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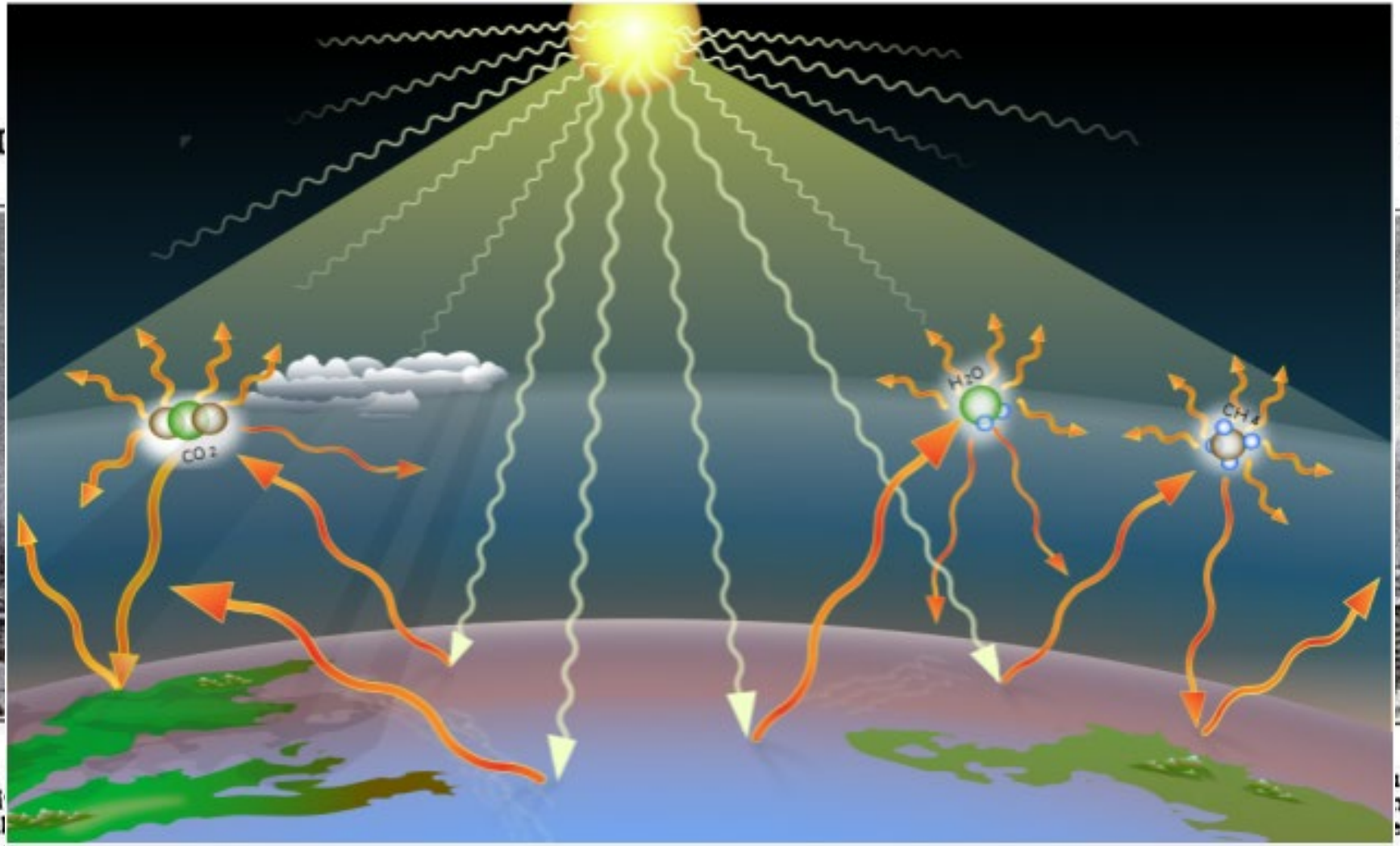
