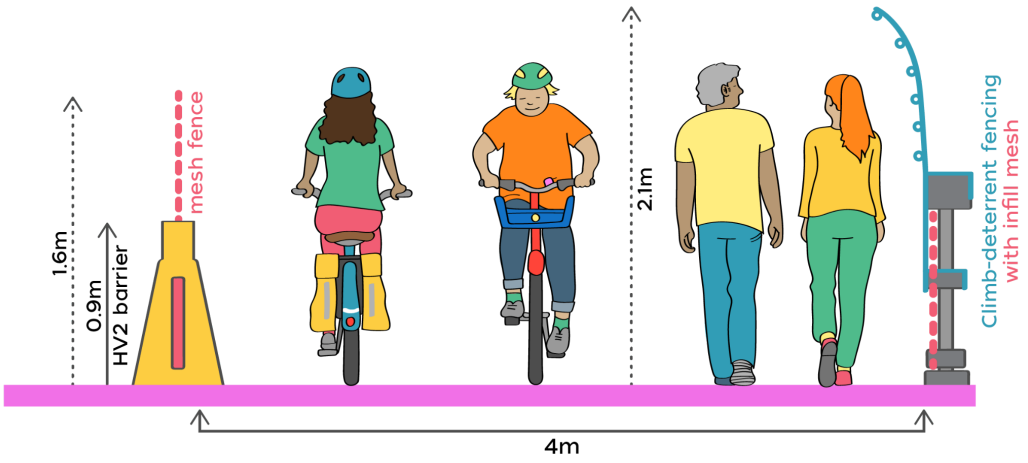
Liberating the Lane, an assessment

Bike Auckland executive summary of Smartsense Ltd. report 2023

Overview

Bike Auckland commissioned SmartSense Ltd to investigate the feasibility of liberating a lane on the Auckland Harbour Bridge for active mobility - walking, cycling and other personal mobility options. The resulting report concludes that:

- There is **existing capacity on the Harbour Bridge** to support a lane permanently being used for active modes without significantly impacting on motor traffic
- A **safe design** would include:
    - A shared path for active modes located on the most easterly clip-on lane. The east side provides for better protection from wind (predominantly Westerlies), easy access on and off the bridge, and stunning views of the harbour and city
    - The use of free-standing HV2 Steel/Concrete composite barriers with mesh fence between the shared path and the motor traffic. This is a relatively lightweight barrier which Waka Kotahi has already approved the use of in Aotearoa NZ
    - An anti-climb barrier along the eastern edge of the bridge for suicide prevention, as has been effective on comparable bridges overseas
    - Potential for a 4metre shared path width which is within the Austroads guidance for gradient (5%) and width with the expected usage
    - Potential for dampers to be placed between the bridge and the clip-on (to prevent movement caused when a significant number of pedestrians march across at the same time)
    - Potential for a 60km/h speed limit for the motor-traffic in the lane adjacent to the shared path for additional safety if considered required



We consider that a cross-section similar to the image above would be a pragmatic, cost effective, and realistic design for an Auckland Harbour Bridge Shared Path.

- Based on data from Waka Kotahi, weather conditions on the bridge appear suitable for walking and cycling for 98% of the year. The shared path would be affected by adverse weather conditions approximately 3 - 7 days per year, similar to other road users.

Artist's impression of a shared path over the Auckland Harbour Bridge

SmartSense Ltd. estimates that access for walking and cycling across the Auckland Harbour Bridge could be delivered within 8 months for under 30 million dollars.

Bike Auckland notes that this is both affordable and can be rapidly delivered, and is a vital equitable solution for transport choice and emissions reduction in Tāmaki Makaurau, Auckland.

