AV '23 CONFERENCE ASPHALT PAVEMENTS 2023

Data quality obtained by the iPAVe during comprehensive measurements of road infrastructure conditions.

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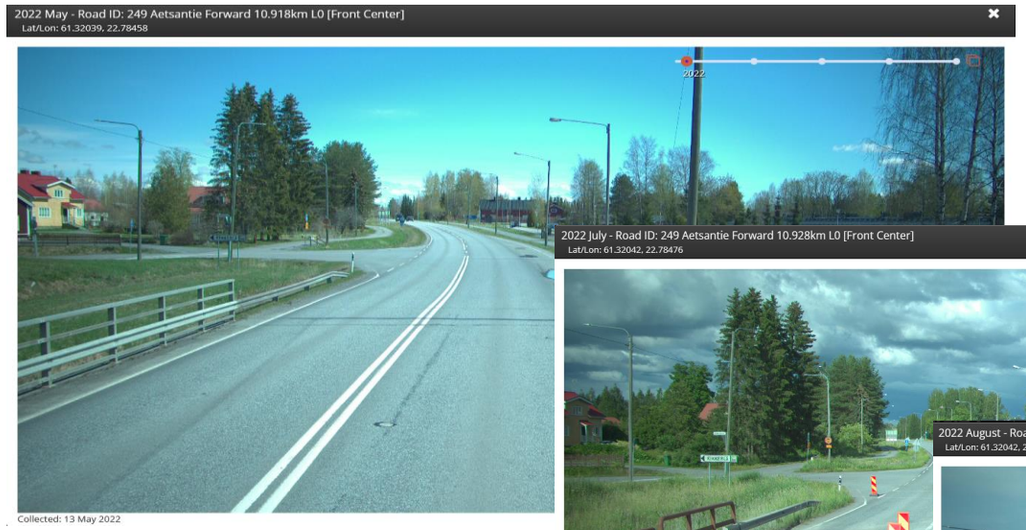
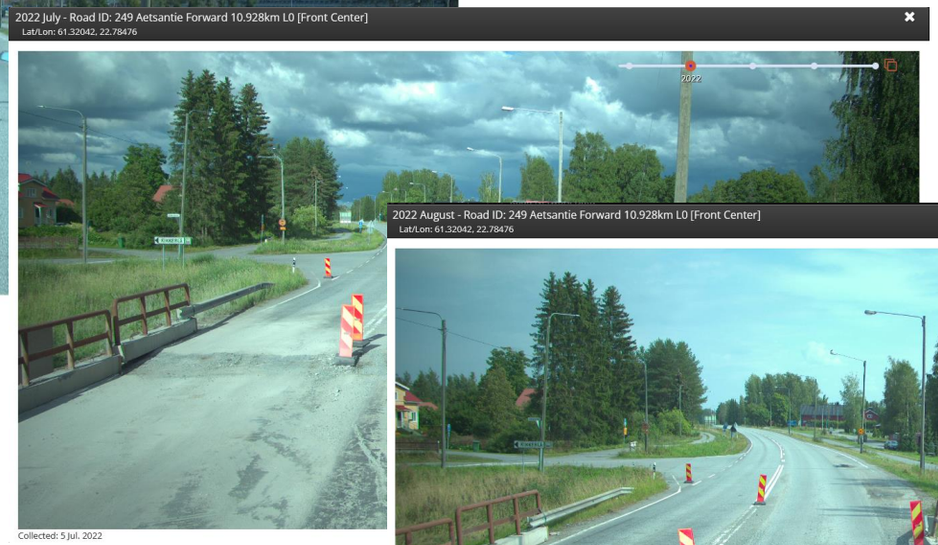
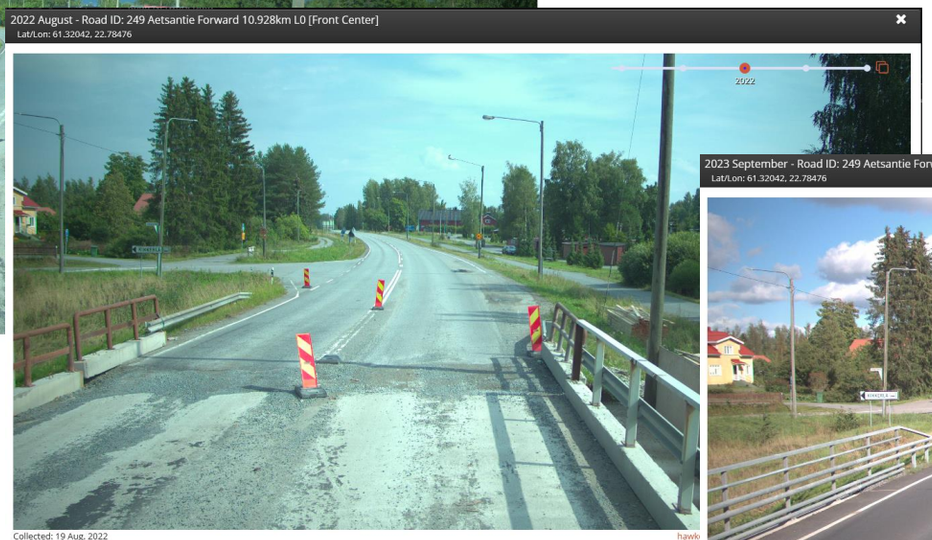
28 – 29 November 2023, České Budějovice

