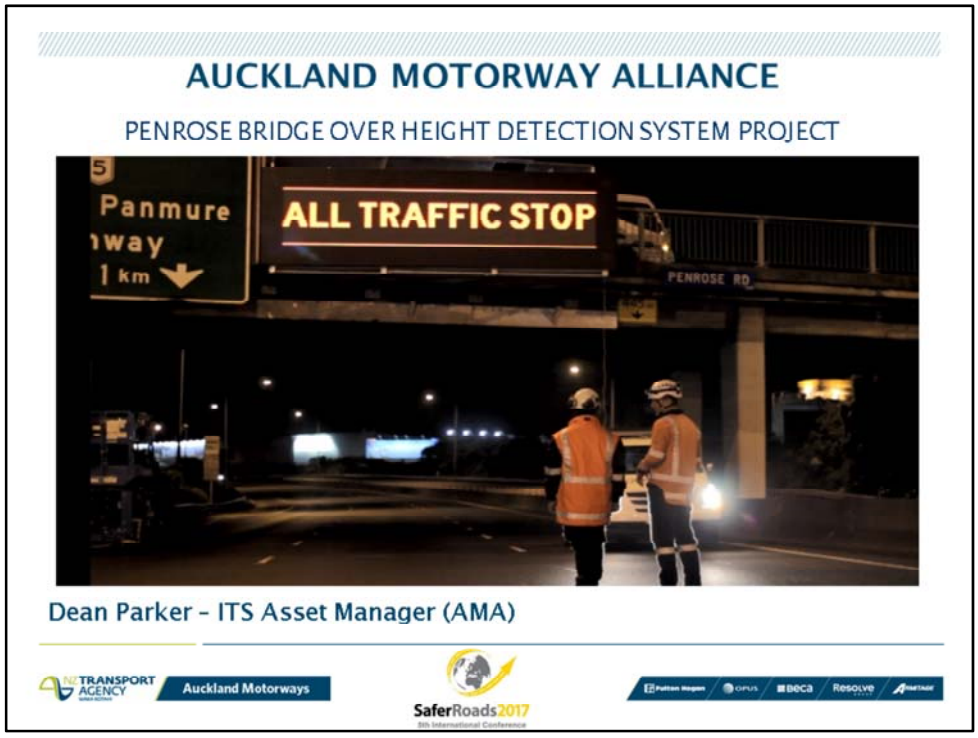


Project completed in September 2016

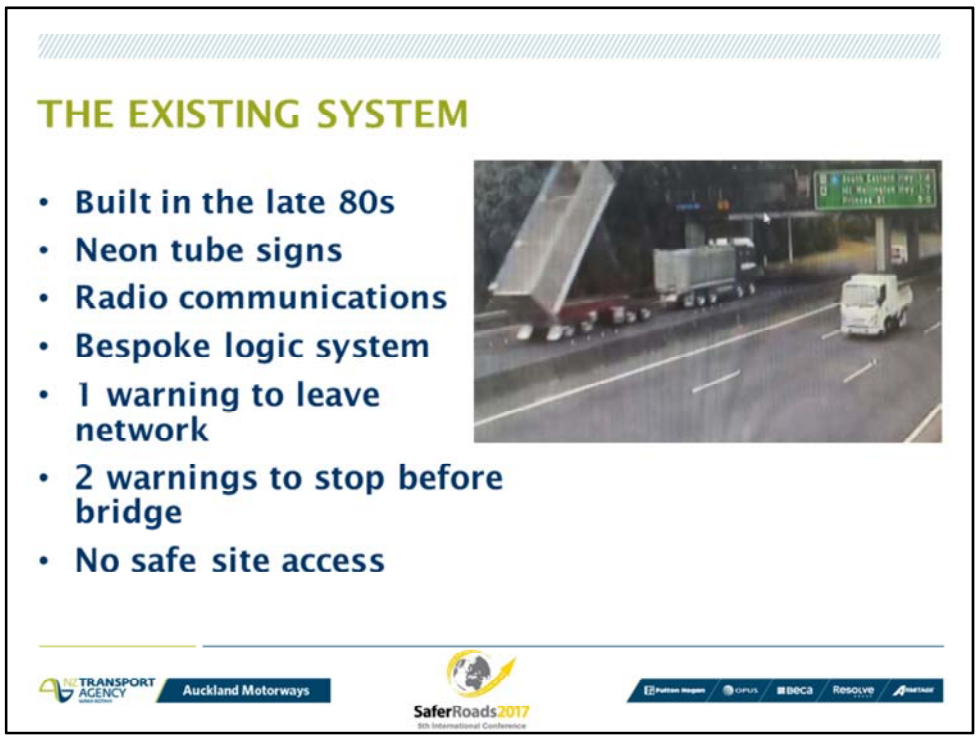
A overview of the project and please feel free to come and talk to me after if you'd like to discuss any of the details for this project

This is a video of an impact on Penrose Bridge which occurred on Monday the 9th May 2016 @ 1:15pm

The event caused 5 hours of traffic jams across the Auckland road network and had an estimated impact of $9m on the Auckland economy

More critically how close was this to being a fatal event?