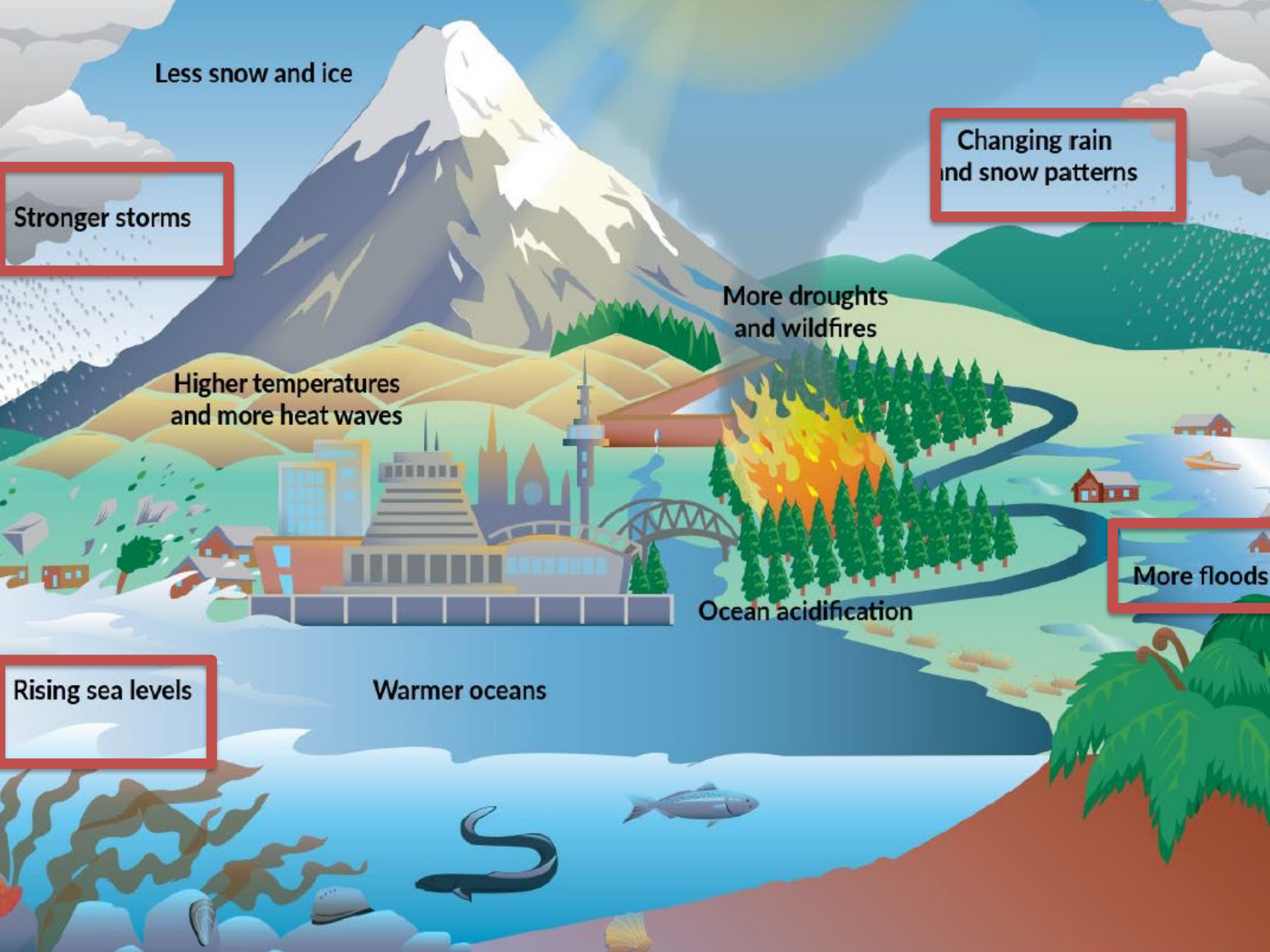
Flooding our Roads

