

# Rapid Continuous Structural Evaluation of Low Volume Roads

Using the Multi Speed Deflectometer (MSD) to screen low volume roads  
**Lily Grimshaw & Graham Salt, Geosolve, New Zealand**

# A Niche Problem

- ▶ Low volume roads, < 5 million ESAs
- ▶ Low volume road asset owners are often reacting to road maintenance rather than planning for it
- ▶ Existing available non-destructive testing methods are not ideal for lower volume road asset management
  - ▶ Access
  - ▶ Cost
  - ▶ Survey Speed
  - ▶ Weather dependency
- ▶ Which roads should I test in my low volume road network?



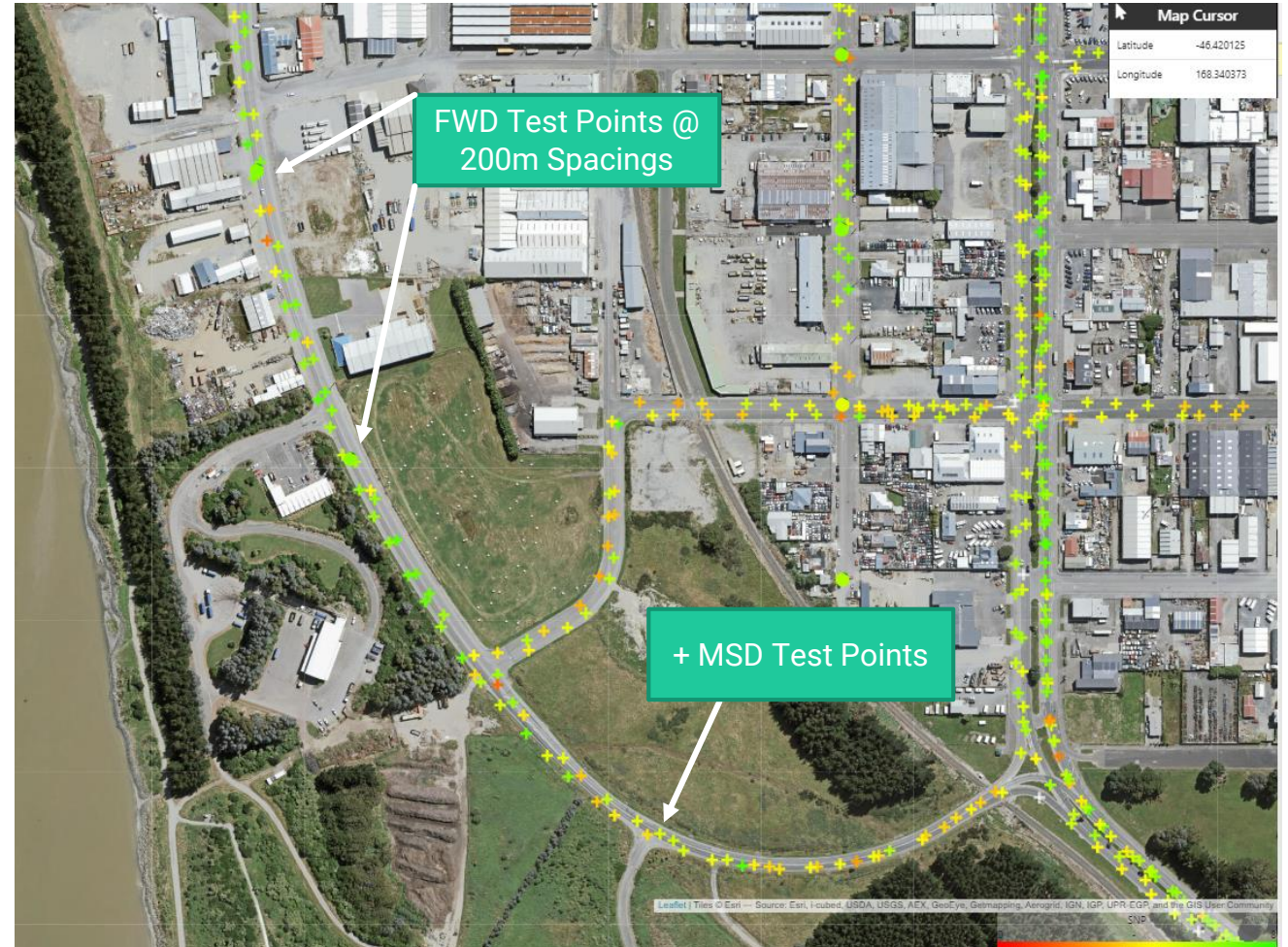
# Which Roads Should I Test?

