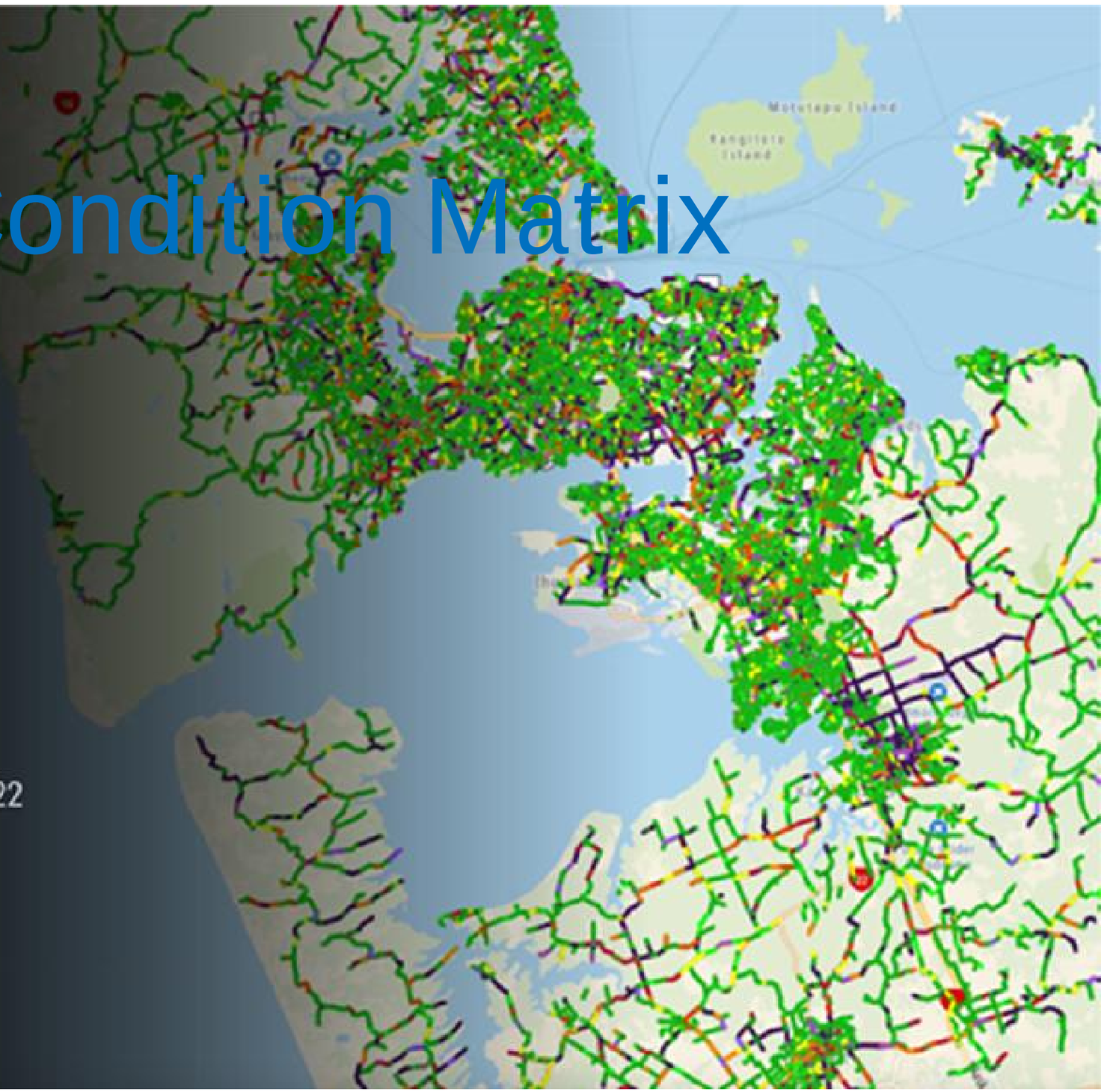
The Pavement Condition Matrix

THE PAVEMENT WORKSHOP

WORKSHOP DATE	Thursday, 12th May 2022 14:00 - 17:15
VENUE	TEAMS