A Study on Climate Change and Emulsion Stabilisation



Simplified diagram showing how Earth transforms sunlight into infrared energy. Greenhouse gases like carbon dioxide and methane absorb the infrared energy, re-emitting some of it back toward Earth and some of it out into space. Credit: A loose necktie on Wikimedia Commons


Less snow and ice
Changing rain
nd snow patterns
Stronger storms
More droughts
and wildfires
Higher temperatures
and more heat waves
More floods
Ocean acidification
Rising sea levels
Warmer oceans

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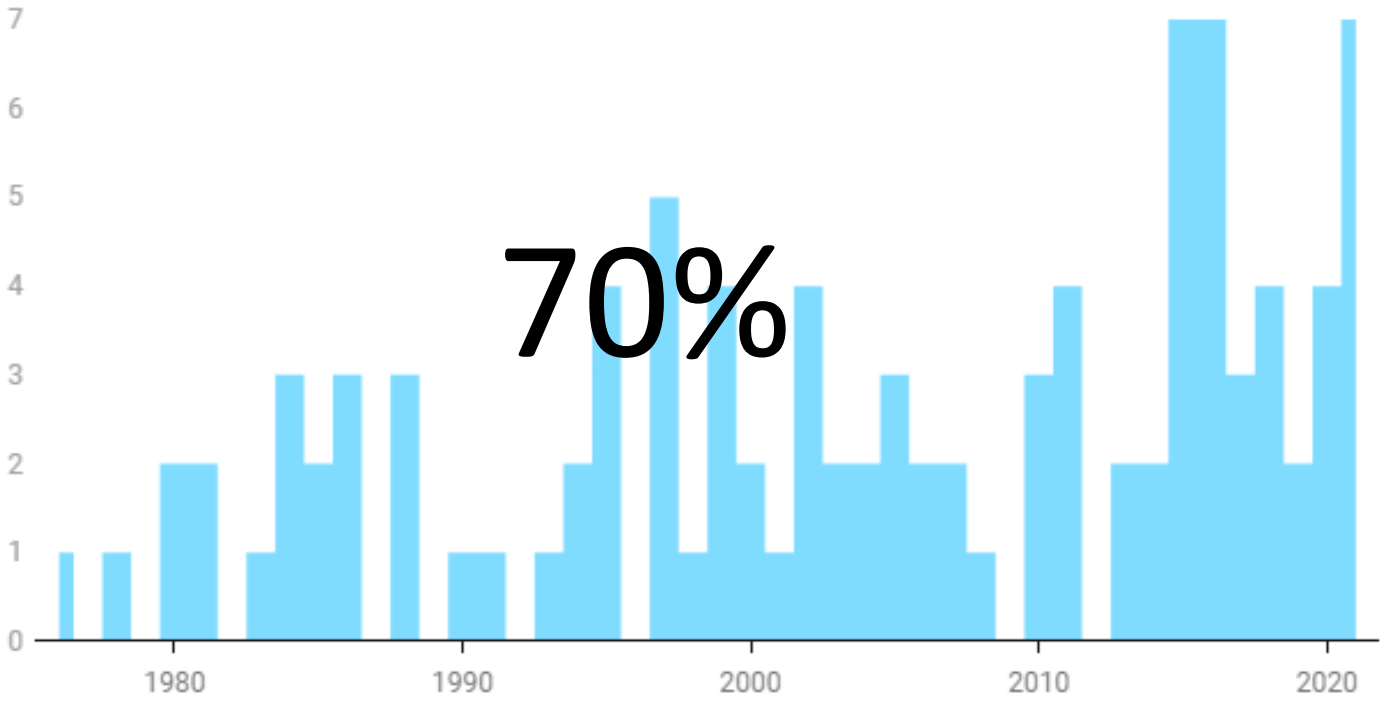
Number of floods in Aotearoa