Not included in Waka Kotahi's assessment are the following benefits;

- ★ Empowers people to choose climate-friendly travel resulting in emissions reductions
- ★ More transport choice for people who don't drive
- ★ Saves people money
- ★ Creates a more resilient transport system
- ★ Delivers greater health and wellbeing from active travel
- ★ Greater independence, especially for children
- ★ Culturally significant crossing
- ★ Fun to cross and with great views for locals and visitors alike!
- ★ Potential to relieve congestion across the transport network as people switch to walking, cycling, and public transport

Note: Bike Auckland commissioned SmartSense Ltd. to create the following two reports, but for simplicity we are referring to them as one report. They are as follows:

1. Assessment of Waka Kotahi Safety Concerns Related to Active Mode Provision (on the Auckland Harbour Bridge)
2. Report on Traffic Flows on Auckland Harbour Bridge 2013-2023

Liberating the Lane, assessment by Smartsense Ltd. 2023

Bike Auckland summary (the long version)

Context

Auckland Harbour Bridge (Auckland Harbour Bridge) is a critical transport link connecting State Highway 1 (SH1) from Auckland central to the North Shore and carrying traffic further afield on the State Highway network. Presently Auckland Harbour Bridge is closed to non-vehicular transport modes including walking and cycling. This creates equity concerns for non-drivers including young, elderly, disabled, and low-income residents. It is a direct constraint on Auckland's regional capability to achieve policy and strategic outcomes for climate, population health and transport network resilience.

In October 2021, the Minister of Transport requested the chair of Waka Kotahi investigate options for trialling walking and cycling access on the existing harbour bridge. Investigative work was undertaken which resulted in the presentation of a paper[1] to Waka Kotahi's Investment and Delivery committee (I&D) which advised "that the Board consider offering the Minister the opportunity to host an event, or series of events, as opposed to a trial."

The purpose of this report is to review the robustness, accuracy, and completeness of the investigations on which advice and recommendations for a trial of walking and cycling on Auckland Harbour Bridge were presented to Waka Kotahi's Investment and Delivery committee.

Key Considerations

The investigative reports on which advice to the I&D committee were based identified two principal areas of concern: *Network impacts* (relating to potential traffic congestion) and *safety risks*. The reports did not take into consideration climate change and emissions reduction; equity and transport choice; or population health, including physical inactivity and air pollution. As such, the reports did not identify risks and opportunities nor alignment with policy and strategic objectives associated with the status quo or any proposed changes to Auckland's transport system.

[1]Investment and Delivery Committee Paper, Auckland Harbour Bridge Walking and Cycling Event, 23 November 2021

Network Impacts

Waka Kotahi references[2] "significant network implications" associated with trialling walking and cycling on Auckland Harbour Bridge, however documentation released under the Official Information Act 1982 does not conclusively support this. At the time of consideration by the I&D Committee only a draft Traffic Impact Assessment[3] is known to have been prepared, with a note included in the document scope stating "The elements discussed in this document are explorative and have been developed for the purpose of discussion only."

SmartSense Ltd has analysed the available traffic count data for the Auckland Harbour Bridge (from 2013 onwards) to assess the impact of repurposing one lane from vehicle traffic to active travel.

With one lane repurposed, and careful management, the remaining seven vehicle lanes can provide sufficient capacity for current peak period traffic demand. This takes no account of mode-shift or time-shifting. People using motor vehicles are unlikely to be significantly negatively impacted by the creation of an active lane. No evidence has been found to support Waka Kotahi's statement that a traffic reduction on the Auckland Harbour Bridge of 17,000 vehicles per day would be required to avoid wider traffic disruption in Auckland. The 3, 4, and 5 lane hourly traffic capacities used by Waka Kotahi to assess traffic flow have been demonstrated to be relatively conservative, with proven capacities higher than these.

The data shows that peak period traffic volumes have been declining since 2016. Even ignoring behaviour change and traffic evaporation effects, the average southbound morning flows could generally have been accommodated in 4 lanes (rather than the 5 provided) from 2018 onwards. Northbound, the same trend achieved close to a 4 lane capacity in late 2019. Under the same overly conservative assumptions, trend data from 2016-2019 indicated that the three-hour peak period traffic flows on the busiest days of the year would be fully accommodated with a 4-lane capacity by 2021 (southbound) and by 2022 (northbound). As it panned out, the pandemic reduced traffic flows, and capacity was not a concern from early 2020 onwards.

The last few years therefore presented a golden opportunity for Waka Kotahi to make better use of the Auckland Harbour Bridge. Even using entirely orthodox transport planning, they had the data to be confident that the creation of an active lane on the Auckland Harbour Bridge would improve travel options. This would have been wise management even before the pandemic reduced traffic volumes further, and the heightened need for open-air, reliable travel options was already apparent.

