

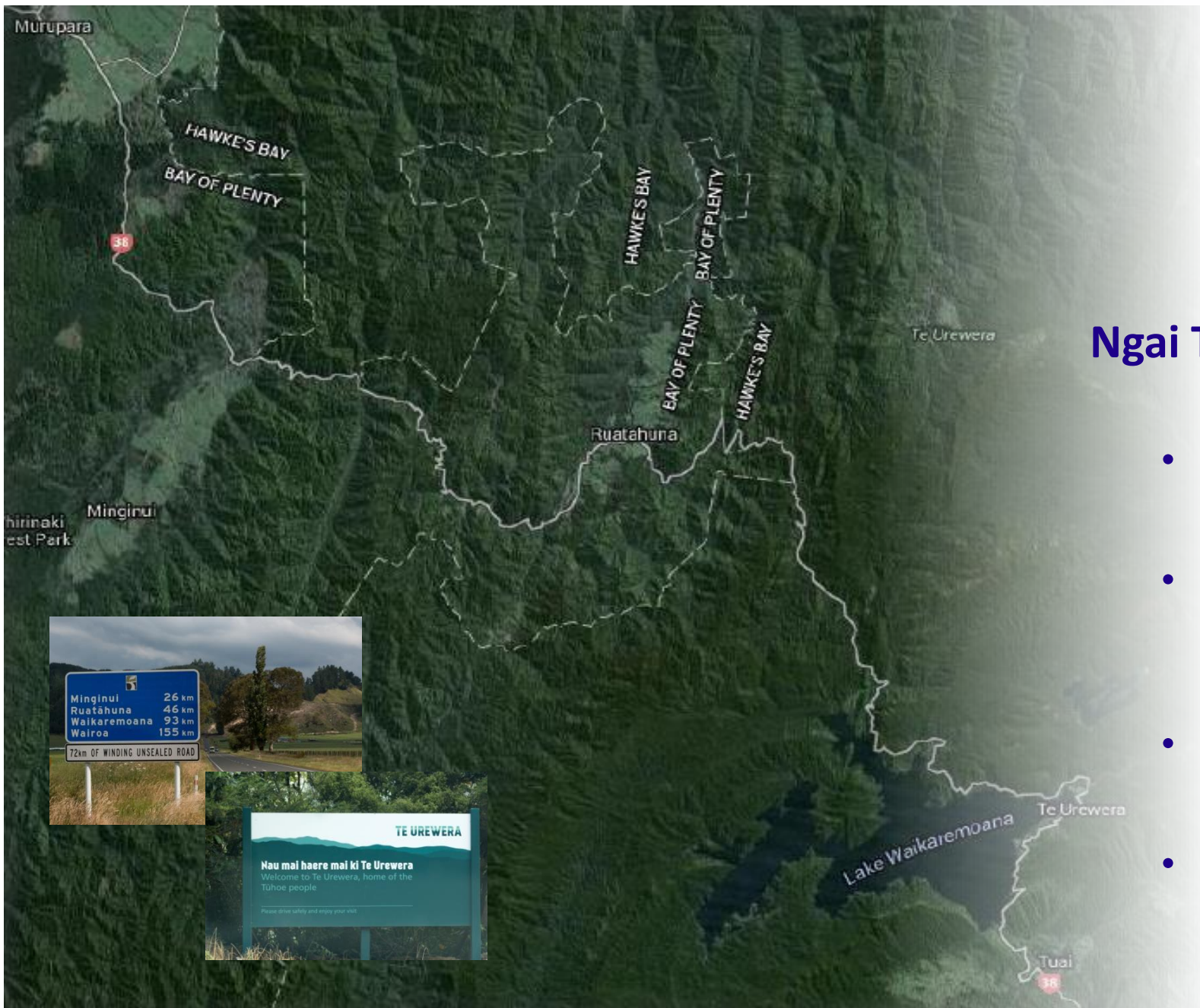


Road to Nature

LIA VAN DEN KERKHOF | WSP RESEARCH

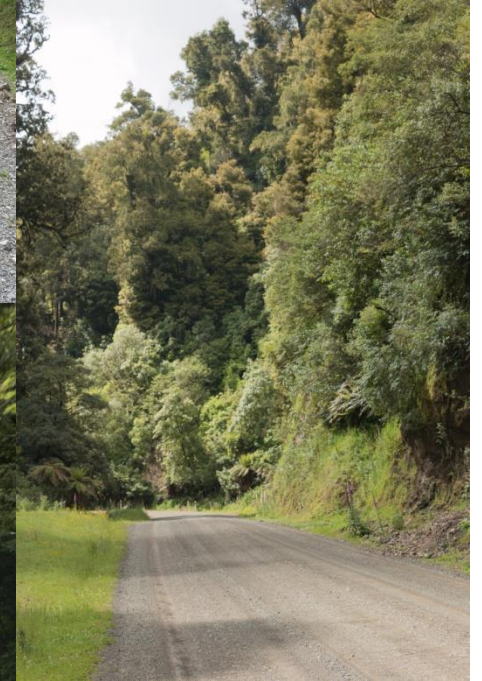
Ngai Tūhoe – Te Urewera

- Guardians: Kaitiaki
- 2016: Investigate resurfacing options for SH 38
- 72 km unsealed road
- Vital connection point for their community



SH38

- **Problems:**
 - Uneven surface i.e. Potholes, rutting
 - Dust generation – damaging roadside vegetation
- **Goals:**
 - sustainability
 - safe and reliable access
 - Encourage tourism
 - Maintain pristine wilderness



Sustainable Binder

- Tall Oil Pitch (TOP)
- Readily available (by product of Kraft paper process)
- Dust suppressant
- Available commercially in NZ
- Easy to implement, and by local contractors



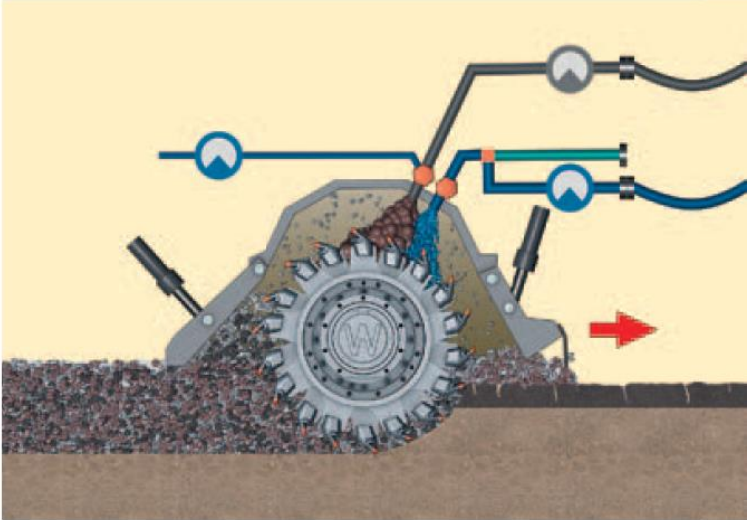
Trial - January 2018



Ruatāhuna Road at Mangapae Stream



Lake Road at Rosie Bay
Abandoned due to accidental grading



Stabilisation Process



Monitoring 2018 - 2022

- Sites were monitored for: potholes; rutting; erosion; corrugation; loose stones and dust



Left: visible dust behind the vehicle on untreated section, Right: minimal dust behind car on the trial section

- Mangapae stream: exceeded all expectations (dust suppression and resistance to failures)

Skid Resistance

	British Pendulum Number (BPN) Result
Mangapae Stream	60 to 75
Country	Requirement BPN
NZ (T10, 2013b)	min. 45
Australia (TRRL 1969)	min. 55 (wet surfaces with ADT over 2000)
Europe	42 to 60

The site exhibits good skid resistance after 3 years.

***Skid resistance by British Pendulum method
ASTM E303-93(2018)**

Can we recycle it?