From 1978 to 2021



70%

Chart: The Spinoff • Source: Tower Source • Created with Datawrapper

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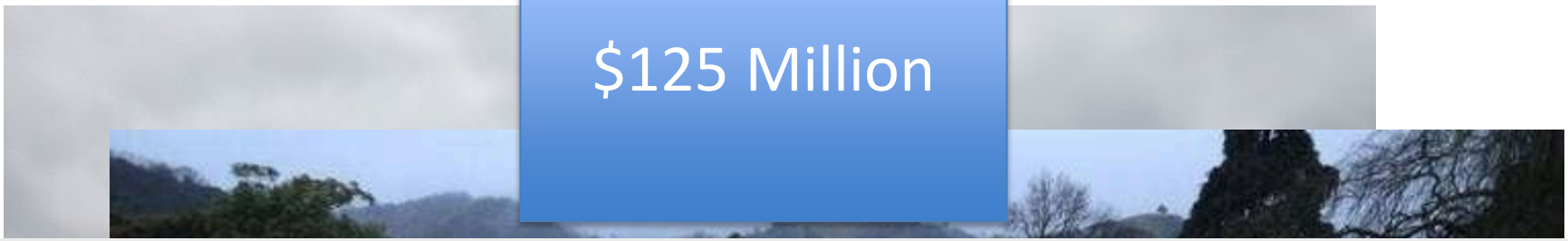
$125 Million



Date	Event	Categories	Cost ($m)	Inflation adjusted cost ($m)	More info
2022 May 20 - 20	Levin Tornado	Tornado	8.1*		
2022 Mar 21 - 29	North Island Floods	Flood, Rain, Storm	79.6*		
2022 Feb 9 - 14	Cyclone Dovi	Cyclone	54.84		i
2022 Jan 15 - 15	Tonga Volcanic eruption and tsunami	Earthquake	5.93		i
2021 Nov 3 - 5	Gisborne Floods	Flood	3.37		i
2021 Sep 9 - 13	South Island Windstorm	Wind, Storm	36.53		i
2021 Aug 30 - 31	West Auckland Flooding	Flood	62.29		i
2021 Jul 16 - 19	West Coast Flooding	Flood	97.2		i
2021 Jul 16 - 19	Wellington Floods	Flood	17.88		i
2021 Jul 16 - 19	Upper South Island Floods	Flood	17.35		i

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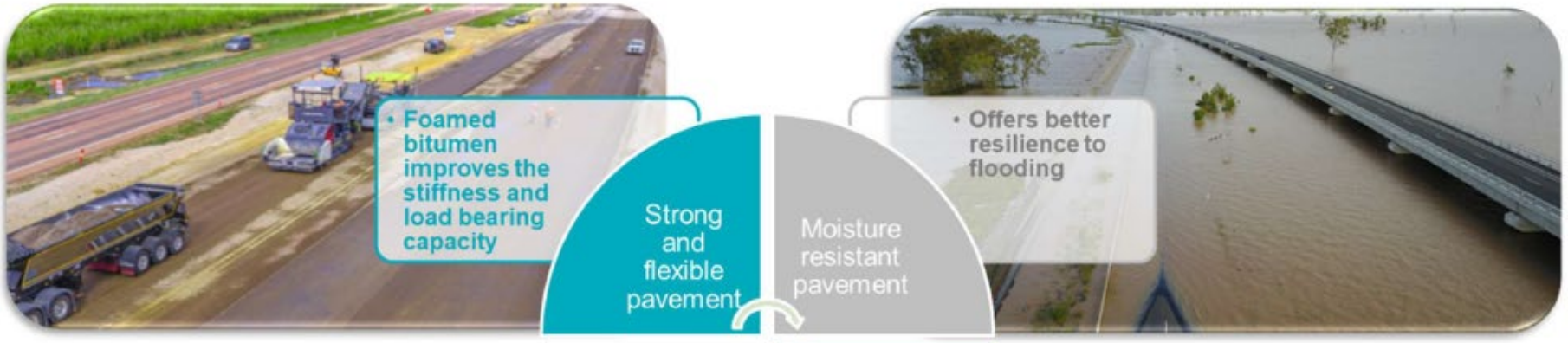
Foamed Bitumen flood resilience – Oakey-Pittsworth Road

In 2014 after the Darling Downs communities were again inundated by floods, the Oakey-Pittsworth Road was the lead story on the local news. This road was in the process of being repaired following inundation in 2010 and 2011. After the 2010/11 events the road was closed for several days whilst repairs were undertaken and was speed and load restricted until rehabilitation in 2014. The news story reported that the road was able to be opened immediately after the flood waters receded. This was due to the use of the Foamed Bitumen Stabilisation treatment and permitted the road to connect communities immediately after being inundated by floods. This event was only days after the successful completion of rehabilitation.