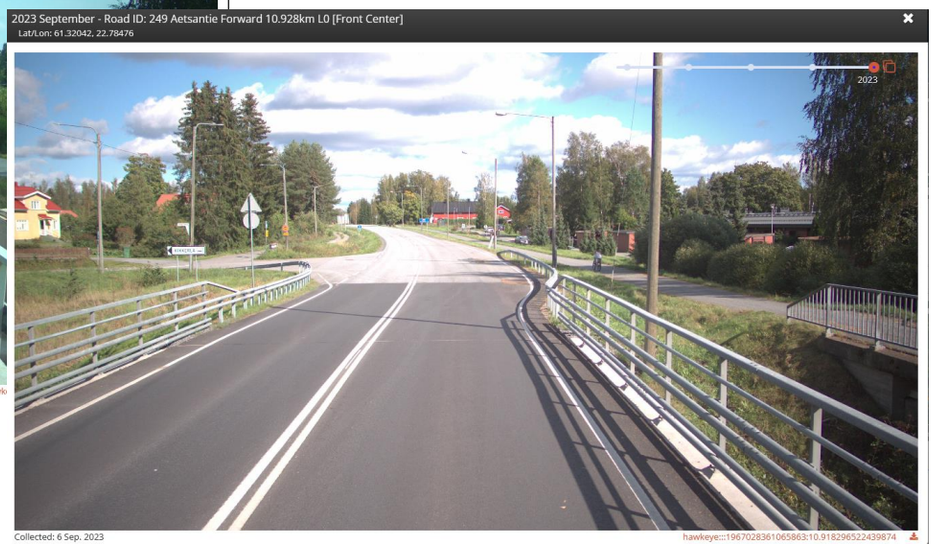
Motto: Let´s asphalt out of the crisis

You need good information to make good decisions

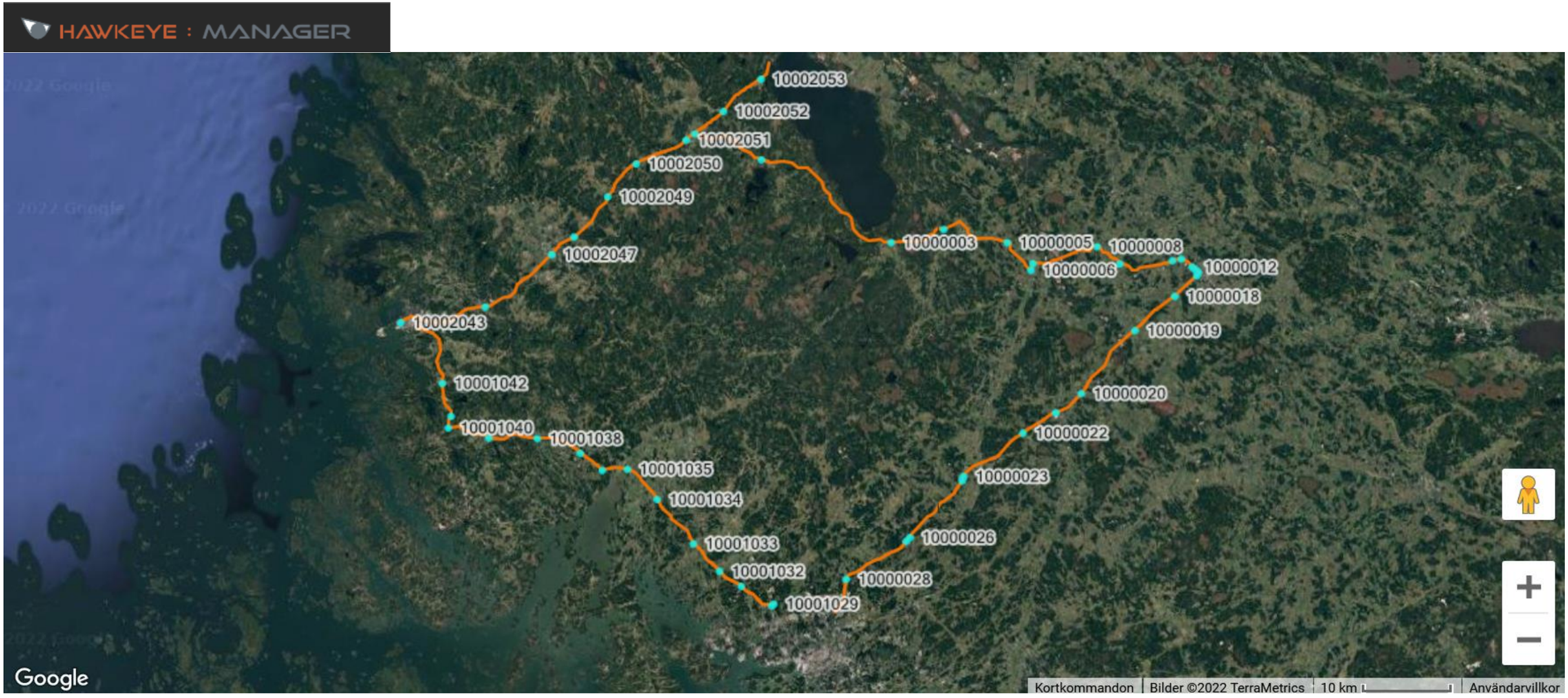




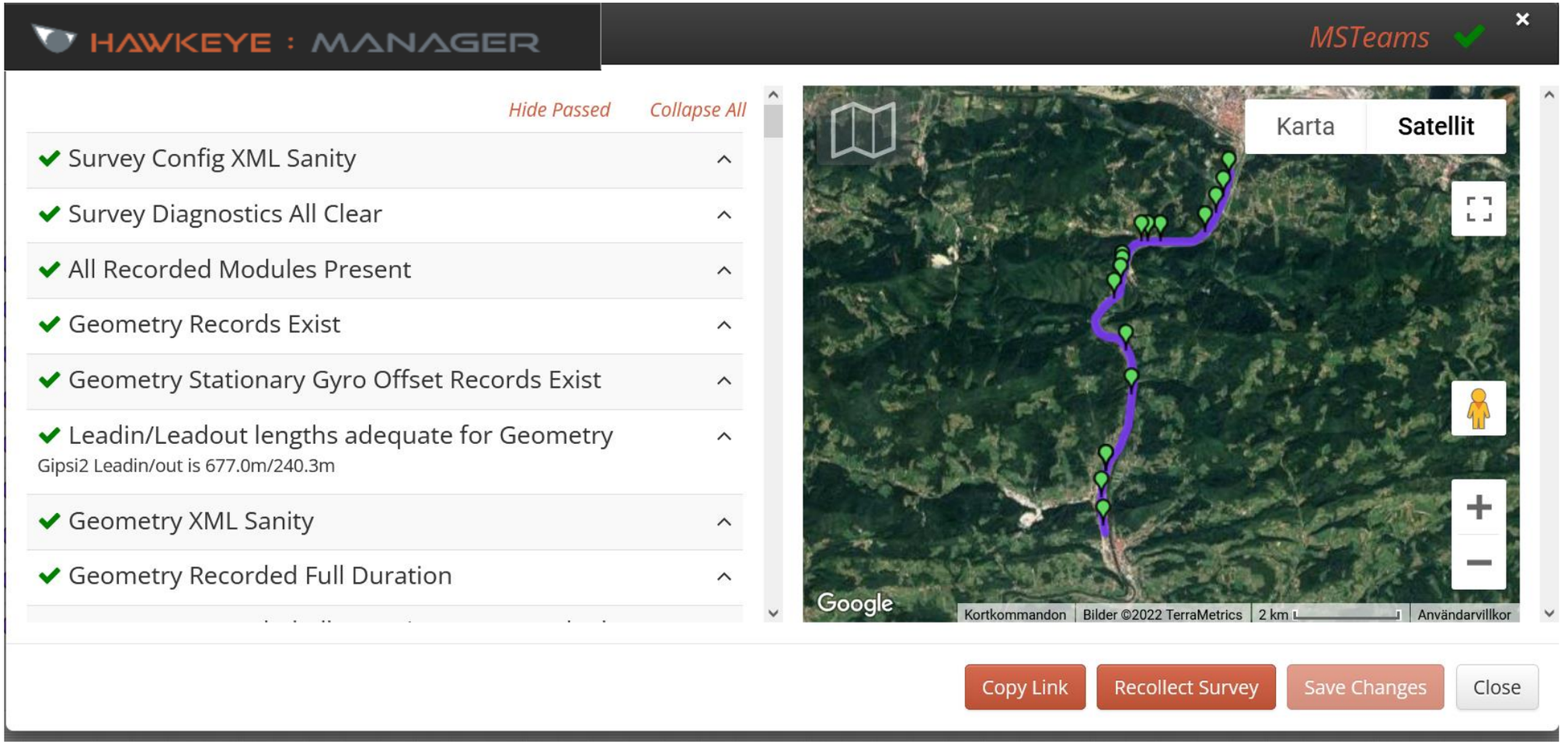




Data quality starts when planning a measurement campaign



Securing data quality during measurements – 39 parameters for equipment tests



Repeatability tests as part of the Quality Control

Aim:

- To investigate the actual performances in the field of the equipment used
- Tests are performed on special tracks and/or In-service roads
- Testing are done at different speeds
- To determine repeatability, multiple runs, at least three, must be done on the same section.

Reproducibility can be investigated if a reference device is available, or a ground truth established

- Reference or ground truth measurements are made with a view to study the accuracy of the device, compared to a reference or a ground truth.

Alignments – is important when studying repeatability.