Then consider that we've had at least 21 similar strikes in the last 10 years and that there have been countless near misses



There was an existing OHD system installed at Penrose bridge which was built in the late 80's following a series of bridge strikes often with cattle trucks transferring livestock

The system used technology available at the time including neon tube signs the same as you may see advertising Beer in bars in the 70's and a locally designed and manufactured bespoke logic control system with radio communications in the marine emergency band.

The original layout provided little warning to exit the motorway but gave more emphasis on stopping the vehicle at the point of no return before impact with the bridge

The sites had no safe maintenance arrangements so access was generally via a motorway closure
There was little evidence that the system had ever worked effectively and the Police and public didn't value the warnings

This picture on the slide is of the event in February 2016 which destroyed the original Neon warning sign when a trucks deck was accidently lifted in transit

Impacts with the bridge have made international news on several occasions so all eyes were on us

The bridge is above legal height and NZTA wish to maintain its current height as it protects more critical assets on the network.

The system is spread over a 7k stretch of motorway with multiple on and off ramps

The continual operation of the existing system throughout construction was seen as critical by NZTA

Human factors engineering was used to help design the layout taking into consideration driver behavior

As a New Zealand first we used full colour VMS to help elevate the visual impact of the messages

Traffic Operations Center need to receive live notifications of events to notify them of imminent impacts and provide rapid response

Safety in Design process used to ensure the new sites are safe for our people

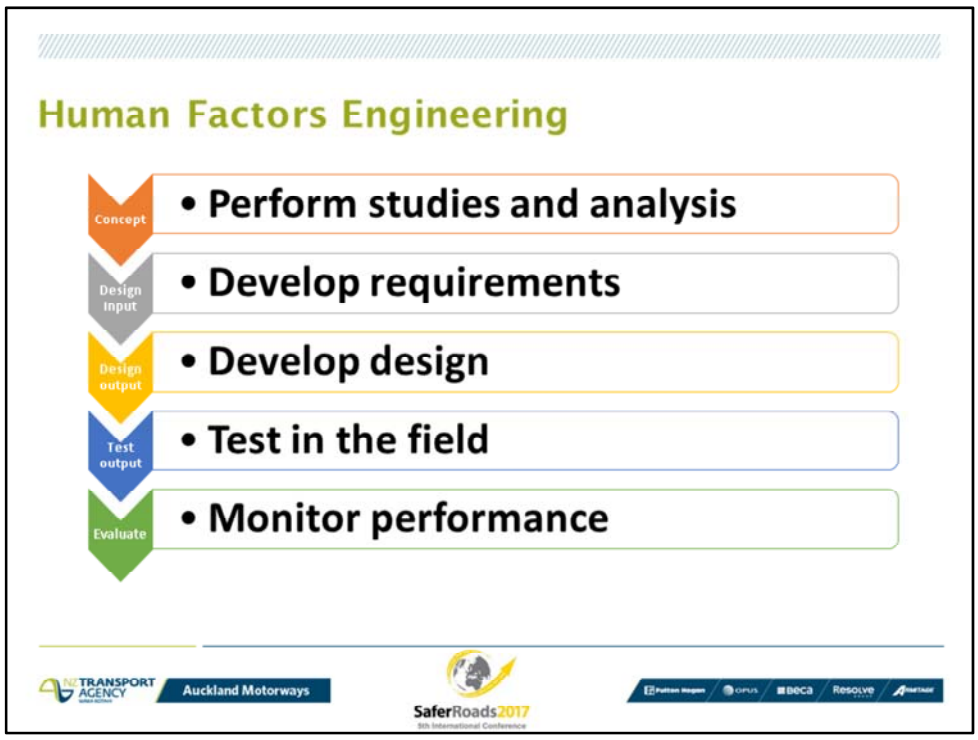
Information published in transport industry magazines, social media and workshops held with industry leaders

Our perceived threat based on historic data was from out of town vehicles where hydraulic booms had raised during transit or the load hadn't been measured prior to travel