Why the implementation of bitumen stabilisation in Queensland?



Resilience of Bitumen Stabilised Pavements

These foamed bitumen pavements survived unscathed after flooding from natural disasters in Queensland.

Emulsion Stabilisation

Unbound

Bitumen Stab

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Performance – Water pressure test

Unbound

Stabilised

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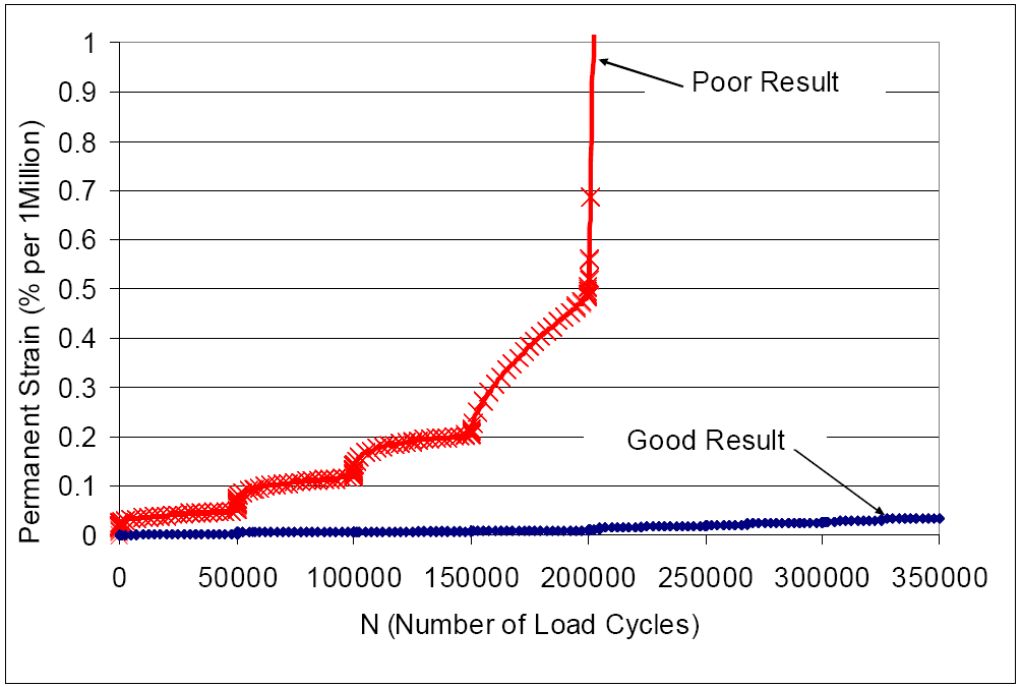
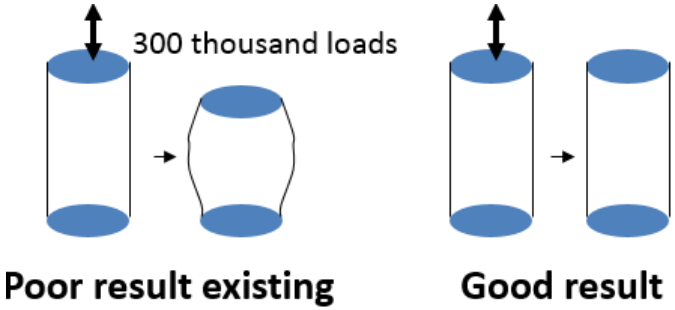
Performance – Water pressure test

- Unbound base course
- Water-blasted
- Fines washed away
- Material blew out

- Emulsion stabilised base course
- Water-blasted
- Fines remained intact
- Material performed well

