
  - Incorporate routine maintenance activities within zone closures to support a 25-year design life.

By maximising output during closures, NZTA and District Councils have been able to integrate other critical activities into the construction sequence – such as structure replacements, intersection upgrades, and local road improvements adjacent to the highway.



WORK UNDERTAKEN DURING SEASON 1

Season one for the TWRAP took place during the roadworks period, running from September 2024 through to April 2025.

By committing early to the full programme, it allowed all parties to commit and mobilise a highly experienced and capable team.

The scale of works required close collaboration and clear communication with each other and with the community, local councils, iwi, the freight industry, emergency services, bus companies, and tourism organizations to minimize the effect of staged closures and lessen disruptions associated with alternative route planning.

Season 1 saw the successful delivery of:

- Total length completed: 119 lane kms (~601,000m^2), including:
  - Road rebuilds using foam bitumen stabilising: 63 lane kms (~318,000m2), including a thin asphalt concrete surface layer: 6 lane kms (~30,000m^2)
  - Road rebuilds using structural asphalt concrete: 9 lane kms (~44,000m^2)
- Re-seals using chip-seal: 47 lane kms (~239,000m^2)
- Tonnes of aggregate used: ~198,366t
- Truckloads of metal: up to 145 loads per day delivered across all sites
- Number of workforce hours to date (road crews): ~110,000 hours
- Number of lost-time injuries: zero
- Number of contracting firms utilised: up to 32 working at once.

Most Structural Asphaltic Concrete (SAC) and Thin Asphaltic Concrete (TAC) has been programmed for season two, due to start in September 2025. In areas where detour lengths were long and SAC sites could be completed within the existing road closures, they were brought forward and programmed into season one.

KEY BENEFITS AND VALUE FOR MONEY DELIVERED BY TWRAP MODEL

The accelerated model and block closures allows longer treatment lengths, a more robust design and a greater focus on quality of construction. In addition to direct cost savings and efficiencies, there are several wider key benefits under this model.

Cost Escalation Savings

The accelerated programme model avoids escalation costs over the forecast 5-year period. TWRAP has seen an expected $16.6M in cost escalation savings by consolidating the 5-year BAU programme into an 18-month period.

Long-term asset performance

The 25-year design life ensures long-term asset durability, minimises future maintenance costs, and enhances overall resilience compared to existing infrastructure.

The adoption of a 25-year design life requirement for pavement rehabilitation, as implemented in the TWRAP, offers substantial advantages over the traditional minimum level of serviceability approach. These benefits span financial efficiency, operational reliability, sustainability, and network resilience.

Lower Life-Cycle Cost

A direct comparison shows that the cost of delivering a 25-year pavement under TWRAP—featuring enhanced materials, increased pavement thickness, and higher construction standards—is comparable to the cost of the catalogue designs used under the Central Waikato NOC.

Reduced Maintenance and Disruption

Pavements designed for extended life are engineered to endure greater traffic loads and environmental stressors. This resilience leads to fewer maintenance interventions on those areas rehabilitated, minimising the need for routine patching, resurfacing, or structural upgrades. Consequently, road users will experience significantly less downtime and traffic disruption during construction and over the life of the asset due to higher quality.

A key advantage under the accelerated model was the project's capacity to deploy additional crews and extend usual working hours to consecutively carry out large-scale stabilisation works. Under stop-go traffic control (BAU model), it would not be feasible to undertake three or four large-scale stabilisation sites consecutively as this would result in excessively long traffic queues with potential delays of several hours.

Under a traditional stop/go it would have taken approximately 5 years to complete what the TWRAP project has delivered in 18 months.

Enhanced Service Quality and Safety

Long-life pavements maintain smoother surfaces over time which improves ride quality and reduces safety risks associated with surface degradation. Additionally, fewer maintenance activities reduce the number of work zones, thereby lowering the risk of work zone-related incidents for both road users and maintenance crews.

Environmental and Sustainability Gains

Reducing the frequency of rehabilitation cycles substantially decreases the consumption of raw materials, energy use, and greenhouse gas emissions associated with construction. This aligns with broader sustainability objectives and supports NZTA's commitment to environmentally responsible infrastructure delivery.

Improved Planning and Investment Certainty

A longer design life enhances infrastructure planning by enabling more predictable maintenance schedules and long-term budgeting. It provides greater certainty for asset managers and opens opportunities for alternative financing models, such as public-private partnerships, which favour projects with extended return profiles and stable performance metrics.