There has been demand for crossing the Auckland Harbour Bridge by foot and by cycle since it first opened in 1959, with recent surveys by Waka Kotahi showing that 66% of Aucklanders would walk or cycle across te Waitematā[4]. Enabling people to have access has a high potential for easy, healthy journeys, and provides an opportunity to get Aucklanders out of traffic and reduce our emissions.

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[2] Ministerial briefing note BRI-2265, Auckland Harbour Bridge shared path – Interim findings presentation, 6 August 2021
[3]Auckland Harbour Bridge Active Mode Provision - Traffic Impact Assessment, 24 June 2021
[4]Waitematā Harbour Connections engagement summary - Waka Kotahi, February 2023

There's growing urgency for climate action – and 45% of Auckland's emissions are from transport, with 79.9% of that from cars[5]. We have an opportunity to reduce emissions by giving people options for climate friendly transport like walking and cycling. Because of this, the Climate Commission's draft advice includes completing cycle networks in main cities by 2030; and the Auckland Harbour Bridge is a big missing gap in our network!

We also need more transport choices for greater resilience of our transport network. And, we are in a cost of living crisis. Giving Aucklanders more choice for how they travel will enable people to be able to let go of the high cost of owning and maintaining a car. These shifts in transport behaviour would have a positive impact on the wider transport network.

The lane conversion capacity analysis undertaken by SmartSense Ltd is based on historic data and takes no account of any trip reduction / reassignment / time shifting / migration to active transport and public transport that may have occurred had a lane already been converted. This was a deliberately conservative approach, in order to be clear that the analysis does not rely on assumptions of behaviour change or policy levers such as congestion charging.

Safety Risks

Waka Kotahi's safety concerns are based on a Safe System Assessment[6] which compared the existing bridge layout with a scenario where a single lane on the eastern side of the bridge is opened for walking and cycling. Many of the safety risks identified in the Safe System Assessment appear to have been significantly overstated, and the report contains incorrect underlying assumptions about wind conditions, traffic volumes, bridge gradient and shared-use path design.

A recent shortlist of future Waitematā Harbour crossing scenarios released by Waka Kotahi includes options where active modes are provided for on the existing harbour bridge, effectively undermining their own Safe System Assessment and demonstrating that any risks that remain can be sufficiently controlled or mitigated if desired.

Residual safety risks beyond those easily controlled or mitigated through low-cost interventions relate to the level of danger posed by the width, length, and gradient of a proposed shared-use pathway. By cross-referencing existing and newly built facilities with similar or more challenging lengths, widths and gradients, this report concludes that the risk of active-modes crashes on any Auckland Harbour Bridge pathway is low, with no supporting evidence to the Safe System Assessment categorization of such risk as "highly likely based on the crash trends observed elsewhere on Tāmaki Makaurau Auckland's network". The Safe System Assessment for the Auckland Harbour Bridge appears to take a far more cautious approach than is being applied on other Waka Kotahi built and funded infrastructure.

[5]Auckland's Greenhouse Gas Inventory to 2019 - Auckland Council, April 2022
[6]Auckland Harbour Bridge shared path safety assessment, 18 February 2022