Hand entered reference

- can be several meters out, dependent on operator skill

GPS alignment

- can be few meters off here or there
- very reliant on quality of GPS/INS System (kinematics)

Optical trigger

- very good, but can be 100 mm or so out with system lag and detection rate
- optical tape can move and at times not be detected on every run

Physical block

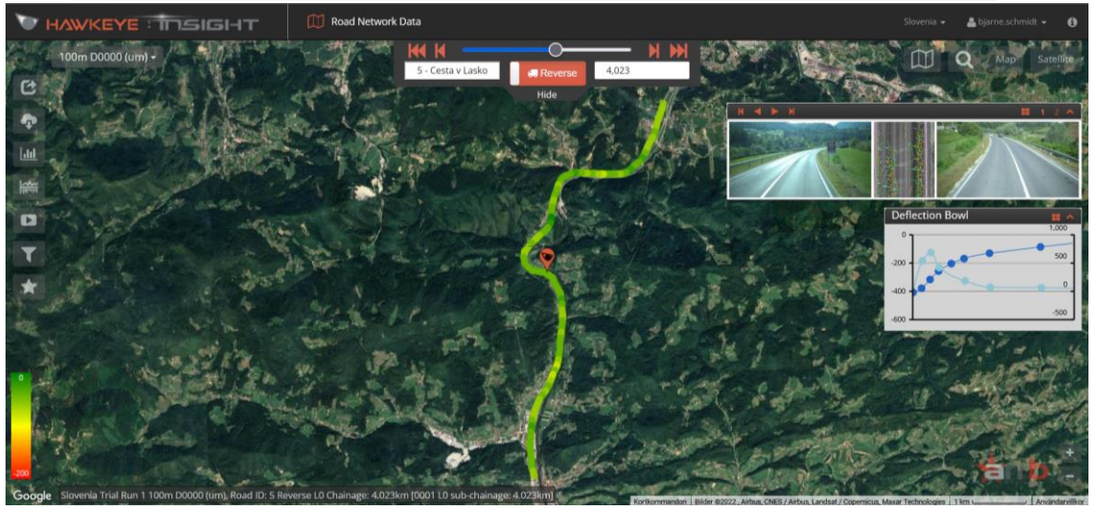
- physical block on ground to ‘manufacture’ a spike in the laser data set.
- relies on post survey data manipulation to shift reference to spike in raw data

Profile alignment

- utilizes statistical techniques to determine the optimum offset
- horizontal offset within the cross-correlation sweep analysis is determined and profiles shifted for best match

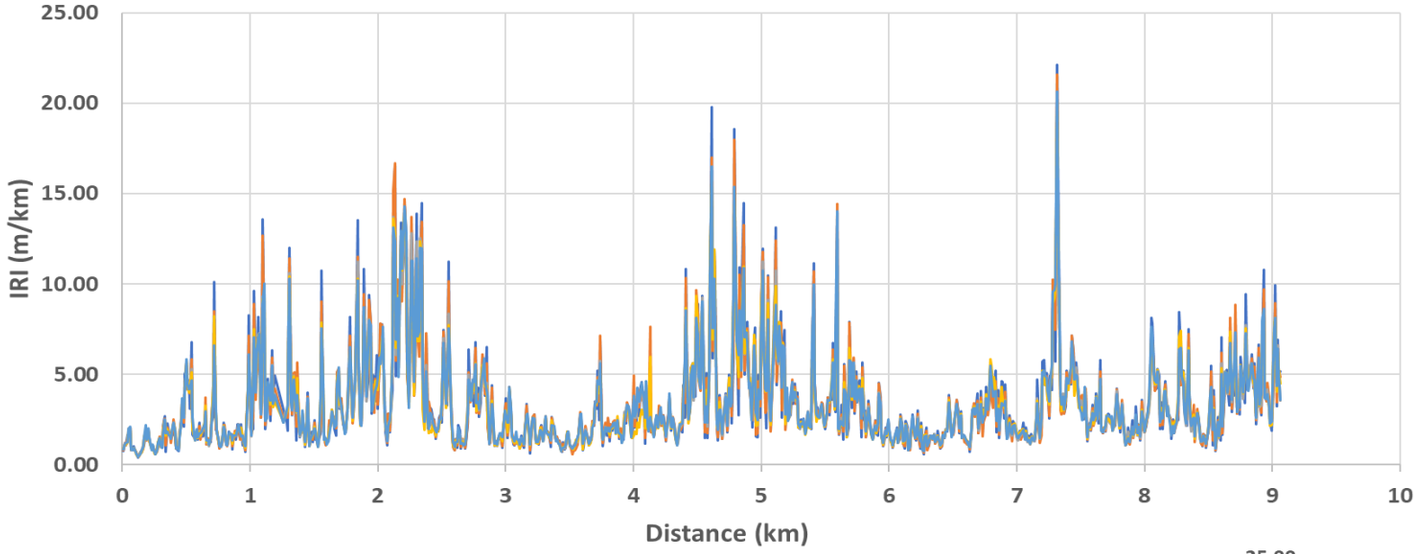
ARRB Systems was asked to show the repeatability of the iPAVe for a client, testing under traffic on in-service roads.

- 9 km road section measuring in both lanes
- Tests are performed on In-service roads
- Testing are done at traffic speed
- 5 runs in each direction.



The challenges of performing repeatability tests on in-service roads.