Higher Load-Bearing Capacity

Roads built for a 25-year design life are typically constructed to accommodate higher traffic volumes and heavier vehicle loads. This is particularly beneficial on freight corridors and high-growth routes, such as State Highway 1, where durability and performance are critical.

Economic Benefits

TWRAP has built a stronger, longer-lasting road that's designed to last 25 years. That means fewer roadworks and less disruption for trucks, freight, and everyday drivers using this key route. With smoother, more reliable travel, businesses can move goods more efficiently, helping the local economy grow. Over time, this will bring benefits to the region by saving time, reducing costs, and keeping things moving.

Quality

Delivering such a substantial volume of work under the accelerated model, TWRAP justified the establishment of a mobile asphalt plant for season two. This enabled the delivery of the highest quality product to site, while also reducing cartage challenges and associated costs from existing fixed plants. The central areas (Zones 7 and 8) do not have an existing plant within the designated travel time-frames to meet the standards and quantities required for the 25-year design life.

The quality of the finished work is also significantly improved. With traffic volumes of 10,000–20,000 vehicles per day removed from the construction zone, road rehabilitation can be carried out more effectively and to a higher standard. This higher standard also benefits road users through reduced overall disruption over the life of the asset.

EFFICIENCY AND COST COMPARISON

Table 1 compares the outcomes achieved under the BAU model with those realised under the accelerated programme model applied to the TWRAP, highlighting key differences in cost, efficiency, and long-term value.

A direct comparison of like for like physical works shows the TWRAP model provides an approximate 8.5% reduction in construction cost with more significant savings also observed in traffic management and Design, Investigation and MSQA.

Under the NOC BAU model, design is typically not undertaken in detail with the focus being on network serviceability standards, rather than life of the pavement. Contractors often rely on catalogue models, with limited consideration for the desired design life, knowing they will likely return within the NOC contract period to re-treat those areas.

In contrast, the TWRAP model established a dedicated design team to carry out full investigation and design services.

The design team was tasked with delivering solutions that meet a 25-year design life. Even with the greater focus on level of design, the scale of TWRAP allowed the overall cost of professional services to be reduced by 40% of the BAU costs.

This model is closely aligned with NZTA's Integrated Delivery Model (IDM) – incorporating independent design, contract administration, and MSQA (monitoring, surveillance, quality assurance) The savings observed within TWRAP are likely to observed within the new IDM as well.

The project leveraged the road closure approach, with nearly 80% of the disruptive pavement rehabilitation work completed under full closures—an essential factor in achieving the productivity and efficiency targets set by TWRAP. These block closures significantly reduced road worker exposure to traffic (both in volume and speed) and minimised the need for road users to travel through active work sites, which are a common cause of crashes.

Table 1: Cost comparison between BAU and the Tīrau to Waiouru Rehabilitation Accelerated Programme.

FACTOR	BAU	TWRAP MODE	DIFFERENCE (%)
Project Duration	5 years	18 months	
Physical Works	$125.8m	$115.1m	-8.5%
Extra over for ancillary improvements and 25 year design		$9.6m	
Traffic Management Costs	$15.1m	$8.7m	-43%
Design, Investigation and Quality Assurance	$12.5m	$7.5m	-40%
Indirect Costs *(detour costs, legal fees, detour costs, other contractor, and sundry NZTA costs)*	$1.2m	$1.7m	42%
Total Project Cost	154.6m	142.6m	-8%