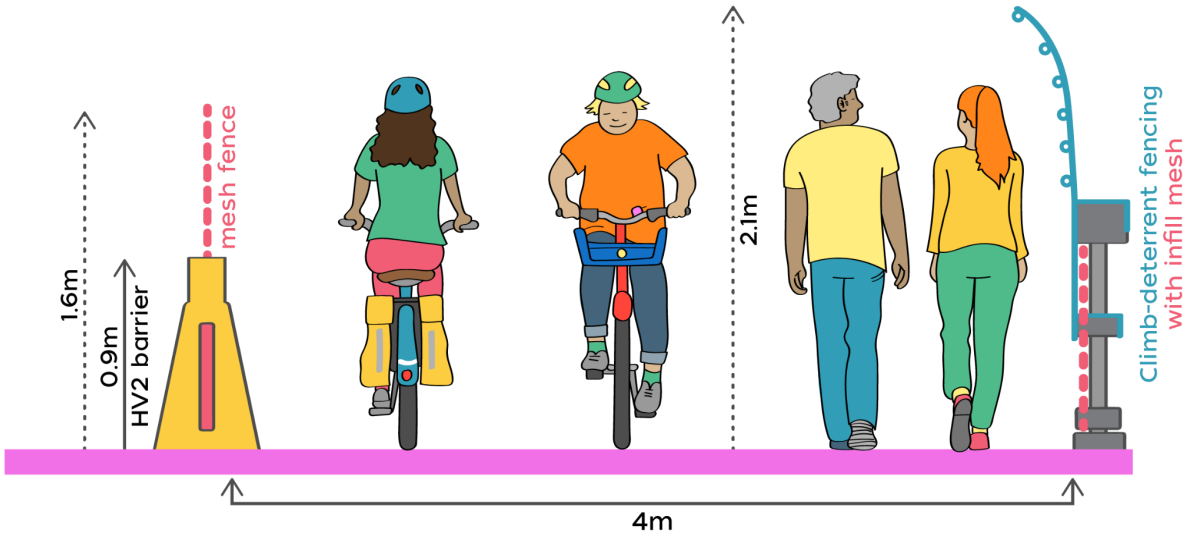
By excluding the health benefits of active travel, the assessment fails to quantify risks against potential benefits. Waka Kotahi guidance for cycling health and safety[7] states: "Regular cycling has been shown to significantly reduce the risk of serious ill-health from inactive lifestyles, cutting rates of heart and respiratory (cardio-vascular) disease, cancer and Type II diabetes. ***These positive outcomes far outweigh any risk from injury*** (emphasis added)".

This report concludes that the Auckland Harbour Bridge assessment is overly pessimistic, and uniquely inconsistent with safety standards applied elsewhere on the transport network where Waka Kotahi build, operate and maintain facilities which present considerably greater risk to pedestrians and people travelling by bicycle.

The Design Solution

The solution proposed for repurposing a lane for walking and cycling is:

- Reallocation of the most easterly clip-on lane (4m) from traffic to a shared path for active modes. This side provides for best access on and off, better weather protection, and views of the harbour and city.
- The provision of a free-standing HV2 Steel/ Concrete composite barriers with Mesh fence (combined 1.6m high) between the active modes lane and the traffic lane, and an anti-climb barrier on the eastern edge of the Auckland Harbour Bridge clip-on (2.1m high)
- It is recognised that this is not a 'perfect' solution, however it is achievable and offers path users a higher level of safety than they have on many thousands of unprotected paths and cycleways.



[7]https://www.nzta.govt.nz/walking-cycling-and-public-transport/cycling/workplace-cycling-guide/why/health-and-wellbeing/

Overall we consider that a cross-section similar to that shown in the figure above would be a pragmatic, cost effective, and realistic initial design for the Auckland Harbour Bridge Shared Path.

This design negates all structural and safety concerns posed by Waka Kotahi.

Bridge Structural Integrity

SmartSense Ltd assessed Waka Kotahi's selected barrier option and other viable solutions. It is understood from Waka Kotahi that any barrier solution could not be fixed to the bridge and needs to be light enough to not overload the bridge deck, but strong enough to protect walkers and cyclists.

Suitable barriers to separate cars, buses and trucks from people walking and biking are already approved by Waka Kotahi for highway use. The design recommended is the HV2 (MASH TL-4) barrier. Its relatively lightweight and simple installation design ensures the bridge's structural integrity is not compromised.

The assessment undertaken by Waka Kotahi assumed a barrier deadweight of 715kg/m length (SRTS Barrier) and flagged this option as 'Overloaded'. In contrast, the HV2 (MASH TL-4) barrier has a linear mass of 360kg/m and was approved for use on New Zealand roads by Waka Kotahi in May 2019. As this barrier is approximately half the weight of the SRTS Barrier, it is unlikely to result in structural impact concerns for the bridge.