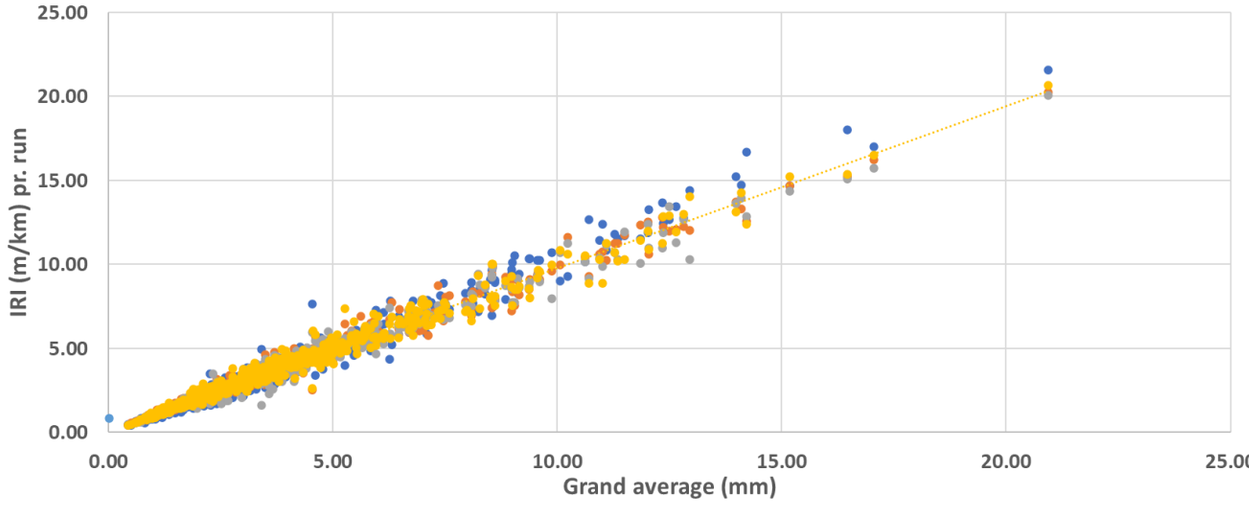
Repeatability of IRI



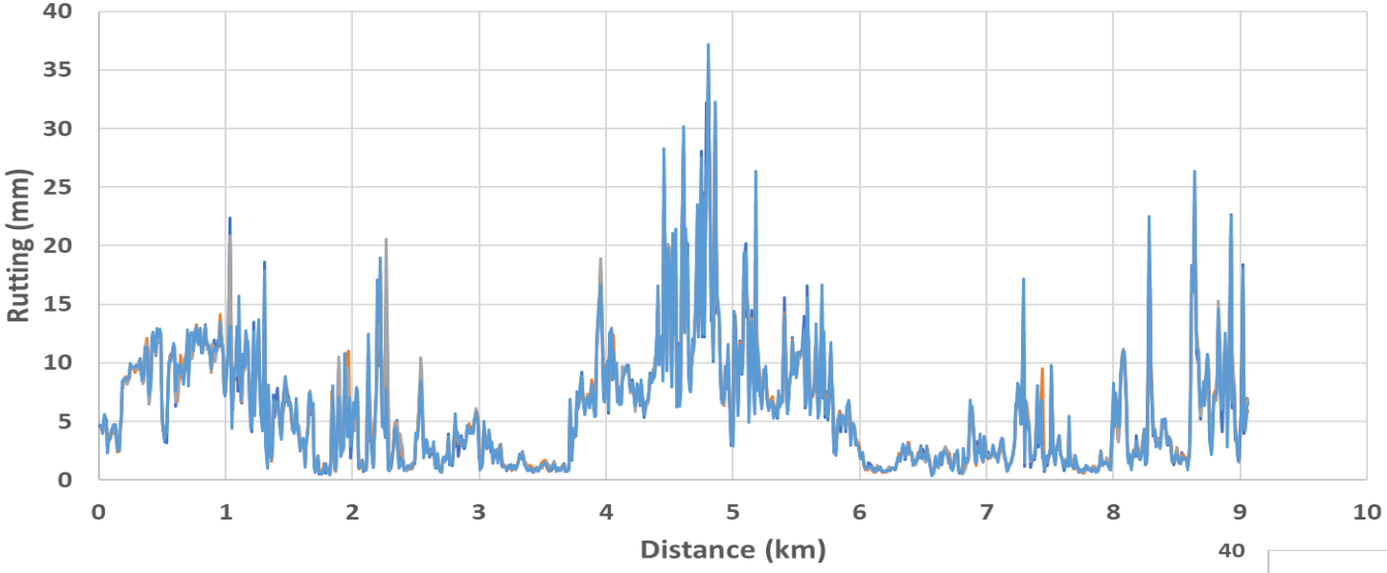
y = 0.96x + 0.123

R^2 = 0.98

Standard deviation of residuals 0,37 m/km



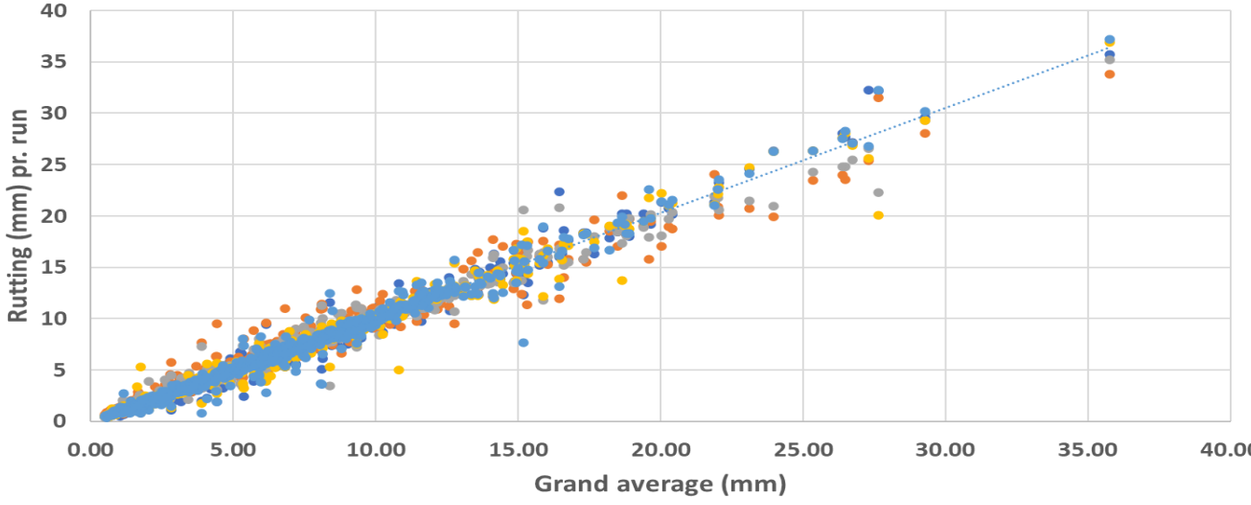
Repeatability of rutting



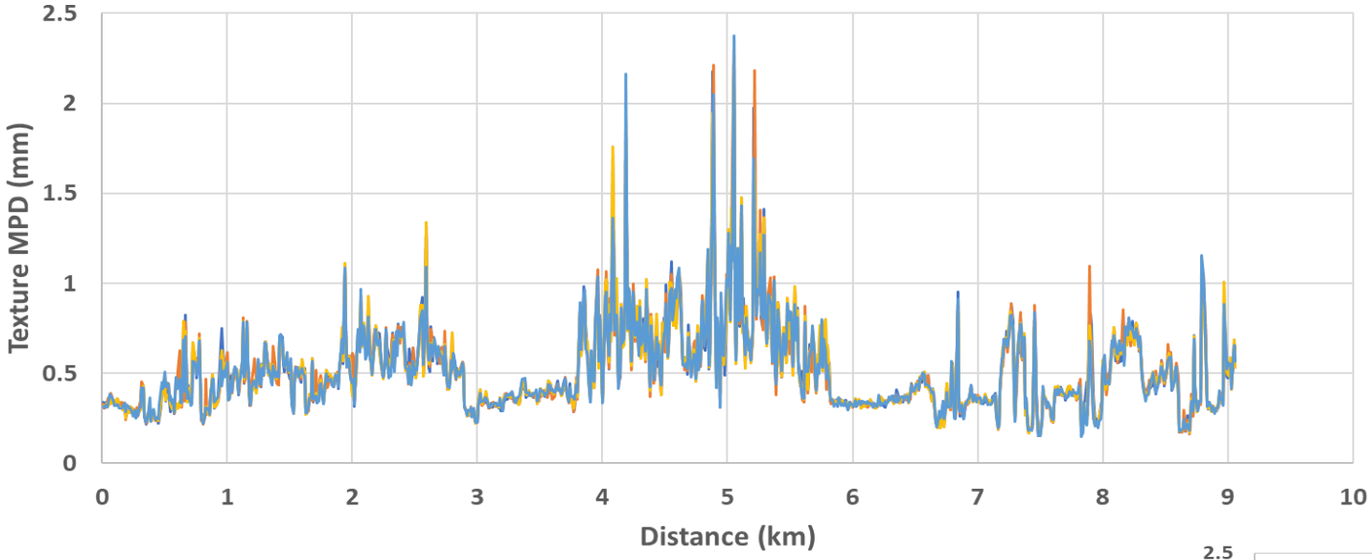
$y = 1.02x - 0.141$

$R^2 = 0.98$

Standard deviation of residuals 0,67 mm



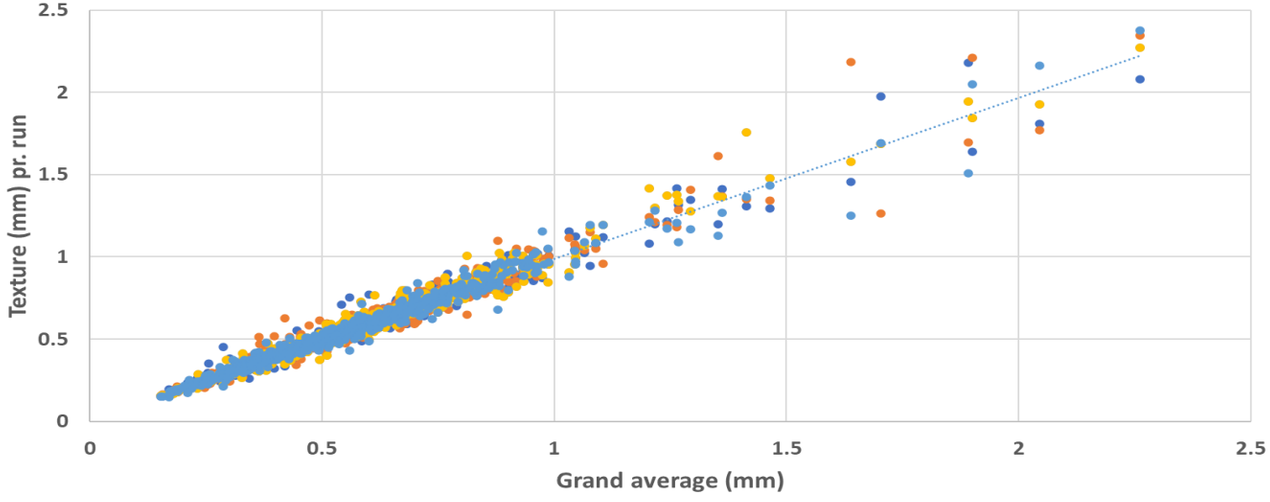
Repeatability of texture (MPD)