The Pavement Condition Matrix

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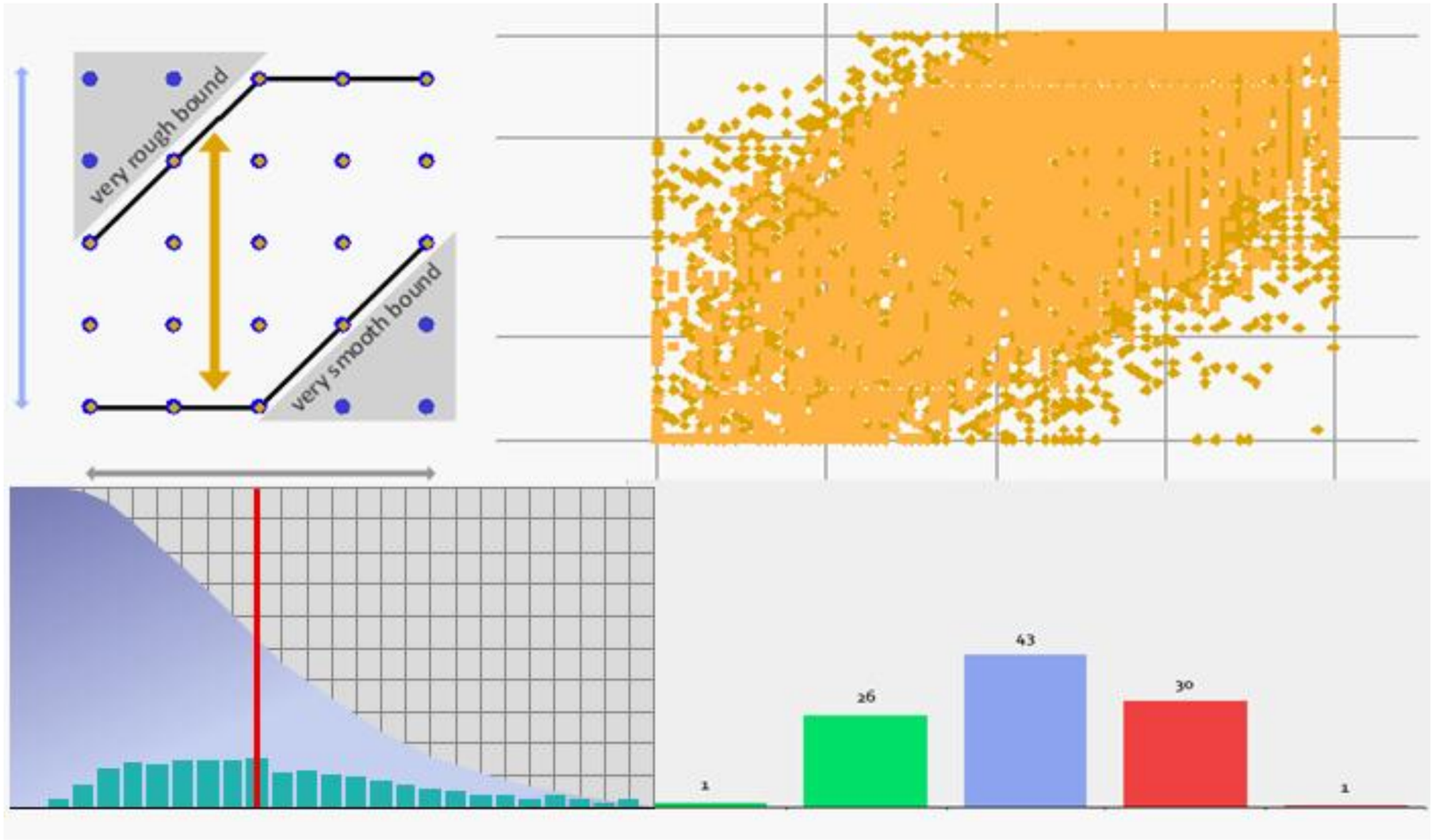
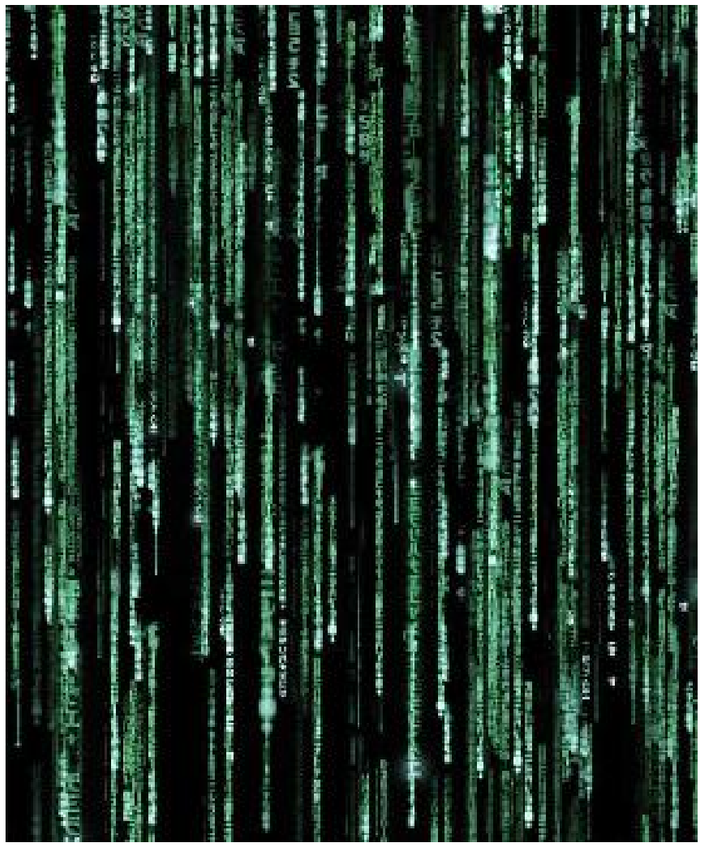