## ▶ Common Answers:

- ▶ Don't test, conduct visual survey, mill and overlay
- ▶ Test the Worst (FWD)
- ▶ Network survey @ discrete spacings (200m to 1 mile!) (FWD)
- ▶ Test all high volume roads (TSD)

## GeoSolve's Answer:

- ▶ Test all roads continuously with MSD (more data at lower resolution)
- ▶ Use lower resolution continuous MSD data for high level forward works planning and to identify which locations require further high resolution testing (ie. FWD)



# The Multi Speed Deflectometer (MSD)



New Zealand

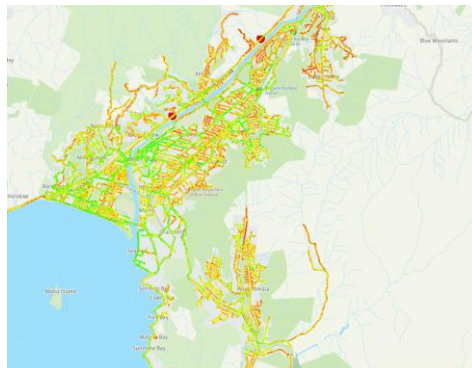


Testing Map



70-130 lane kms/day

GIS Platform



# Analogy between FWD, MSD and TSD



FWD



MSD



TSD

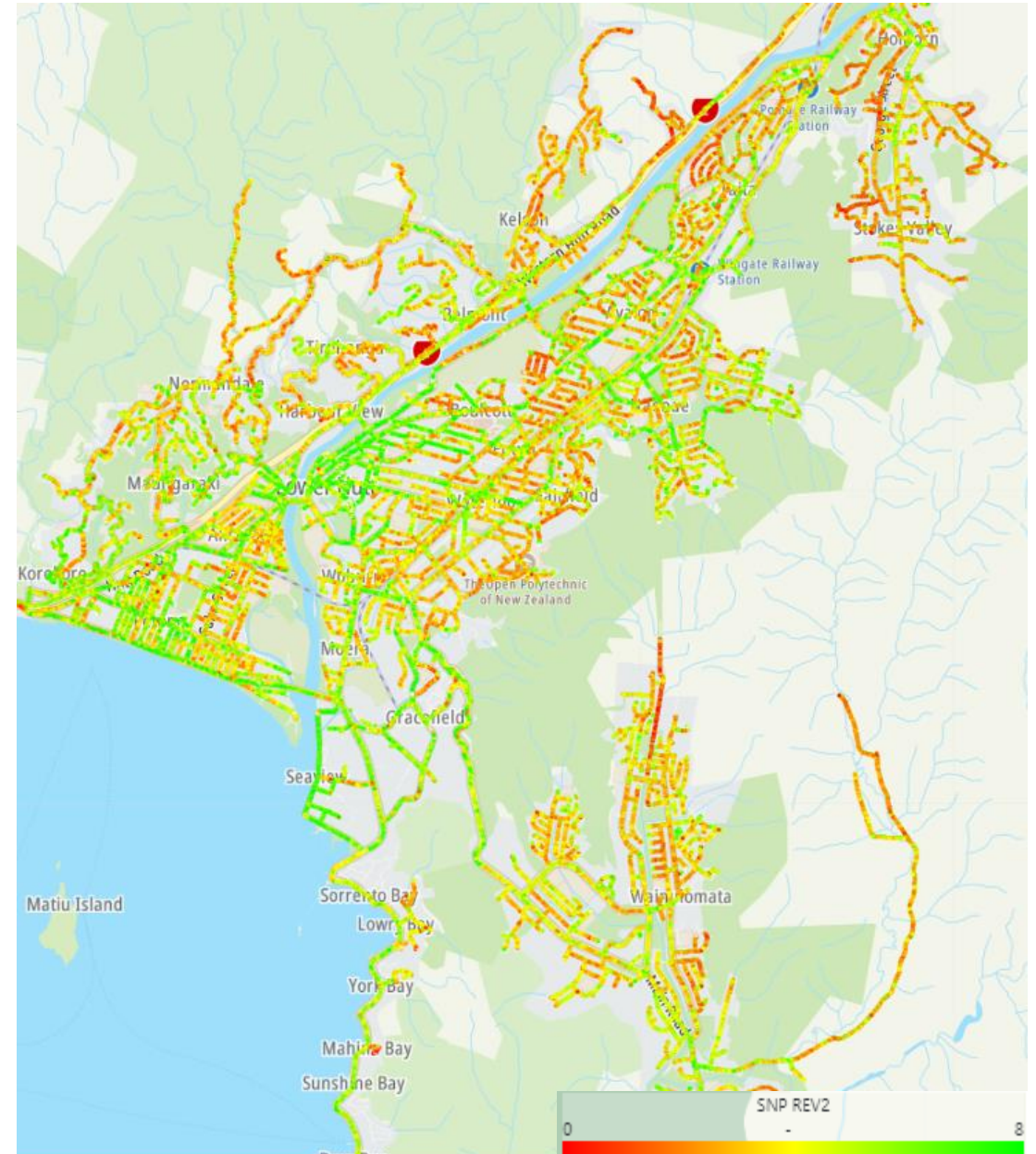
# Comparison of Common Non-Destructive Testing