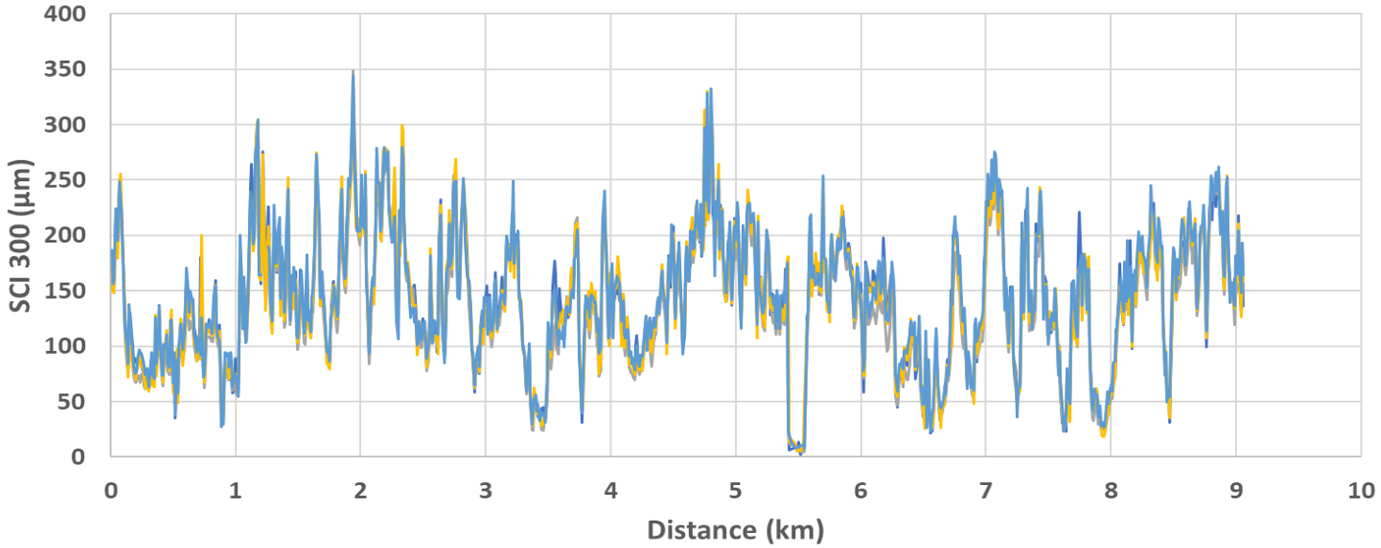
y = 0.98x + 0.009

R^2 = 0.98

Standard deviation of residuals 0,037 mm



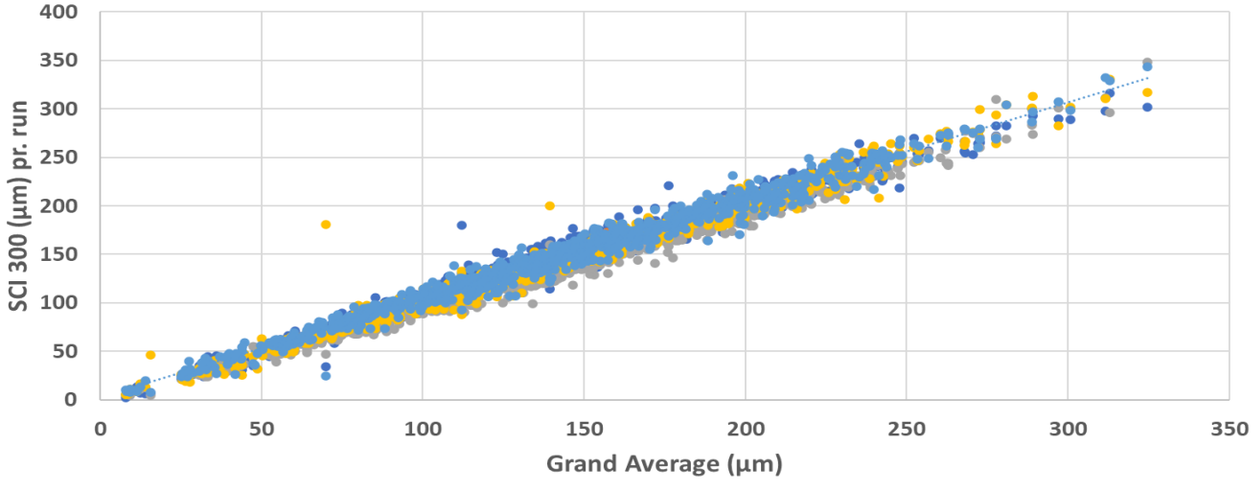
Repeatability of deflection expressed as SCI 300



$y = 1.01x + 2.604$

$R^2 = 0.98$

Standard deviation of residuals 8,3 µm

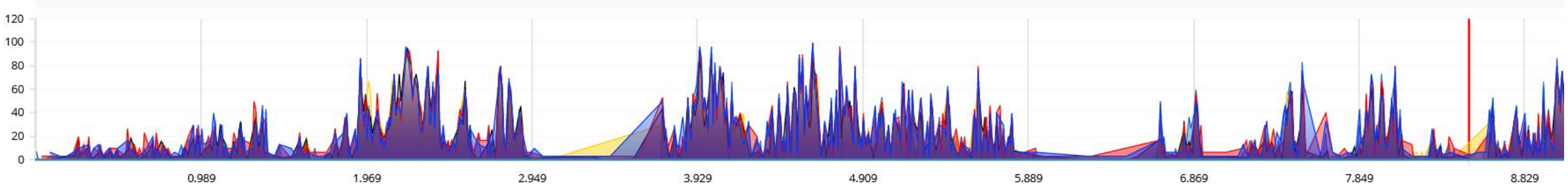


To sum up:

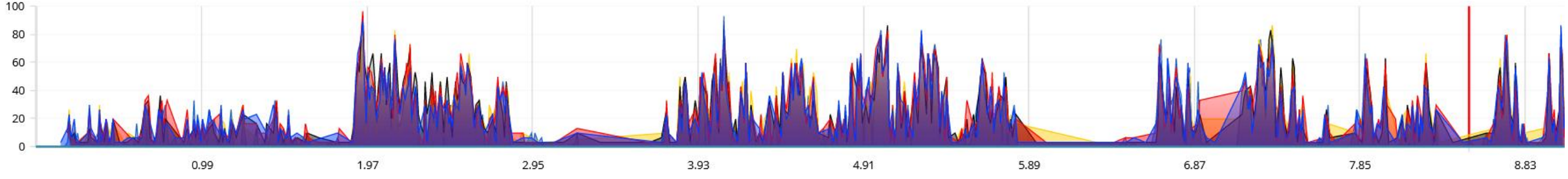
Parameter	Regression	R^2	Standard deviation of residuals
IRI	0,96*x+0,123	0,98	0,37 m/km
Rutting	1,02*x-0,141	0,98	0,67 mm
MPD	0,98*x+0,009	0,97	0,04 mm
Surface Curvature Index 300 (**SCI 300**)	1,01*x+2,604	0,98	8,3 µm
Center deflection D0	0,98*x-0,028	0,94	33 µm

Total pavement cracking measured at the five repeated runs.