We wanted to detect high loads and provide earlier warnings to allow vehicles to leave the network and pull over where safe

If the driver continues we need to warn them that they must stop to avoid impact with the bridge

Drivers need to know when they are passing through the system and the message needed to be simple but clear as to what to do when the signs are triggered



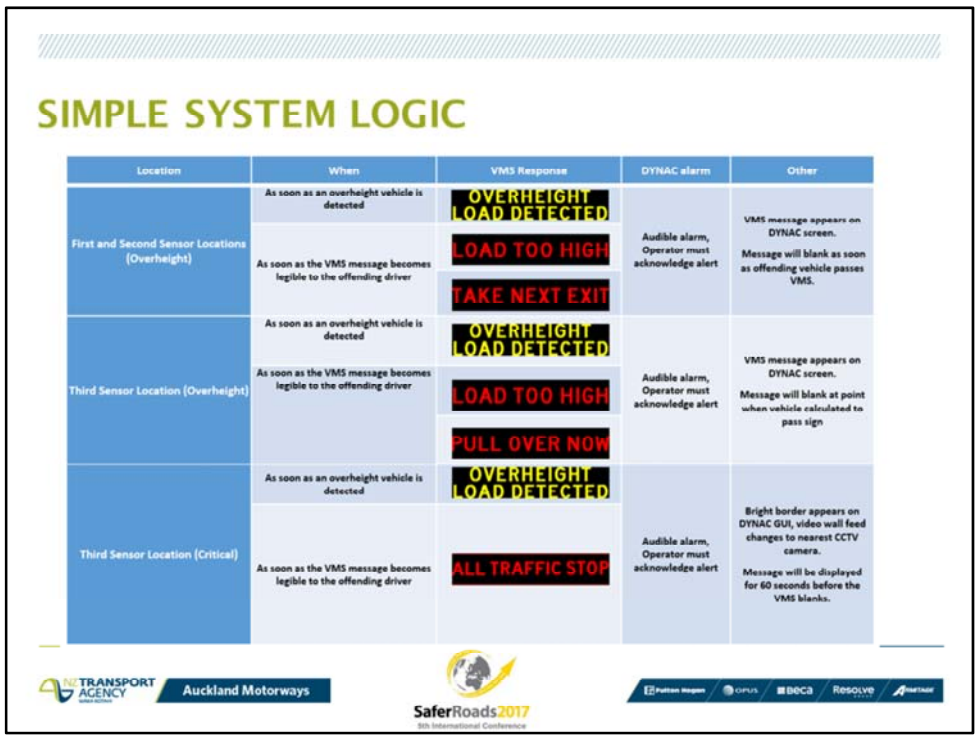
A desktop study of other systems and projects undertaken by Human factors Engineer and we found there wasn't a lot of documented research available internationally

Requirements of the system were developed around the issue we were trying to resolve

Sensor sites designed to be clearly visible to drivers
Sensors and signs linked for cause and effect

During system commissioning we took the opportunity to test colours, pictograms and different fonts in the field with the human factors Engineer

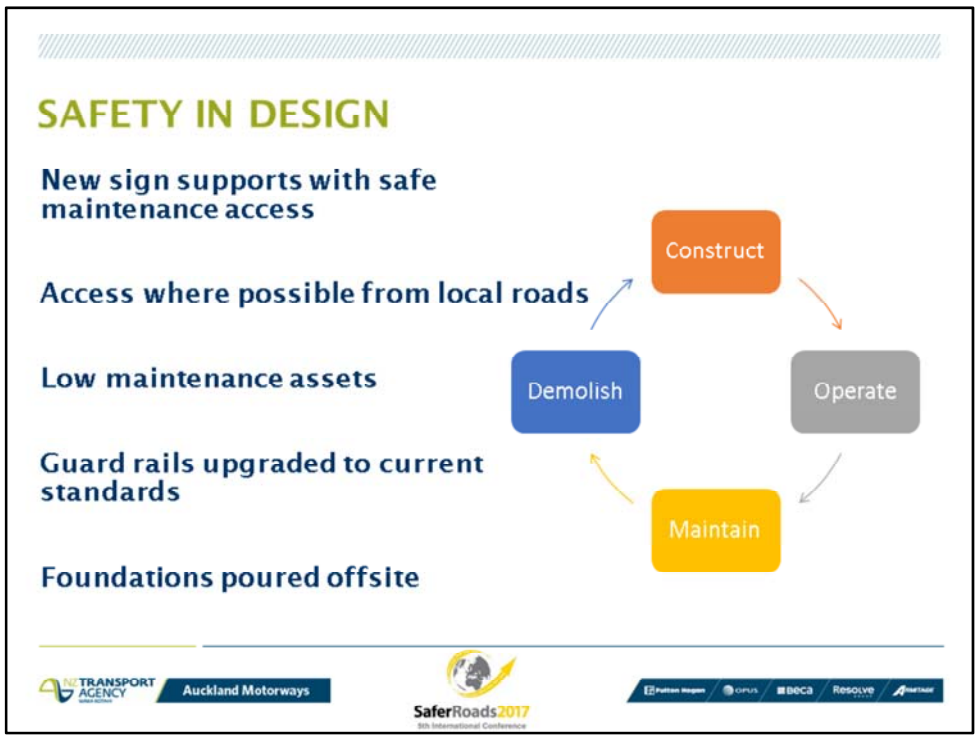
We are now in a 12 month monitoring phase to see how the system is performing not only technically but looking at activation stats and interviewing drivers to understand the effectiveness.