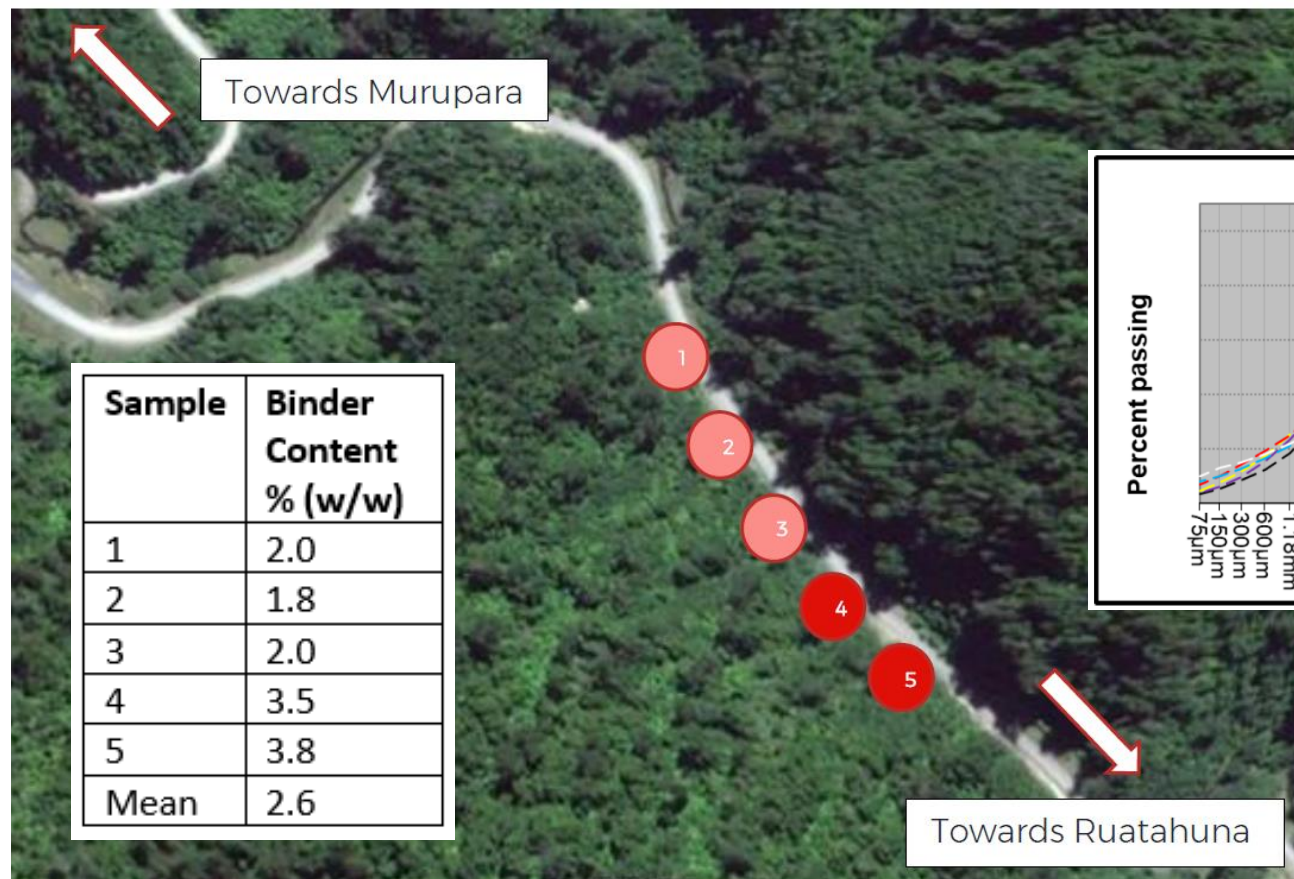
- Retention of binder
- Ageing behavior of binder