South Bound Direction



North Bound Direction



Test of alignment for the 5 repeated runs

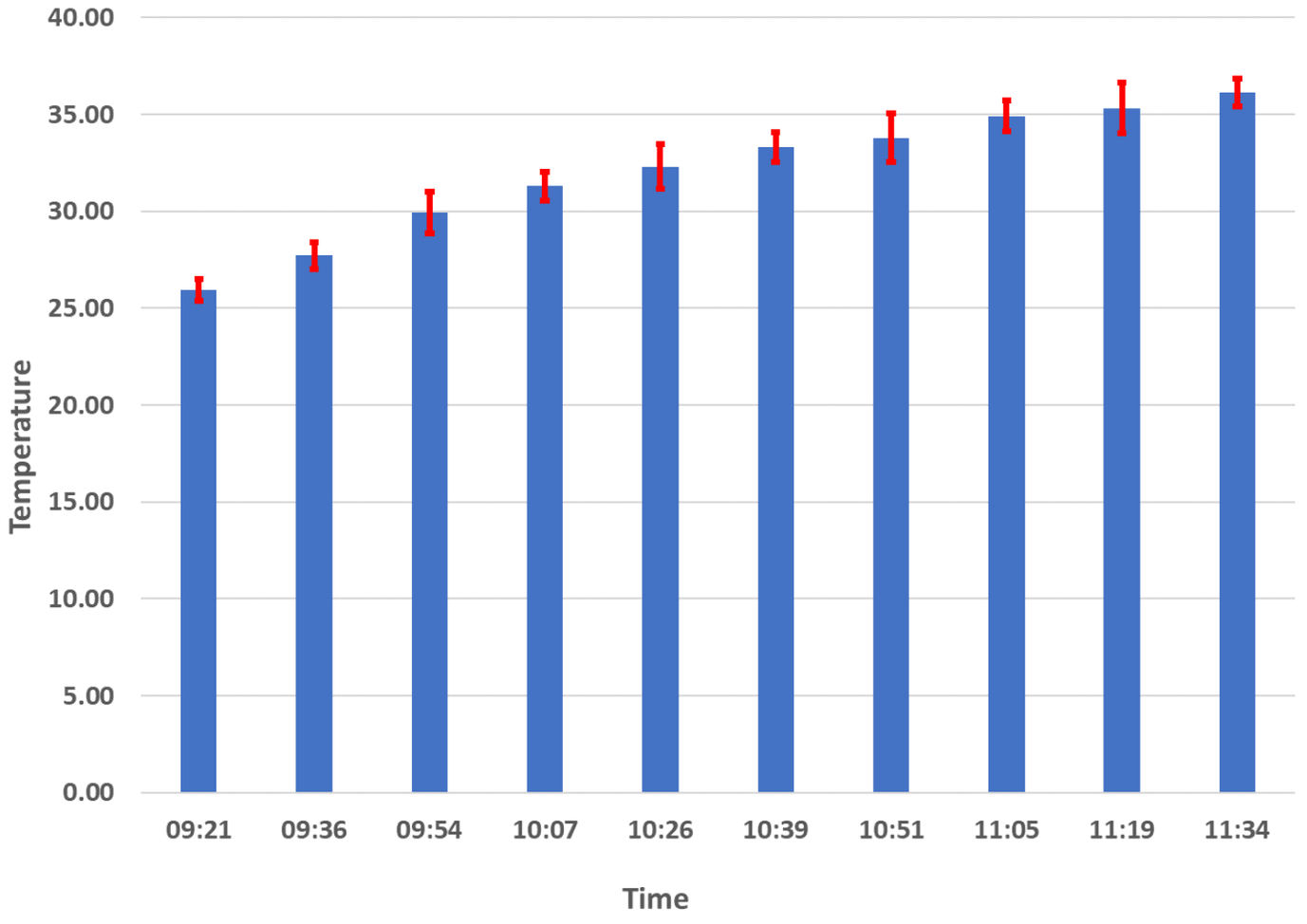
Profile alignment using Proval

Direction and run number	Differences between runs (m)
NB – 1 vs 2	0,45
NB – 1 vs 3	2,18
NB – 1 vs 4	1,55
NB – 1 vs 5	2,00
SB – 1 vs 2	0,05
SB – 1 vs 3	-0,27
SB – 1 vs 4	0,90
SB – 1 vs 5	0,53