Each direction now has 3 sets of height triggers and warning signs which provide increasingly urgent messages as the vehicle progresses through the corridor.

The final warning approaching the bridge at impact height is "ALL TRAFFIC STOP". We understand that there is a risk of nose to tail crashes but it's a far better outcome than an over height vehicle crashing into the bridge at 90kph and the potential results.

The triggers are set around the height of the bridge minus a tolerance which we don't publish for obvious reasons.
Each trigger event provides a live warning to the Auckland Traffic Operations Center to make operators aware of potential strikes before they happen



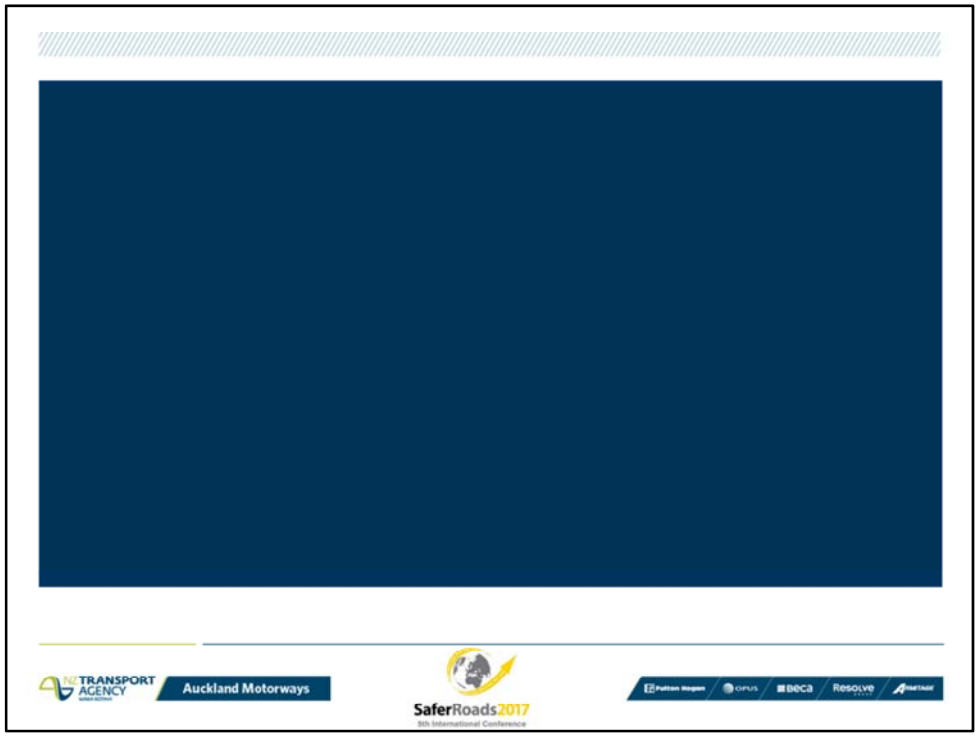
We installed 6 new gantries, each allowed safe maintenance access without traffic management and are secure against unauthorised access

Gates were added to existing fences for staff to access sites from local roads rather than from the motorway

We installed ruggedised devices that can be monitored and configured remotely to reduce need to maintain roadside assets

Old guard rails were brought up to current standard

Some of the concrete pole foundations were cast offsite to reduce impact on traffic due to construction



As part of our industry and public education stream we developed a video to help people understand how the system operates.