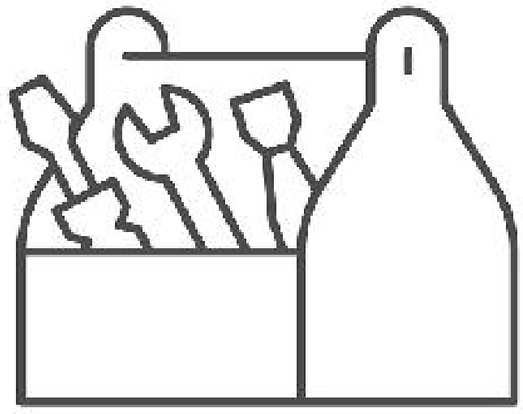
What is the “Matrix”

- Five-point grading system used to describe the condition of each individual road section, known as a ‘treatment length’, with a single rating score.
- The summation of all road sections' rating scores provides a network level rating score distribution
- One to five grading - consistent with the International Infrastructure Management Manual (IIMM) criteria, one is excellent and five is very poor
- The system utilises the current condition parameters from RAMM
- Incremental development over years to improve the outcome, through field validation using FWP’s



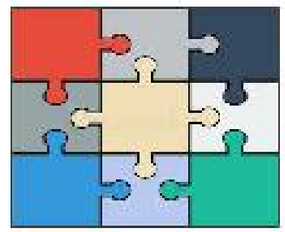
Why the Matrix?

- A one stop shop for pavement and surfacing condition to justify condition based need using available condition data.
- An input to the suite of tools used in development to the FWP.
- Treatment length condition summarisation, already done.
- Same input data for the pavement performance modelling, therefore same baseline.
- Network tool for the whole organisation, management, strategic and tactical decision making, down to day to day decision making.
- Provides a credible outcome, where on site condition could be observed to support the Matrix condition outcome.



Where does the Matrix Fit?

To provide input (candidate sites) for the development of the Forward work Programme (FWP).



Input Data	MATRIX	TSA	dTIMS	Med to Long term FWP	Cross Asset & Programme Optimisation	1 to 5 Year FWP
Inventory	Current - TL Condition	Short Term - Programme - Cost	Meduim to long term - Programme - Cost - Predicted Avg Condition			
Condition Data						
Maintenance						

Levels of Rating Hierarchy

Level 1 – RAMM condition data distributions.

Level 2 Condition Indices – where condition parameters are rated from excellent to very poor, the thresholds between indices are based on network level distributions and engineering judgement.

Level 3 Condition Grade – condition indices are weighted and combined to produce a surface grade score and a pavement-base grade score. the following inputs are used for the surface and pavement base gradings:

- Surface Condition Grade – derived from the worst three condition indices given by; surface age, number of seal layers, alligator cracks, longitudinal and transfer cracks, texture, ravelling/ scabbing, roughness; and
- Pavement-Base Condition Grade – derived from the worst two condition indices given by; roughness, strength (structural number), deformation (rutting/ shoving), and alligator cracks.

Level 4 Combined Matrix Grade – further weighting is applied to the Surface Condition Grade and Pavement-Base Condition Grade to produce an overall Matrix grade for the road section.

Condition Matrix Inputs

	Surface							Pavement			
Inputs	Age	Number of Layers	Aligator Cracks	L&T and Joint Cracks	Flushing Texture	Ravelling/ Scabbing	Roughness	Roughness	Strength	Deformation (Rutting/ Shoving)	Aligator Cracks
Notes			Same rating as pavement	worse case	worse case Texture 300 (Sand circle > 300mm		Less waiting than pavement			Include Peak Deflection & Curvature	worse case
Indices				Surface Index						Pavement Index	

Each index will have the worst three conditions listed. This will help to understrand the reason for the Index Rnking and for future refinments

Matrix and FWP

- The Client asked to explore the possibility of linking condition rating to renewal treatments in the FWP.
- A plan to relate the Matrix condition outputs to the current FWP was discussed and trialled.
- The concept was developed to transition from the current Matrix condition output to an indicative FWP treatment.