EFFICIENCY AND COST COMPARISON *CONTINUED*

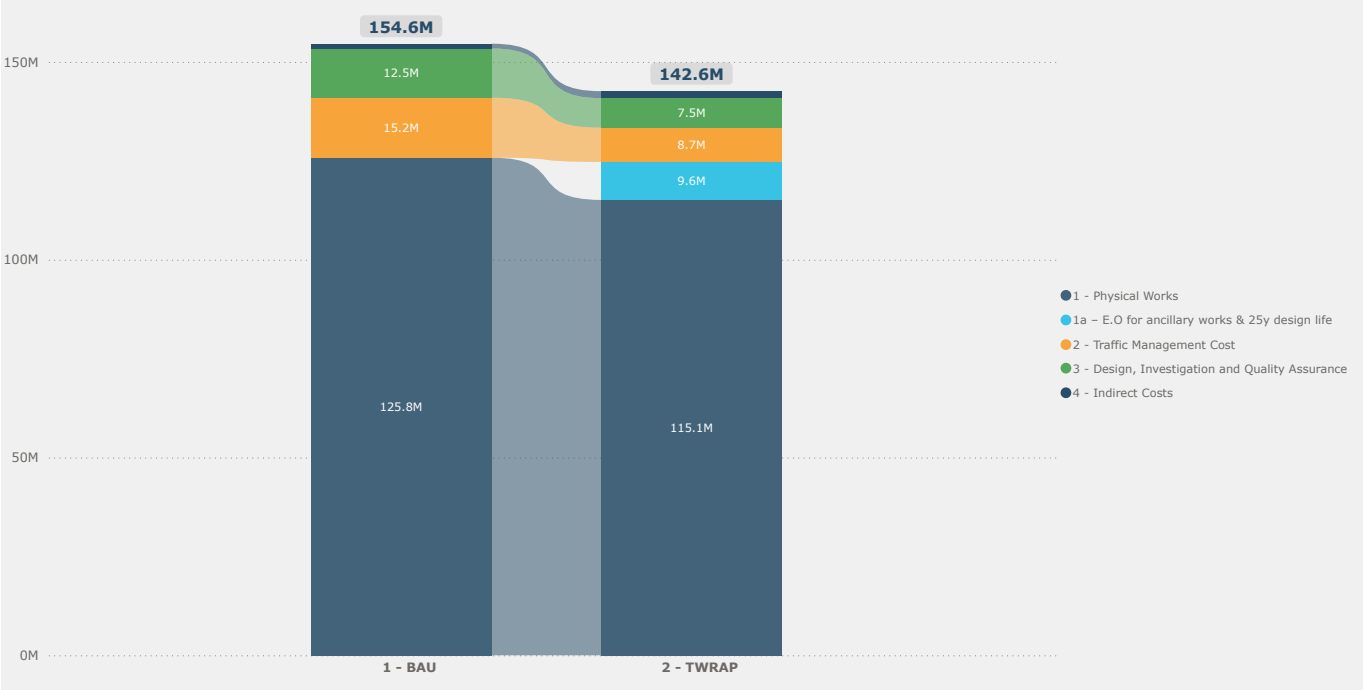


Figure 2: Forecast TWRAP Cost per work type based on current scope (May 2025)

A comparison of material production rates between the Central Waikato NOC (BAU) and TWRAP shows notable improvements in daily productivity (see table 2).

Beyond cost-effectiveness, accelerated model efficiencies enhance construction quality by minimising interruptions to sequencing and significantly reducing rework. With fewer disruptions and more continuous workflows, the model delivers a more resilient road network as well as more efficient use of resources across the project.

The accelerated programme model improved production efficiency on the TWRAP by optimising operations and minimising downtime. Initiatives including extended work hours, double shifts (where feasible), strategic road closures, and longer work sections increased production efficiency by over 40%. These enhancements contribute significant cost reductions, and is forecast to result in less maintenance on the road thereafter.

Table 2: Daily production rate comparison between Central Waikato NOC against what was achieved through the TWRAP.

DESCRIPTION	CWNOC (PER DAY)	TWRAP (PER DAY)	DIFFERENCE (%)
Quantity of FBS (m^2)	3000 – 4000	5000 – 7000	71%
Qty Bitumen used (T)	46 – 64	66 – 92	44%
Qty of aggregate delivered (T)	600 – 1100	1800 – 3000	182%
Chipseal (m^2)	5000	8000	60%

CUSTOMER AND STAKEHOLDER BENEFITS

The TWRAP programme delivers a series of benefits to key stakeholders and the wider public - primarily through staged full road closures, improved coordination, and long-term planning. These advantages contribute to a more efficient, cost-effective, and safer construction environment, while also improving the end-user experience.

Reduced Traffic Management

By implementing full road closures, temporary traffic management (TTM) requirements within construction zones are significantly reduced. With minimal public access through active work areas, the need for complex and resource- intensive TTM setups is greatly diminished. Less cones and less confusion.

Concurrent Maintenance Efficiencies

Full closures provide an opportunity to complete other network maintenance and upgrade activities concurrently. Routine maintenance tasks, such as drainage improvements or barrier installations, can be integrated into the delivery sequence, increasing efficiency and minimising the need for future interventions. During TWRAP it enabled other local authorities to carry out adjoining work with little to no TTM.

Enhanced Stakeholder Satisfaction

Improved road quality and fewer disruptions during and after construction contribute to higher satisfaction among stakeholders, including road users, local communities, freight operators, and public agencies. The reduction in long-term maintenance requirements supports more predictable travel and logistics outcomes.

Faster Project Completion

Executing multiple construction activities simultaneously—both pavement rehabilitation and associated maintenance—allows for faster project completion. Full closures accelerate work schedules by providing uninterrupted access for crews, reducing the overall duration of disruption to the public.