Item	MSD	TSD	FWD
Typical Test Points Per Day	70,000 (Urban) to 130,000 (Rural)	130,000 (highways)	300-400
Equivalent Distance	70-130 kms, 43-81 miles	81 miles	Depends on Spacing
Testing Vehicle	2 or 3 Axle SWB Truck	Semi Articulated LWB Truck	Truck and Trailer
Typically Discrete or Continuous Data?	Continuous	Continuous	Discrete
Resolution	Low	Med	High
Testing Speed	15-50 km/hr	40-70km/hr	Stationary
Access	All roads	High volume roads only	All roads + TM
Weather Dependency	None	Dry and fine weather	None



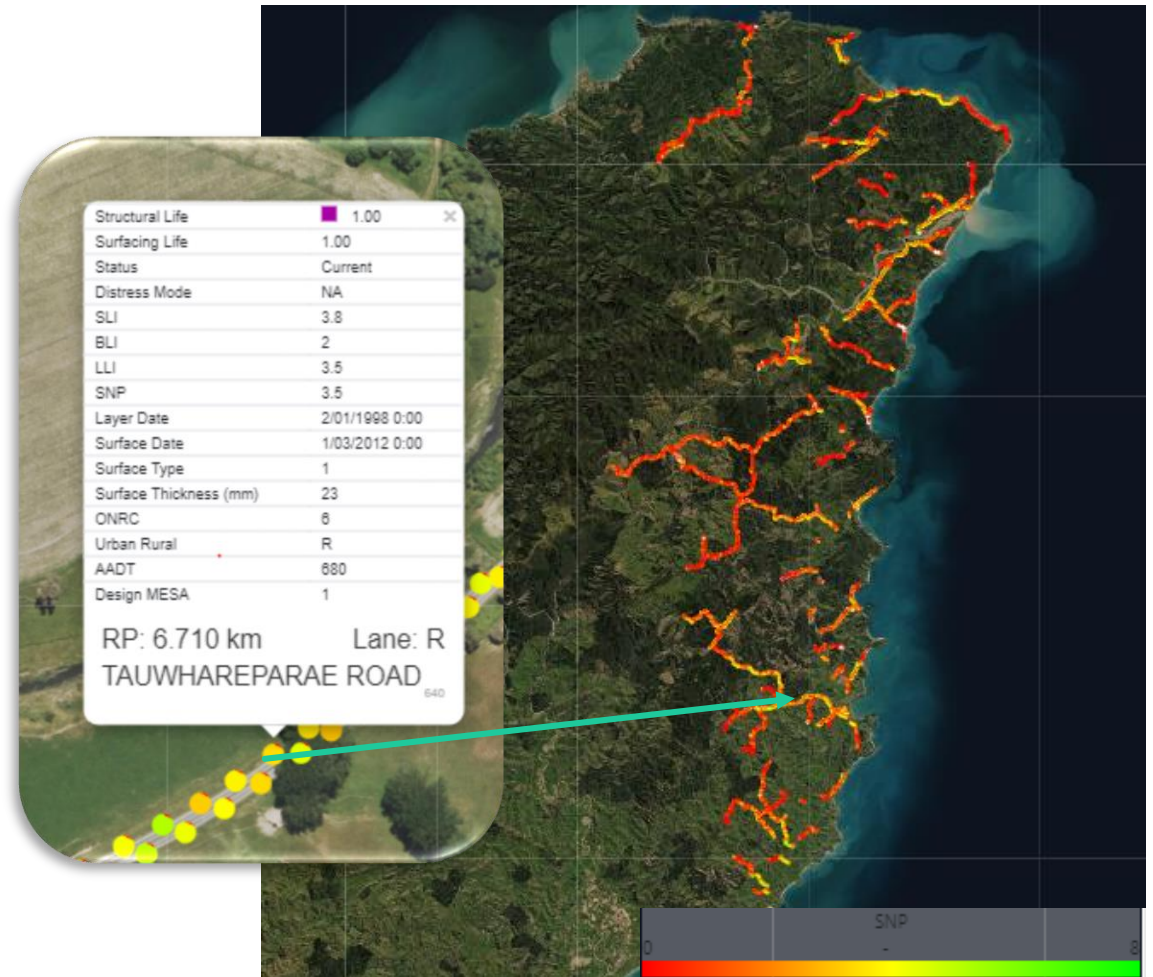
# MSD Outputs – Chipseal & Thin AC

- ▶ GIS Platform, upload latitude, longitude and MSD readings translated to either equivalent FWD (d0 and SCI) or Structural Number (eg SNP) reference system
- ▶ An entire network structural database for user interaction
- ▶ Example to the right:
  - ▶ ~800 lane km
  - ▶ 8 days of testing
  - ▶ Mostly urban roads