RLT Testing





Repeated Load Triaxial Testing

Soaking sample
For saturated test

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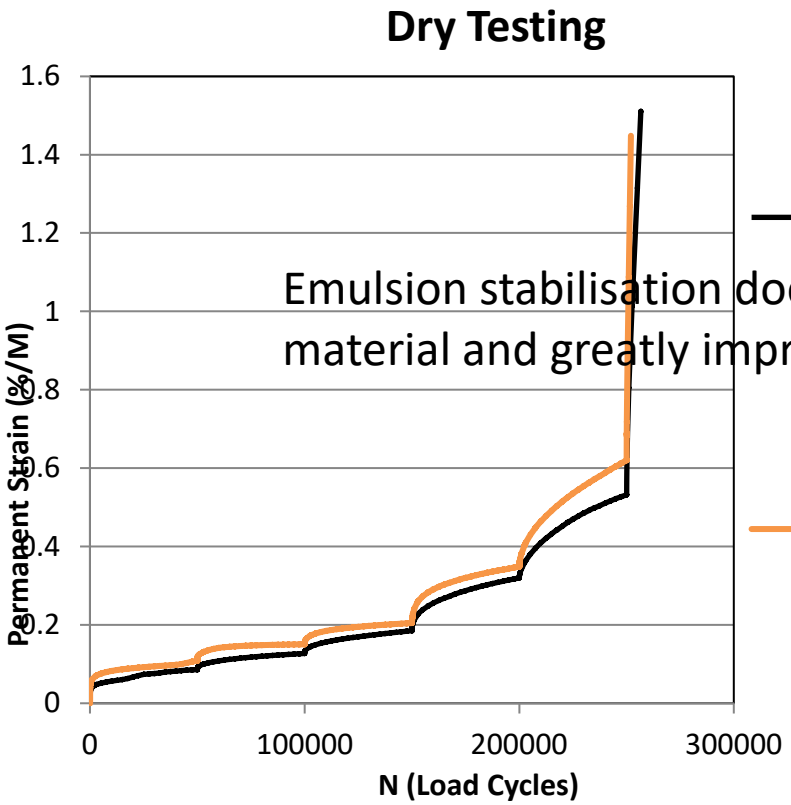
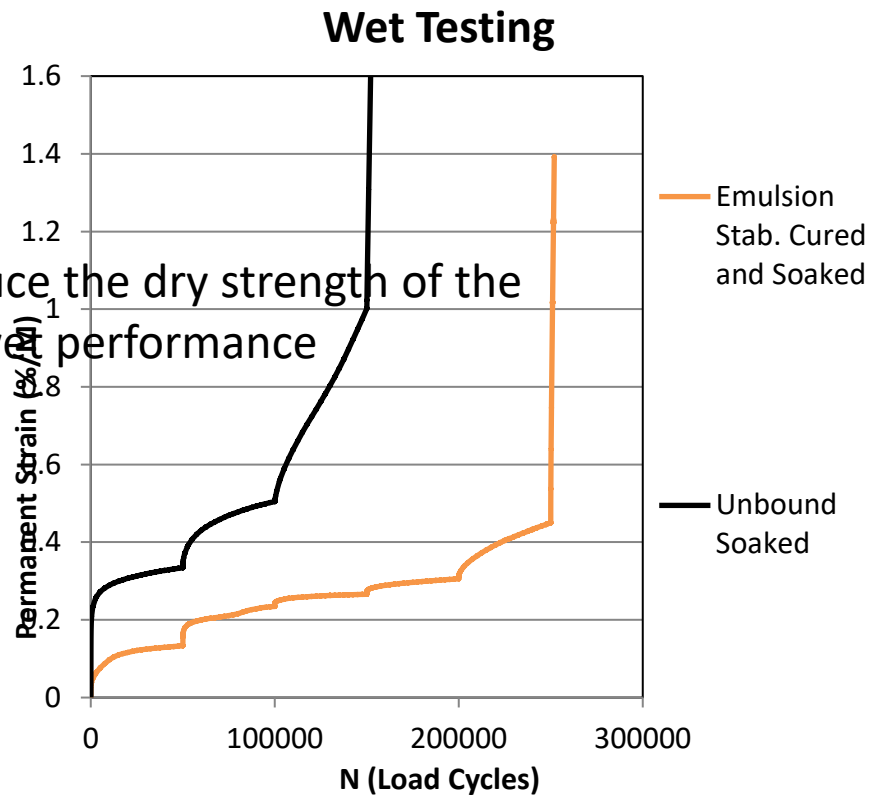
RLT Performance