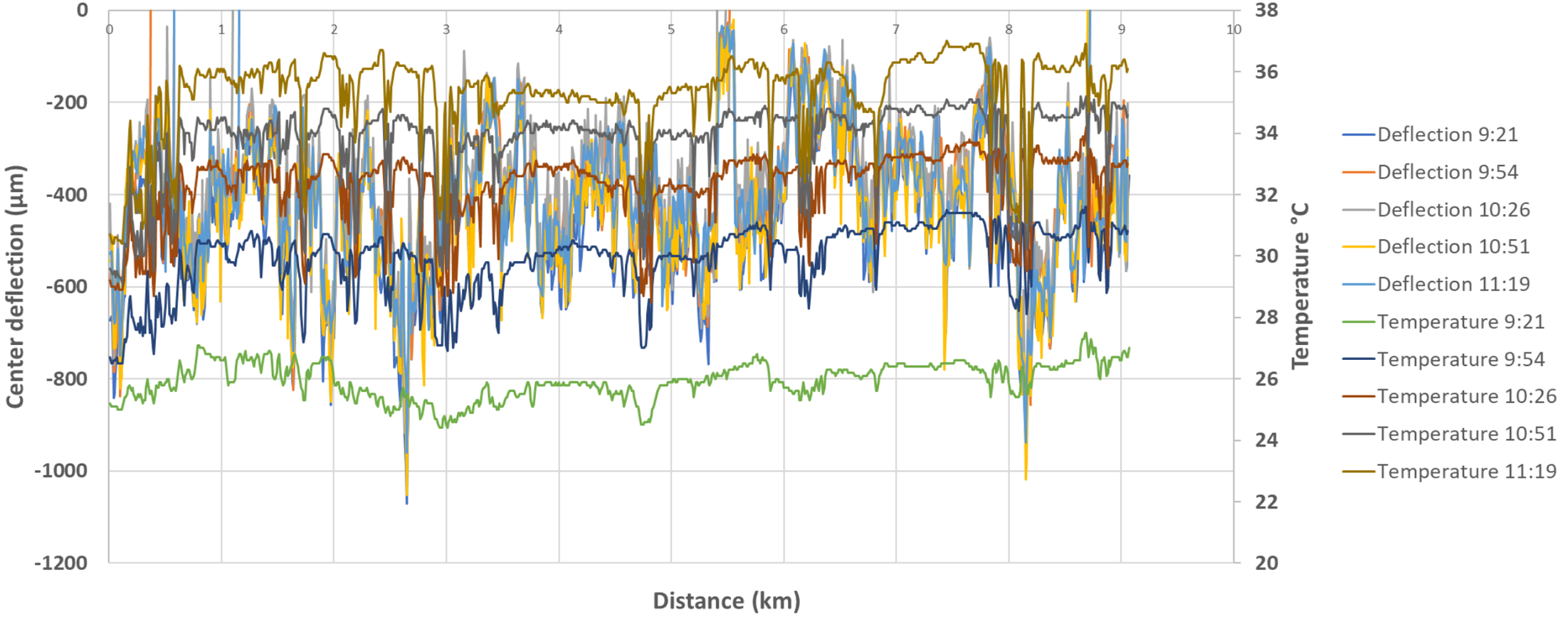
Start of section going north bound

Start of section going south bound

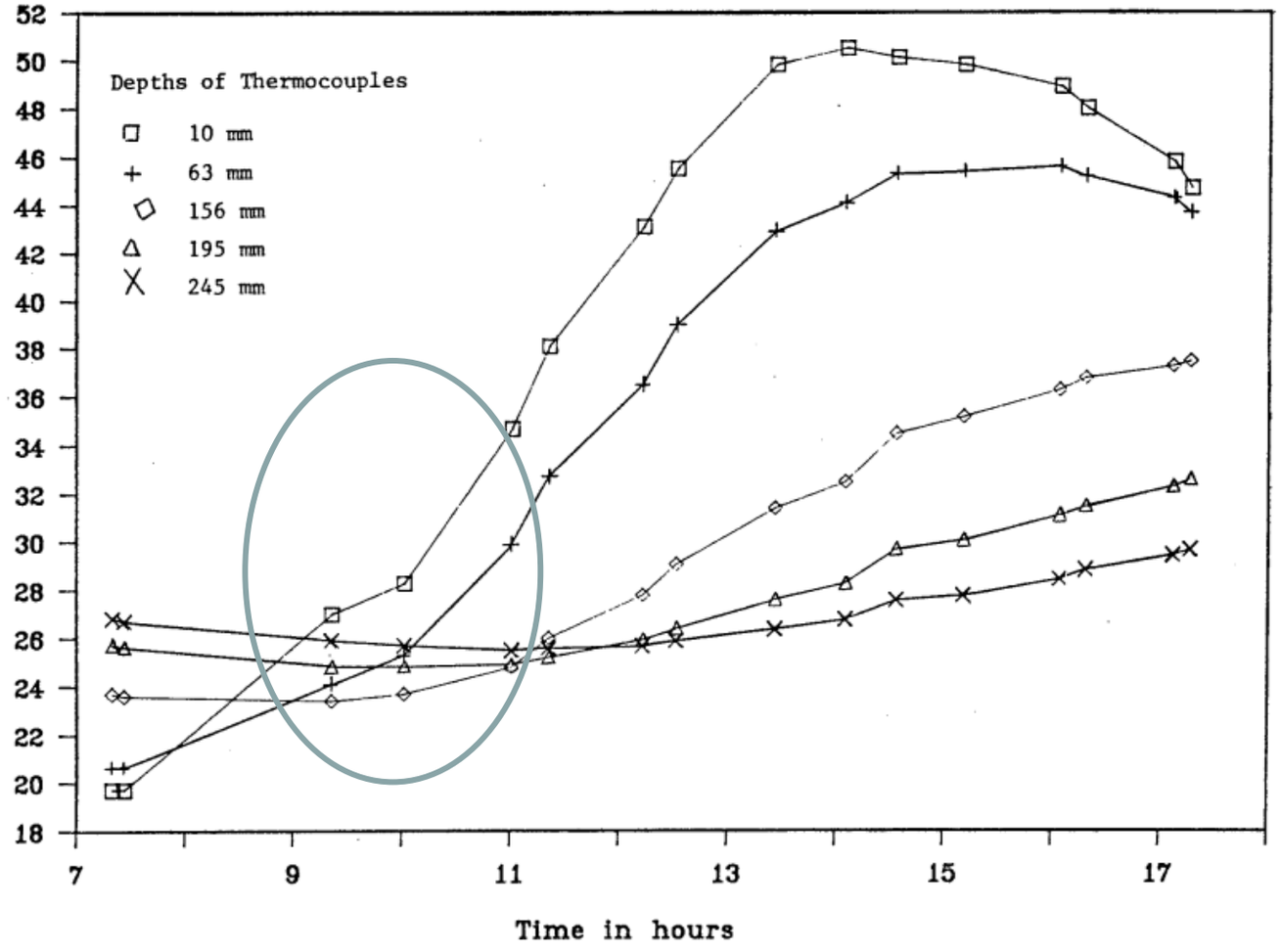
Pavement surface temperature during measurements

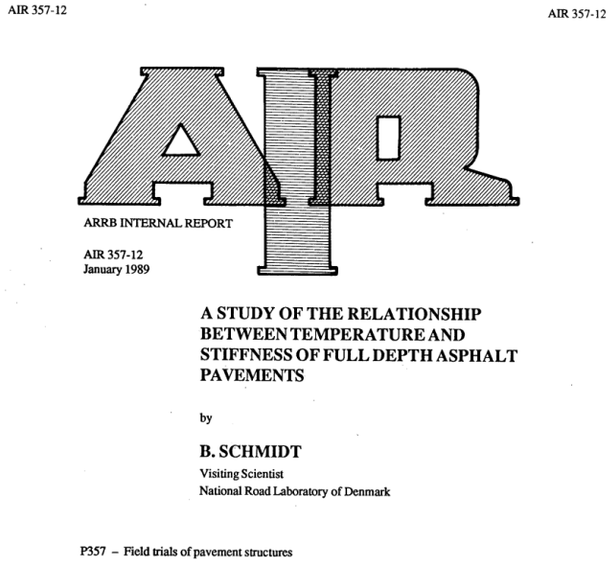


Temperature influence on Deflections – for further studies



Asphalt temperatures measured at different depth during a day – for further studies