# MSD Outputs -Unsealed

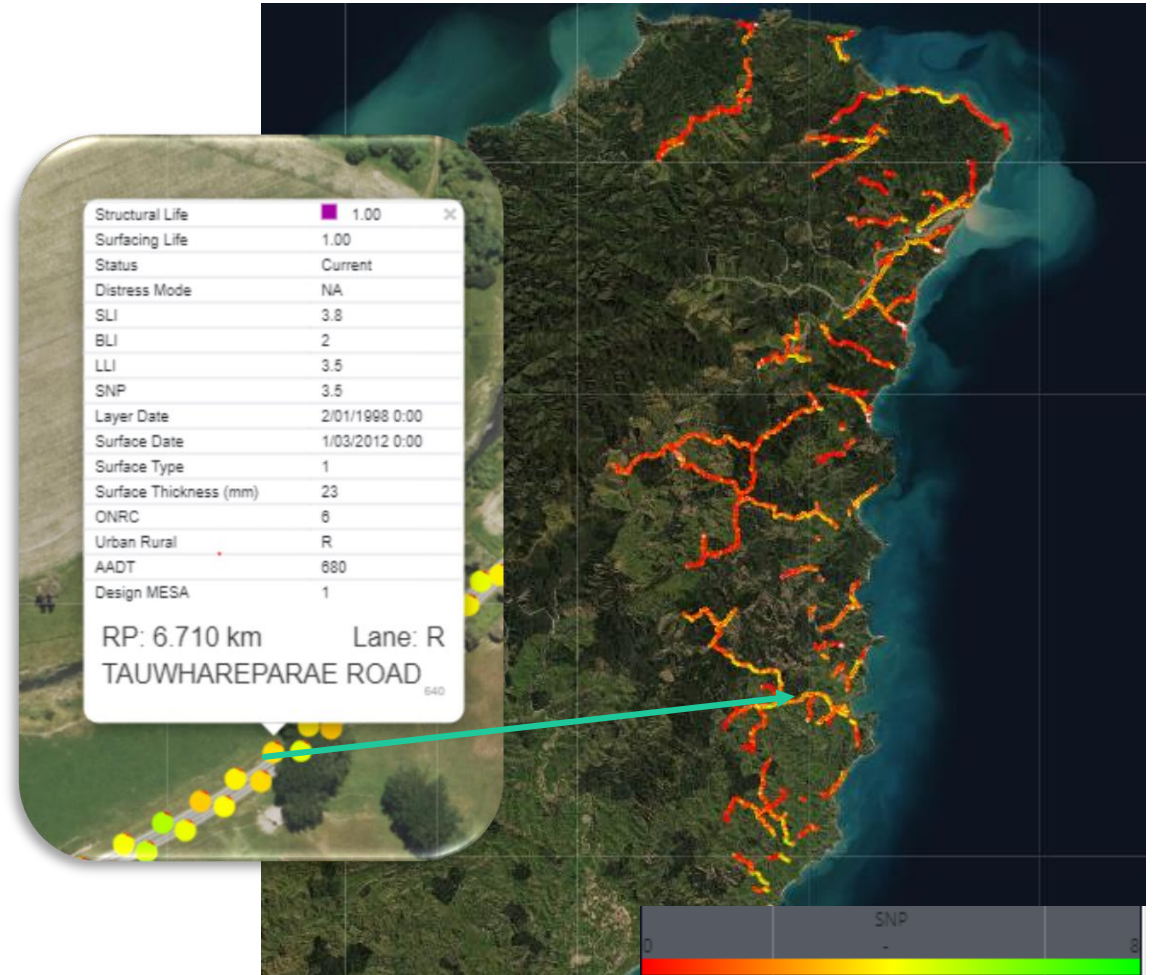
- ▶ GIS Platform, upload latitude, longitude and MSD readings transferred to SNP reference system
- ▶ An entire network structural data for user interaction
- ▶ Example to the right:
  - ▶ ~587 lane km
  - ▶ 7 days of testing (less efficiency due to distance between roads to be tested)
  - ▶ Mostly unsealed forestry roads