Sampling

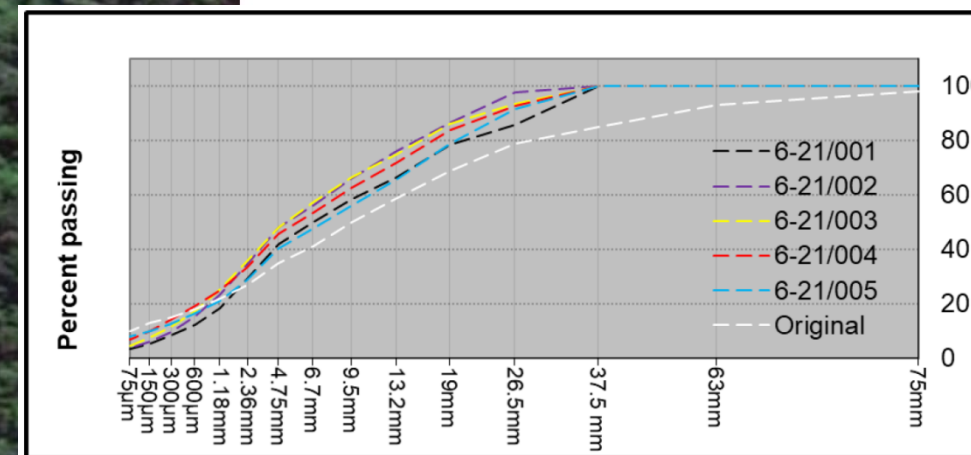


Binder Content and Aggregate Grading



Sample	Binder Content % (w/w)
1	2.0
2	1.8
3	2.0
4	3.5
5	3.8
Mean	2.6

Binder Content



Aggregate Grading

***Binder content: BS EN 12697 (Extraction Method used), Aggregate grading: ASTM C136-14**

Ageing of Binder – Viscosity

- **Stiffness of aged binder - significantly increased**

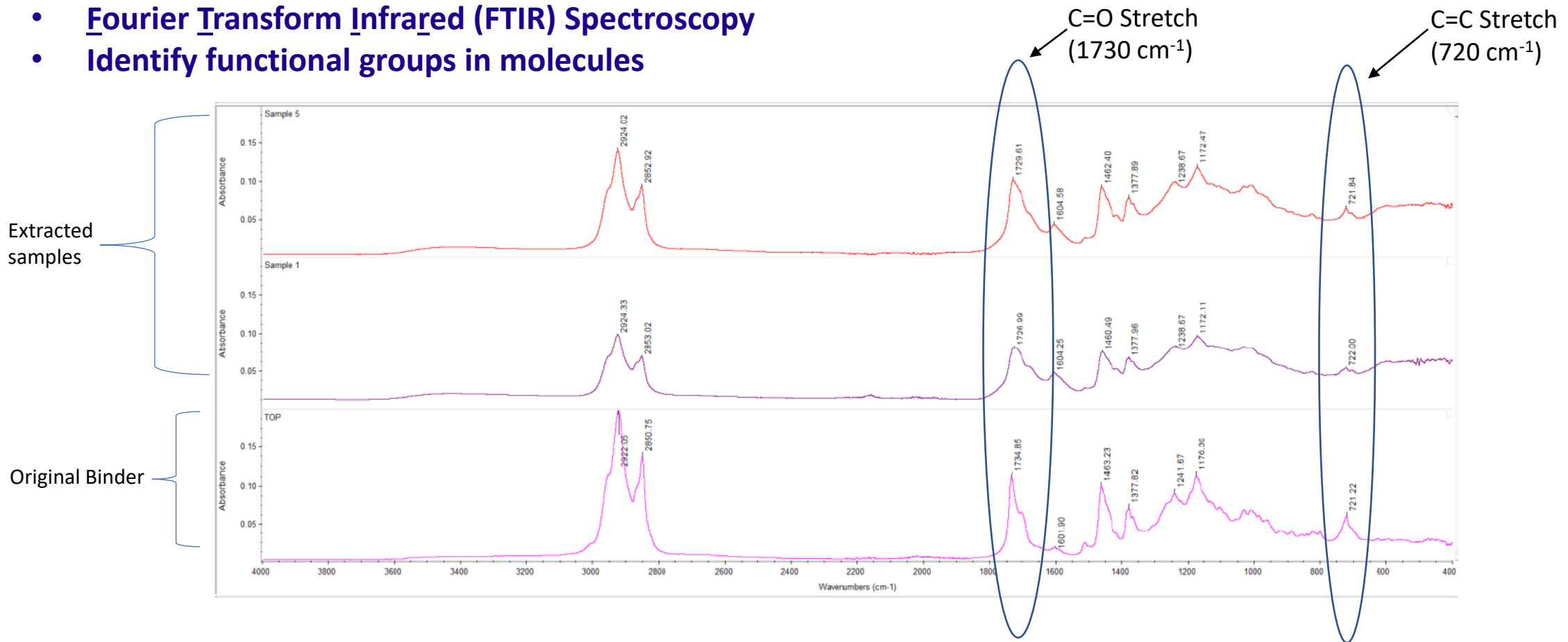


Sample*	Viscosity / Pa.s
Original Binder (interpolated from supplier data)	3.11
Binder from Core 1	1490000
Binder from Core 2	269000
Binder from Core 3	367800
Binder from Core 5	8280

***Viscosity at 60°C measured on an AR2000 Ex rheometer at a shear rate of 0.1 s⁻¹**

Ageing of Binder - Composition

- Fourier Transform Infrared (FTIR) Spectroscopy
- Identify functional groups in molecules



*FTIR measured on a Nicolet iS50 instrument with diamond ATR cell, 4 cm⁻¹ resolution

Indirect Tensile Strength (ITS)

Condition	ITS / kPa	SD
Direct Recomposition of Entire Mix		
Compaction at 90°C	101	13
Compaction at ambient temperature	44	8
Addition of Fresh Binder		
Addition of 0.5 wt%	42	5
Total binder replaced	26	1

Binder can be recycled and the pavement has gained significant strength as the binder ages.

*ITS as per NZTA T-19

Summary

- Adequate skid resistance
- Retention of binder
- Significant ageing of binder
- Potential for recycling –
reduction of whole of life cost
- Future work:
 - Field trial - recycle current site material
 - Larger scale trials



Thank you for your attention.
For further information:



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