AIR 357-12

AIR 357-12

ARRB INTERNAL REPORT

AIR 357-12
January 1989

A STUDY OF THE RELATIONSHIP BETWEEN TEMPERATURE AND STIFFNESS OF FULL DEPTH ASPHALT PAVEMENTS

by

B. SCHMIDT
Visiting Scientist
National Road Laboratory of Denmark

P357 – Field trials of pavement structures

iPAVe - intelligent Pavement Assessment Vehicle

+ Roughness
Left & Right wheel paths

+ Texture
Centre & Both wheel paths

+ GNNS DGPS
geospatial location

+ Geometry
Crossfall, Grade, Horizontal & Vertical curvature

+ 3D Roughness
Full Lane

+ 3D Rutting
Full Lane

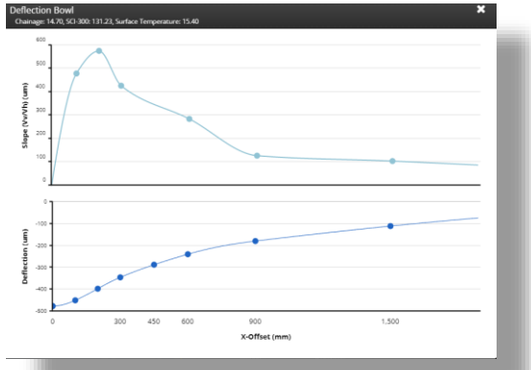
+ 3D Cracking
Full Lane

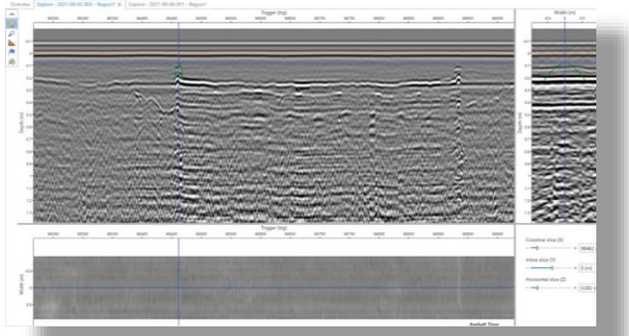
+ 3D Surface Defects
Full Lane

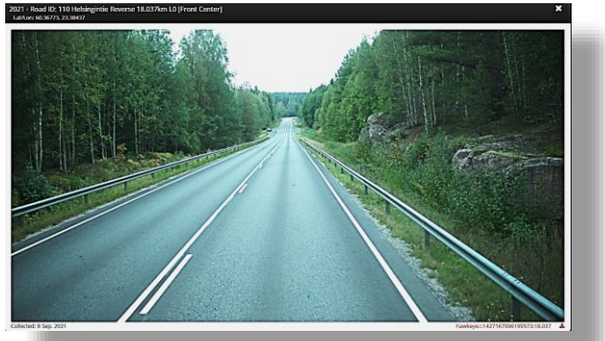
Continuous Deflection Measurement

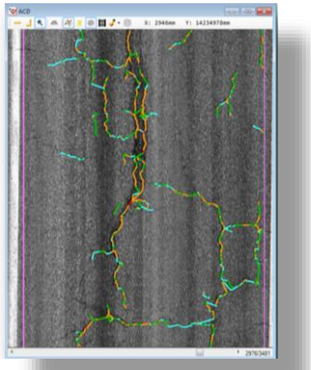
+ 3D Ground Penetrating Radar

+ Digital Imaging System





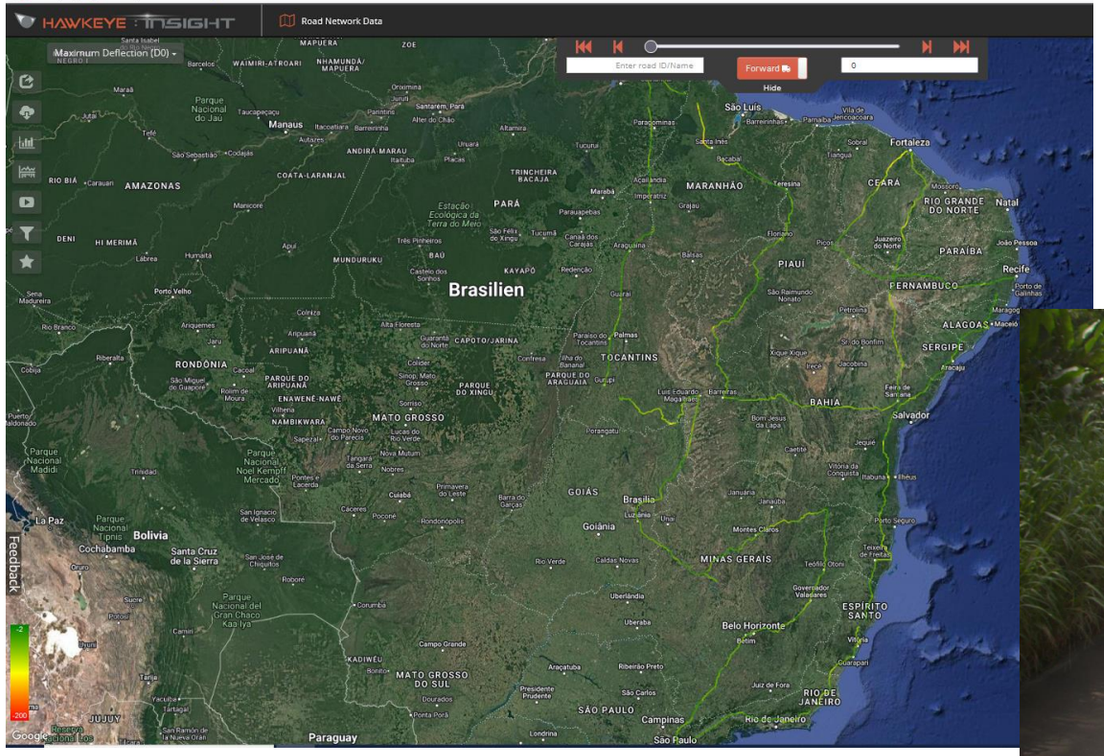




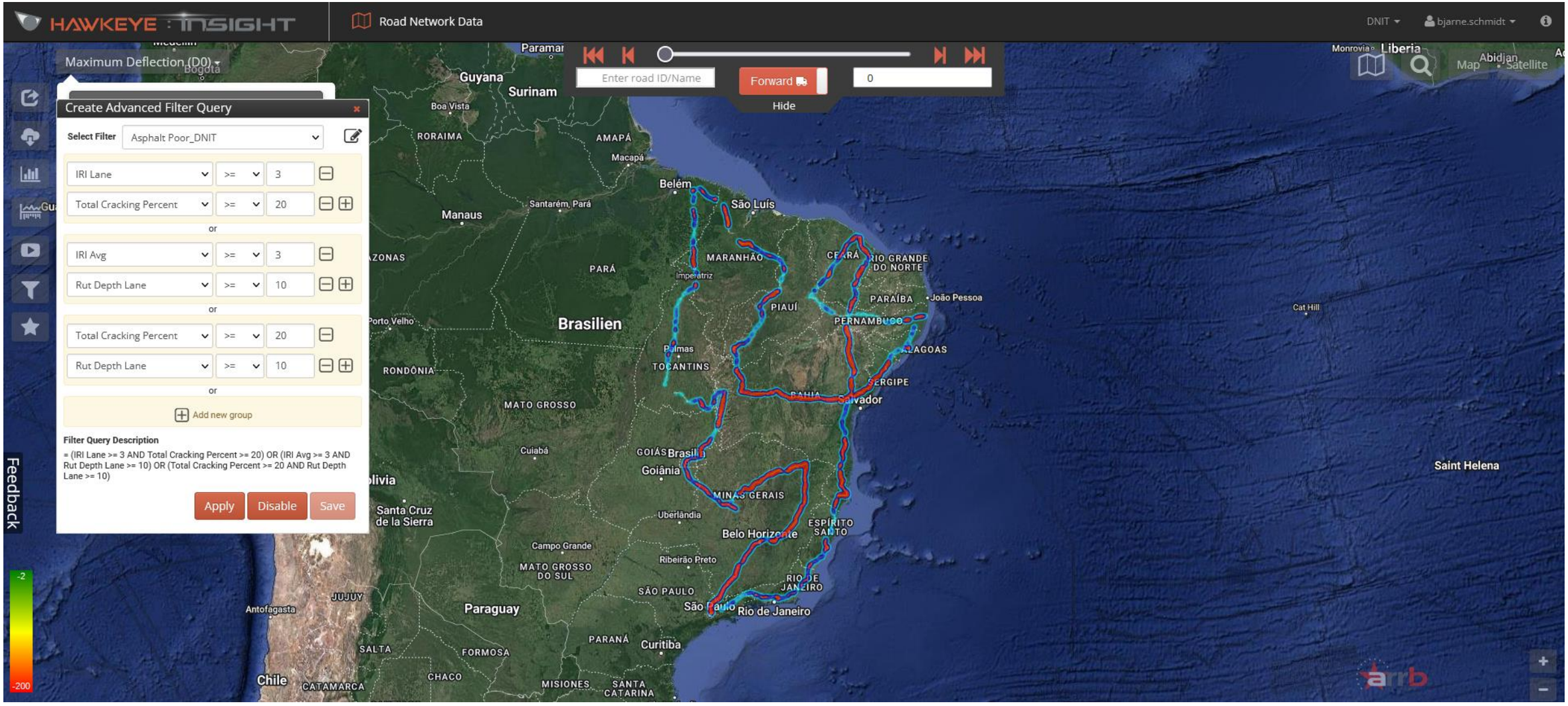
Simultaneous collection of Functional + Pavement layer + Structural data = Comprehensive Pavement Assessment

iPAVe Road Infrastructure measurements in 2023:

Brazil: Over 4 month in 2022/2023, the iPAVe surveyed approximately 12,600 km of Federal Highways. Data delivered to the client.



Filtering data – locate roads where the asphalt is poor:



- Questions?

Data driven pavement people

While we’re driven by a passion for data and technology, our purpose is people and the pavements that take them smoothly and safely from A to B.

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PAVEMENT MANAGEMENT INTELLIGENCE