Recent OIA releases[8] provided information on known sideways movement issues on the clip-on bridges caused by high volumes of people walking on a bridge clip-on (eg. 200 per bridge span which is roughly over 1600 people in total). This movement could put people at risk of crushing injury if they were near where the bridge and the clip-on meet. The movement is unlikely to occur when only the outer lane on the clip-on is walked on, and is not caused by cycling. Any shared path design would include a barrier between the path and the adjacent motor traffic lane, preventing people from being near the potential danger. It is predicted that a shared path over the Harbour Bridge would have a peak usage of 500 people walking on it all at once (and significantly more people on bikes!). This is much fewer walkers than would cause it to move. These effects have been known for over thirteen years and Waka Kotahi have already investigated some designs for relatively simple changes to prevent the issue occurring. In 2010 they identified that this movement can be mitigated by using dampers between the bridge and the clip-on.

Safety

Waka Kotahi's concerns about the ability of a crash barrier to adequately protect walkers and cyclists from vehicles crashing into them are valid, but are effectively mitigated by the use of

[8] OIA 12397 29th May 20203

the HV2 barrier SmartSense Ltd has suggested.

- Whilst any deflection of a large vehicle travelling at 80km/h would encroach into the active modes lane, the resulting deflection of 0.5-0.75m would be broadly comparable with a 0.5m minimum clearance between cyclists and the barrier.
- As further mitigation against barrier deflection, a lower speed could be posted on the constrained single lane on the southbound clip-on. A 60km/h limit appears to reduce barrier deflection by a further 25% for lower-mass vehicles.
- HV2 (MASH TL-4) barrier is approved for use on NZ roads. Combined with the lower speeds and reduced deflection angles of crashes on the bridge (as compared to bendier highways for which this barrier is already approved), the HV2 (MASH TL-4) barrier **is** a viable option for the Auckland Harbour Bridge.

Waka Kotahi's concerns around gradient and width are easily dismissed as there are many well-used urban cycle paths in New Zealand that are both steeper and narrower. SmartSense has investigated the alignment and geometry of the Auckland Harbour Bridge.

- There will be up to 700m of downhill, with a 5% grade at its steepest part. The original report designs confirm the bridge gradient is 5% on both sides of the bridge.
- The 5% maximum gradient is not considered in the Austroads guide to be exceptionally steep.
- Using the HV2 (MASH TL-4) barrier as we have proposed would leave a 4 metre width for the shared path
- Whilst speeds in excess of 50km/h are possible on downhill gradients, these speeds are rarely seen on shared paths due to the nature of their use, and safety measures put in place.
- A length of downhill road 700m with 5% at its steepest is not seen as a significant risk for a shared path.
- If there were still concerns, a speed limit of 30km/h could be put in place and managed by 'bridge wardens' who could provide security and a reassuring presence at all times.

Waka Kotahi's concerns about weather effects are dismissed for the following reasons:

- Waka Kotahi currently proactively advises motorists on adverse weather conditions in advance and restricts or closes the Auckland Harbour Bridge on occasion. The need for a significant advanced warning for people walking and cycling is less important, as they are likely to be closer to the Auckland Harbour Bridge and will make self-informed decisions on whether to travel over the bridge.
- It is accepted that there will be occasions (potentially at short notice) when due to high winds or exceptional rain that the active mode lane is closed by Waka Kotahi based on the ability to safely walk (or push bicycles) across the Auckland Harbour Bridge.
- From Waka Kotahi provided data, there would appear to be a likelihood that unexpected winds gusts in excess of 75km/h may be experienced fewer than five times in a year and almost exclusively from the west. On this basis, it is not considered that unexpected or strong wind gusts would be a significant issue.
- Weather effects on walkers' and cyclists' safety are not seen as a significant concern and can be well managed.

Improved facility safety through anti-climb fencing

Waka Kotahi has raised concerns around self-harm attempts over the side of the bridge with the access granted by an active mode lane. These concerns apply equally to current bridge operation; however this has not been seen as a reason to prevent people from using the bridge for driving. Implementation of an appropriate anti-climb barrier should be seen as critical *regardless* of any active-modes facility becoming operational. As such, inclusion of anti-climb fencing as part of a shared path project will lead to a net safety improvement over the status quo.

SmartSense Ltd have assessed options for suicide prevention barriers that could be placed on the outer edge of the clip-on, and have found a viable and cost-effective design that is used around the world, which is an anti-climb barrier, 2.1m high.

Conclusion

With this design, Bike Auckland is confident that repurposing a lane for walking and cycling on the Auckland Harbour Bridge is entirely feasible.