1:38 video

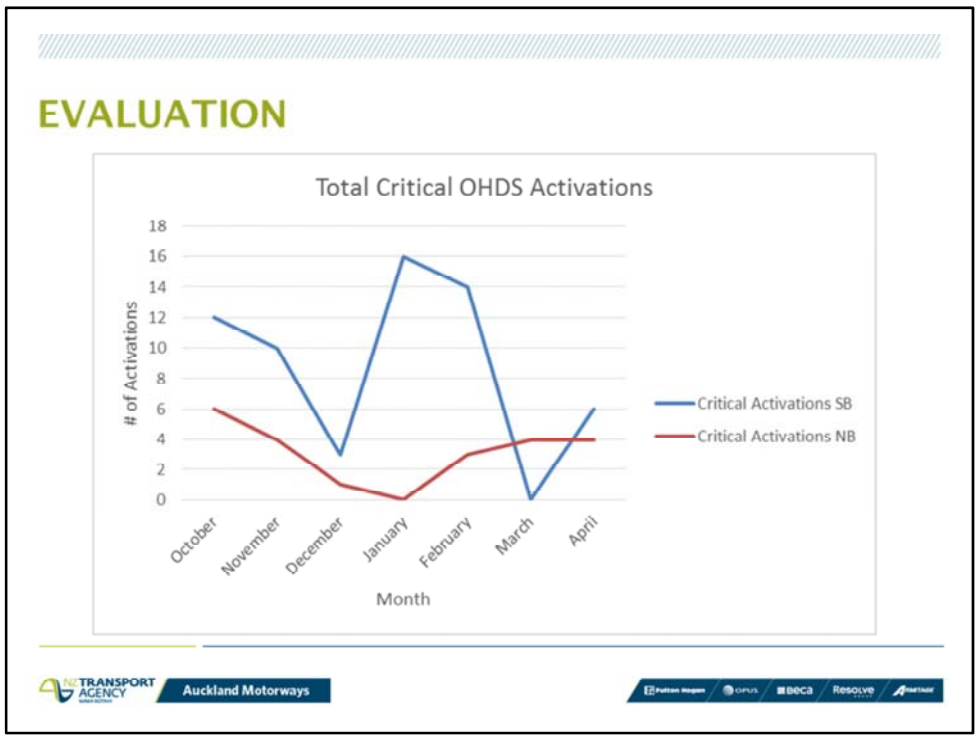
We tested international guidance on the use of pictograms and colour messages.

Many over height vehicles have stopped before the bridge – this is unprecedented

The system stopped a truck carrying a shipping container which would have caused a significant impact on rush hour traffic

Ongoing we continue to engaged with the industry to educate them about the risks of ignoring the warnings

We are currently developing guidelines for the design of future systems



We‘ve been holding interviews with truck drivers and the feedback about the system has been very positive, drivers tell us that the system is simple to understand and warning can’t be missed.

However drivers who regularly pass under Penrose bridge have an idea of what they can get away with and ignore the legal limit and the warnings.

Its early days yet and with the Christmas holiday the data is a little skewed however it critical events have decreased since we implemented the system.

We are revisiting our "check your height" campaign to refresh the message especially following the changes to the VDAM rules

We are working with the Police and NZTA access and use around enforcement for drivers consciously ignoring the warnings

A wider network strategy has been produced and has been put forward for approval

In conclusion this could have been just another ITS project rolling out technology based on gut feelings and personal opinions, but the use of human factors input was a major factor for us as we engaged experts rather than drawing on our own opinions as Engineers.

I challenge you all to think about using the human factors approach if you don't already use it and see how it can benefit projects

THE PROJECT TEAM

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Project Director/Renewal Sponsor - Dean Parker (AMA/Fulton Hogan)
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Civil and Structures Design: Tom Harris and structures team (OPUS)
Onsite Construction Manager: Robert Shiret (AMA/Armitage Systems)
Operational Support – Neil Fisher – Auckland Traffic Operations Center (ATOC)
Engineering Design Support – Jim Bernhard (AMA/Fulton Hogan)
Structures – Taranaki Engineering, Fulton Hogan, ISSA
Electronic Sign Supply – BRAUMS/SWARCO
NZTA Commercial Vehicle Liaison - Eileen Kerry (NZTA Access and Use)
New Zealand Police Commercial Vehicle Investigation Unit - Michael Paki

For more info:

LinkedIn

A Big Thank You to the whole AMA team for their support throughout the project and especially those who were out on the cold rainy nights building the system

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NZ Transport Agency | Auckland Motorways | SaferRoads2017 5th International Conference | Fulton Hogan | OPUS | beca | Resolve | Armitage