Improved Safety for Workers and Road Users

The removal of live traffic from the work zone significantly minimises exposure to high-speed vehicles, reducing on-site safety risks. This results in a safer working environment for crews and a smoother, safer experience for motorists once the road is reopened.

Minimised Long-Term Disruption

While initial closures may be disruptive, the long-term benefits are substantial. The reduced need for ongoing maintenance, patching, resurfacing, or structural upgrades means road users experience significantly less downtime and traffic disruption in the long term.

Planned and Integrated Detour Management

The model requires the detour routes to be inspected, developed and circulated well in advance of closures as some assumed detours may not be capable of carrying SH1 traffic volumes and there is a need for clear, reliable guidance to road users. Suitable routes are also integrated with digital navigation platforms (e.g. NZTA Journey planner, Google Maps, and Apple Maps), reducing confusion during construction phases.

QUALITY AND PRODUCTION IMPROVEMENTS

The TWRAP programme adopted a holistic and data-driven design philosophy, placing a strong emphasis on quality, durability, and risk mitigation from the outset.

Expert-Led Design Process

Subject Matter Experts (SMEs) are engaged from the earliest stages of the project to ensure the design approach aligns with real-world performance requirements and localised conditions. Pavement treatment types are selected based on historic condition data, supported by targeted investigations and field testing. All detailed designs undergo validation and independent peer review to provide a high degree of confidence in performance outcomes.

Construction Sequencing Through Road Closures

The use of planned road closures allows for uninterrupted construction workflows and improved sequencing. By keeping traffic off freshly laid pavement during the critical early curing phase, the project significantly reduces the risk of premature damage and minimises the need for rework. This contrasts sharply with traditional BAU methods, where live traffic exposure often compromises the final outcome.

Key Quality Enhancements Enabled by the TWRAP Approach:

- Fewer Pavement Joints: Reduced construction joints result in fewer weak points, decreasing the likelihood of cracking or surface deterioration.
- Minimal Traffic Interference: The absence of live traffic during active construction reduces interruptions and improves safety for crews and consistency in workmanship.
- Improved Weather Resilience: With fewer constraints from passing vehicles, weather-related delays and complications are easier to manage.
- Full-Width Construction: Road closures enable longer, continuous paving runs and full-width rehabilitation, contributing to a more uniform and durable pavement surface.
- Dedicated Quality Assurance Oversight: In alignment with the IDM, an independent quality assurance team is embedded throughout the project lifecycle, providing cost-effective oversight and ensuring adherence to best practices at every stage.
- Extended Pavement Life: By elevating both design and construction standards, the project achieves a design life of 25 years— far exceeding the typical catalogue standard under BAU—offering long-term performance and reduced maintenance requirements.

COMMERCIAL MODEL & BUDGET EFFICIENCY

The TWRAP programme adopted a cost-reimbursable commercial model with a fully open-book approach, giving NZTA visibility into the true costs of road maintenance. The project allowed the Agency to see the actual costs for various treatments, enabling more informed, network-focused decisions without being influenced by commercial margins or profit-driven choices.

The cost-reimbursable approach offered the flexibility and responsiveness needed for large-scale, fast-paced programmes like TWRAP. As work progresses, the scope naturally evolves in response to factors such as ground conditions and emerging needs – making this model a practical and effective fit.

The programme has been structured to allow for scalability—scope can be increased if delivery exceeds expectations or reduced if constraints arise—ensuring prudent fiscal management without compromising safety or quality.

Ultimately, while this commercial model presents some challenges, it has proven effective in enabling responsive, high-output delivery across a complex and geographically diverse corridor.

CONCLUSION/ TAKEAWAYS

The TWRAP model offers a benchmark for future asset management delivery strategies including a step-change in how infrastructure projects can be delivered for both agencies and end users. This extends to long-term asset resilience by reducing lifecycle costs and allowing greater certainty in infrastructure planning and investment.

The TWRAP demonstrated the viability and advantages of a fundamentally different approach to pavement renewal on New Zealand's state highway network. By condensing five years of traditionally phased work into an 18-month programme, TWRAP accelerated delivery and delivered measurable gains in cost efficiency, quality, safety, site efficiency, design life, and long-term value. This included significant savings in traffic management and design costs, while also avoiding more than $16 million in anticipated cost escalation.

While the model was noted to come with challenges, particularly around design readiness and scope flexibility, the benefits far outweigh the limitations. With appropriate refinements, including earlier design lock-in and more robust performance-based incentives, the TWRAP provides a case study for the broader application of the accelerated programme model across the state highway network and supports NZTA's aspirations to deliver faster, better, and to higher standards.