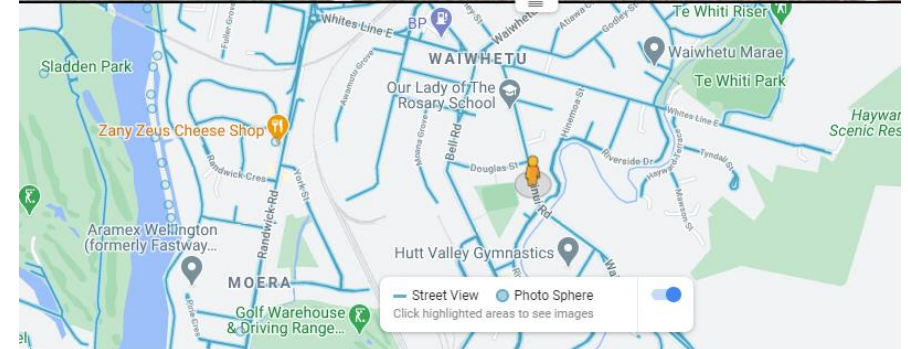


# MSD Outputs- Unsealed +

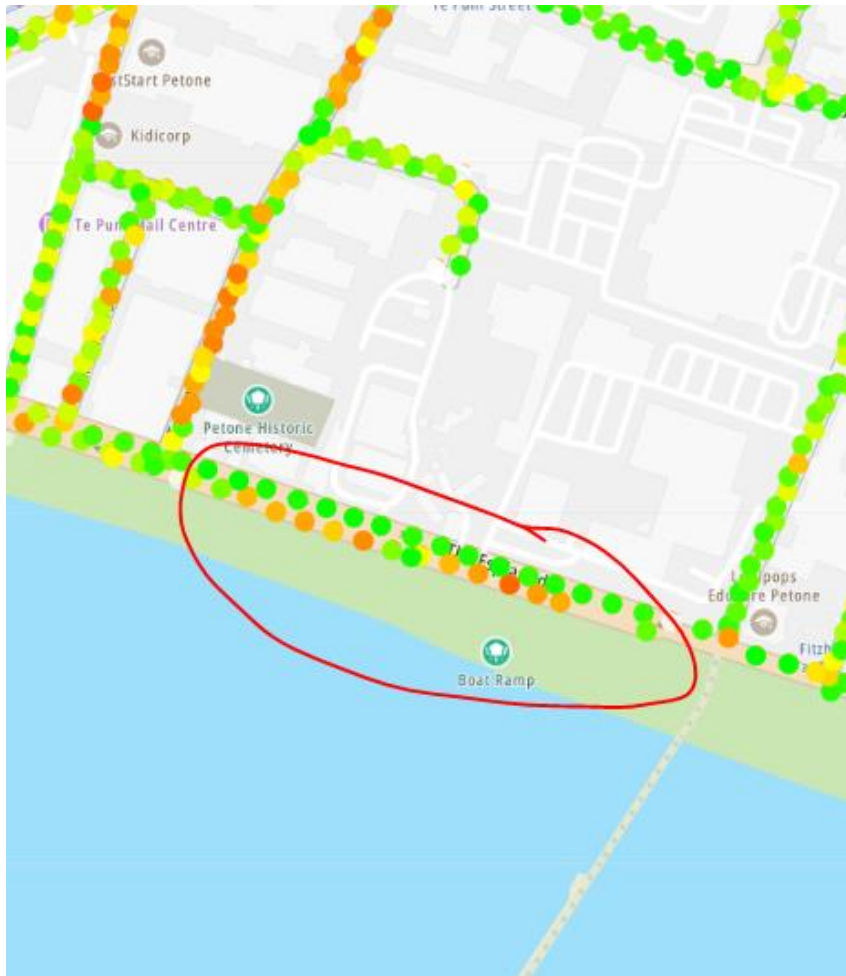
- ▶ Unsealed roads are well suited to MSD as deflections are usually high. However special considerations are needed.
- ▶ Timing is critical. While sealed roads experience mostly only minor fluctuations in deflections with season and or precedent weather conditions, for unsealed roads timing is paramount.
- ▶ Track the local weather patterns and mobilise as soon as “characteristic design” subgrade state is achieved, ie moderately wet but not extreme conditions, then allow at least 1-2 days for drying of the surface.
- ▶ Target is elastic deformation only, particularly in the surfacing. No plastic deformation, otherwise wait until no tyre imprint left. Too dry and the surfacing loses cohesion and results are not as precise. Also the subgrade will no longer be in the relevant characteristic design state.