Matrix and FWP

The Matrix output was compared with the 3-Year FWP where a rehabilitation or resurfacing treatment is programmed.

Based on the field validation, the Matrix outputs showed good correlation to observed condition and could be used as input to the FWP candidate sites when based on condition factors.

Pavement Index \ Surface Index	1	2	3	4	5
1	1	1	1	4	4
2	1	1	2	4	4
3	1	2	2	4	4
4	2	2	3	4	5
5	3	3	3	5	5

Pavement Rating \ Surface Rating	1	2	3	4	5
1	OK	OK	MAINT	SURF	SURF
2	OK	MAINT	future SURF	SURF	SURF
3	MAINT	future SURF	future SURF	SURF	SURF
4	future SURF	future SURF	future RHAB	HOLD SURF or RHAB	RHAB
5	future RHAB	future RHAB	future RHAB	RHAB	RHAB

Desktop Observations

- Comparison to FWP complete
- Acceptable correlation
- Lower grades (better condition) in early years of FWP could be attributed to operational efficiencies and late or no data update
- High grade in latter year could be verified on site
- Based on verifications the matrix can be refined further

Field Validation and Matrix Refinement

- Field validation used to check and refine the Condition Matrix outputs
- Last field validation Feb – 2020, 608 sites were visited
  - 585 sites visited, 92% acceptable outcome, 8% unacceptable.
  - 23 sites not evaluated, supporting RAMM surface data was either incorrect or the treatment length needed re-segmenting

Feb-20202 Visited Sites Summary

Matrix Treatment Type	No. of Sites	Matrix Alignment with Field Observation	
		Acceptable	Not Acceptable
Not in immediate future	141	141	0
Reseal or Resurface	337	300	37
Rehab/Recon	107	96	11
Total	585	537	48

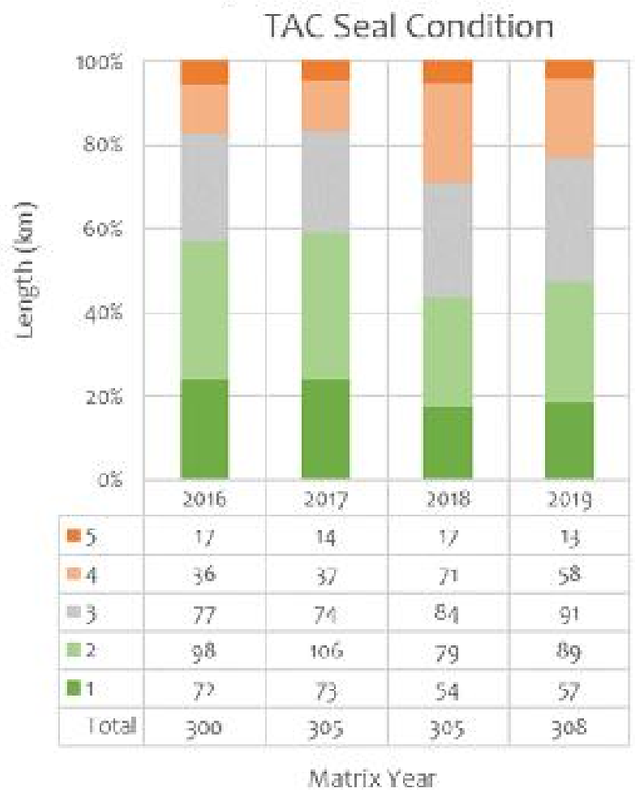
Mobile Road Field Work

Using Matrix outcomes

There needs to be awareness when using Matrix outcomes to challenge the FWP decision-making processes

- FWP is not prioritised on a worst condition first basis, uses wider asset management principles.
- Operational efficiency in FWP, an actual treatment may cover several RAMM TL sections, with varying conditions,
- The Matrix cannot account for second coat seals after rehabilitation treatments.
- The FWP is generally cross optimised with other assets, timing and treatment may change to align with other priorities.
- There is a lag between the time of condition rating and the FWP preparation, in particular, by the time when treatments for the committed year are established.

Condition Matrix – Network Health Trend Analysis



Sample Area (100% stacked & km length distribution) – CHIP & TAC Surface Condition Index and all Base Condition Index

Thank you