Emulsion stabilisation does not reduce the dry strength of the material and greatly improves the wet performance

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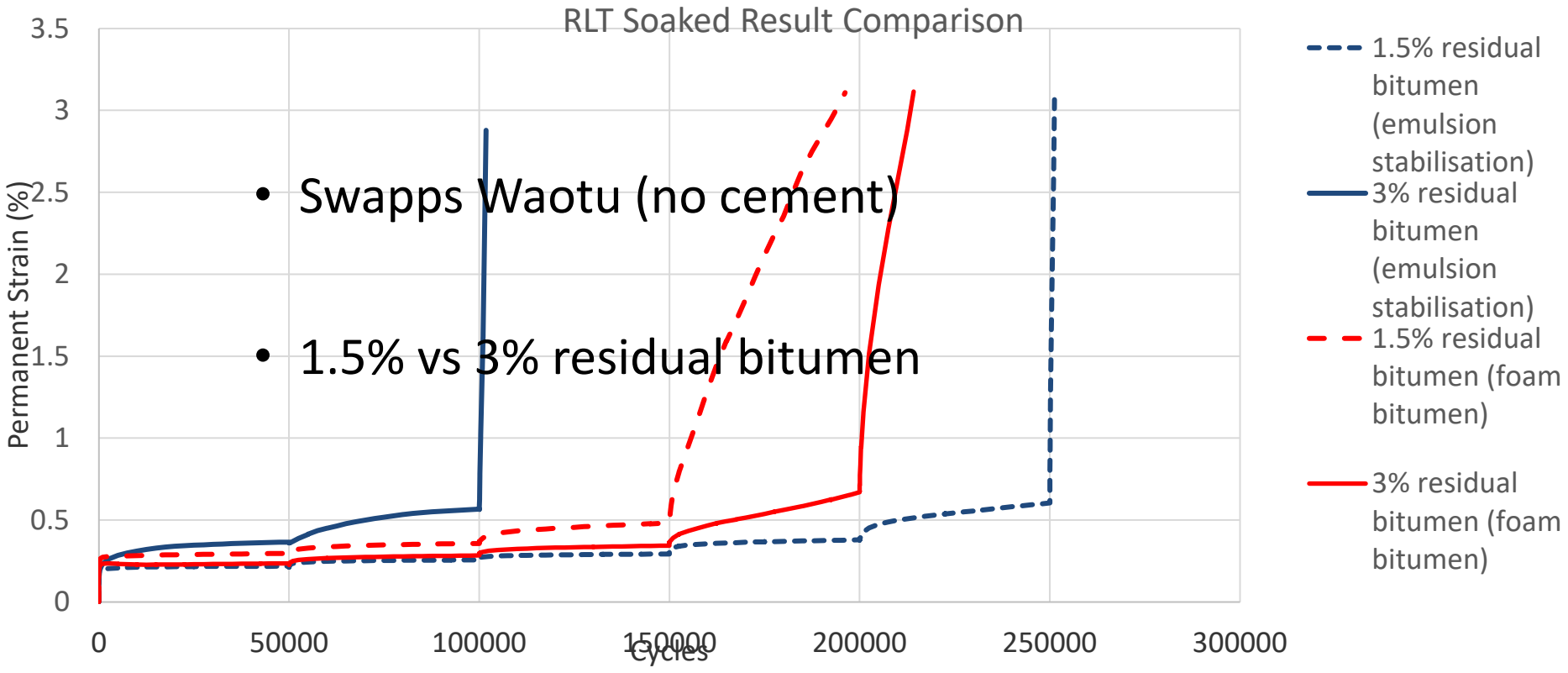
Soaked RLT Performance – Foam vs Emulsion




Foam Bitumen
Stabiliser


Emulsion Stabilised


Foam Bitumen
Stabiliser
Emulsion Stabilised

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37%
Less Carbon than Cement

Conclusions so far for emulsion stabilisation

- Great tool for waterproofing granular material
- Comparable to foam (with less bitumen required)
- Operational advantages (safety, quality, efficiency)
- Carbon Advantages

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Questions?

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