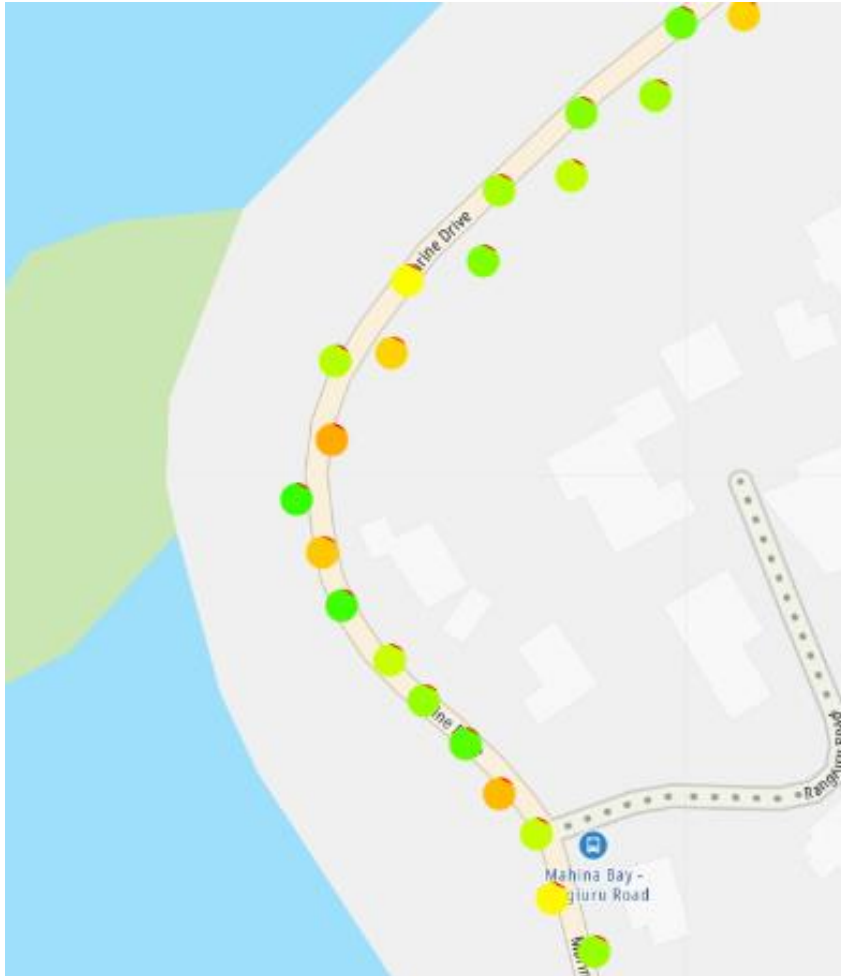
# Reality Checks



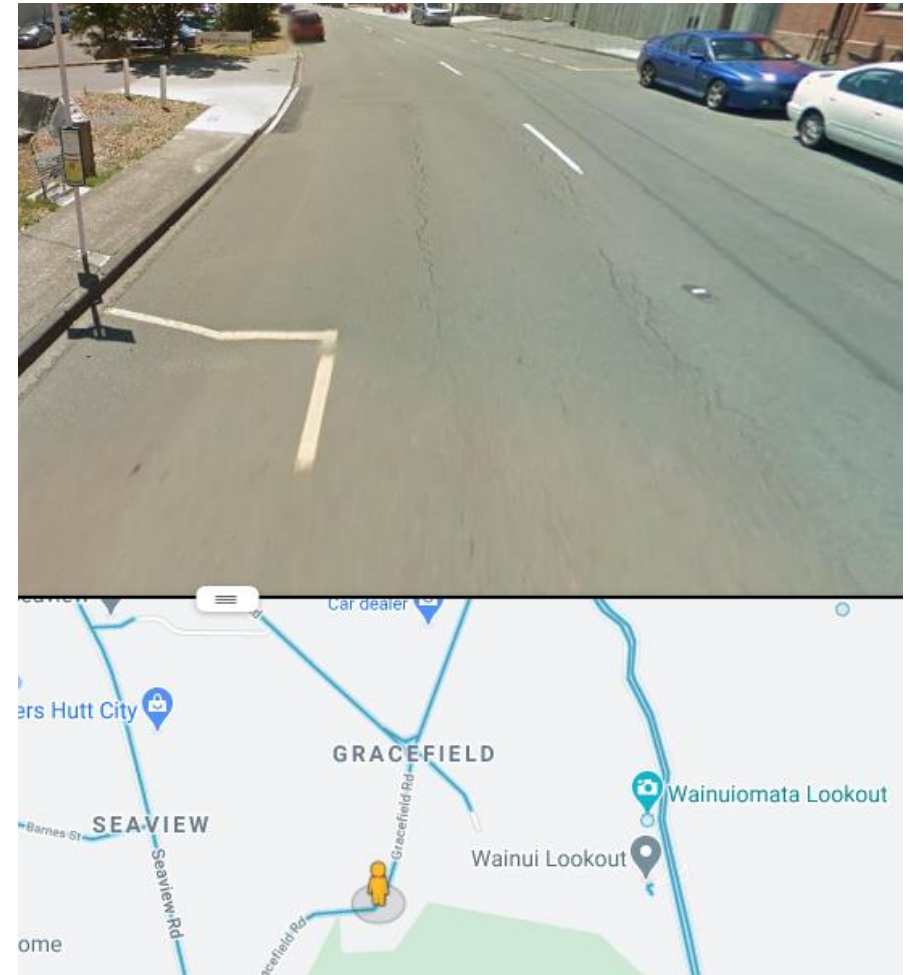
# Reality Checks



# Reality Checks

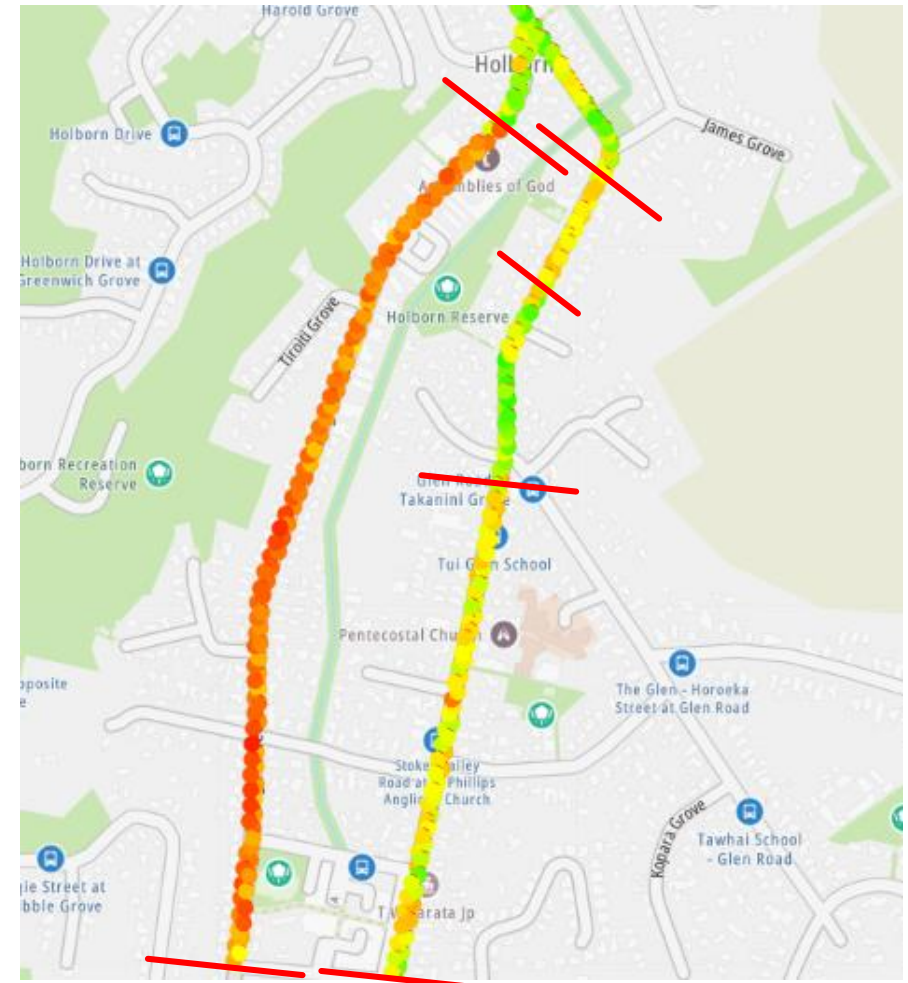


# Reality Checks



# Applications for Asset Management

- ▶ Continuous data for meaningful road sectioning of structurally homogenous areas
- ▶ Easy scoping for higher resolution testing (ie. FWD)
- ▶ Remaining life predictions (a function of structural capacity and design traffic) to enable forward works planning
  - ▶ Requires accurate rather than conservative traffic data



# Conclusions

- Traffic speed testing of low volume roads is finally both economically viable and physically possible
- MSD can provide GPS located structural data for an entire roading network ( suited for lower volume flexible pavements)
- Ideal for vast networks of low volume roads with thin surfacings (sprayed seal or thin AC, less than 40mm)
- Also effective on unsealed roads, (where TSD is not possible) but precedent weather is critical
- The technology now empowers all LVR asset managers to plan and execute both maintenance and rehabilitation with much enhanced efficiency.

Questions?

