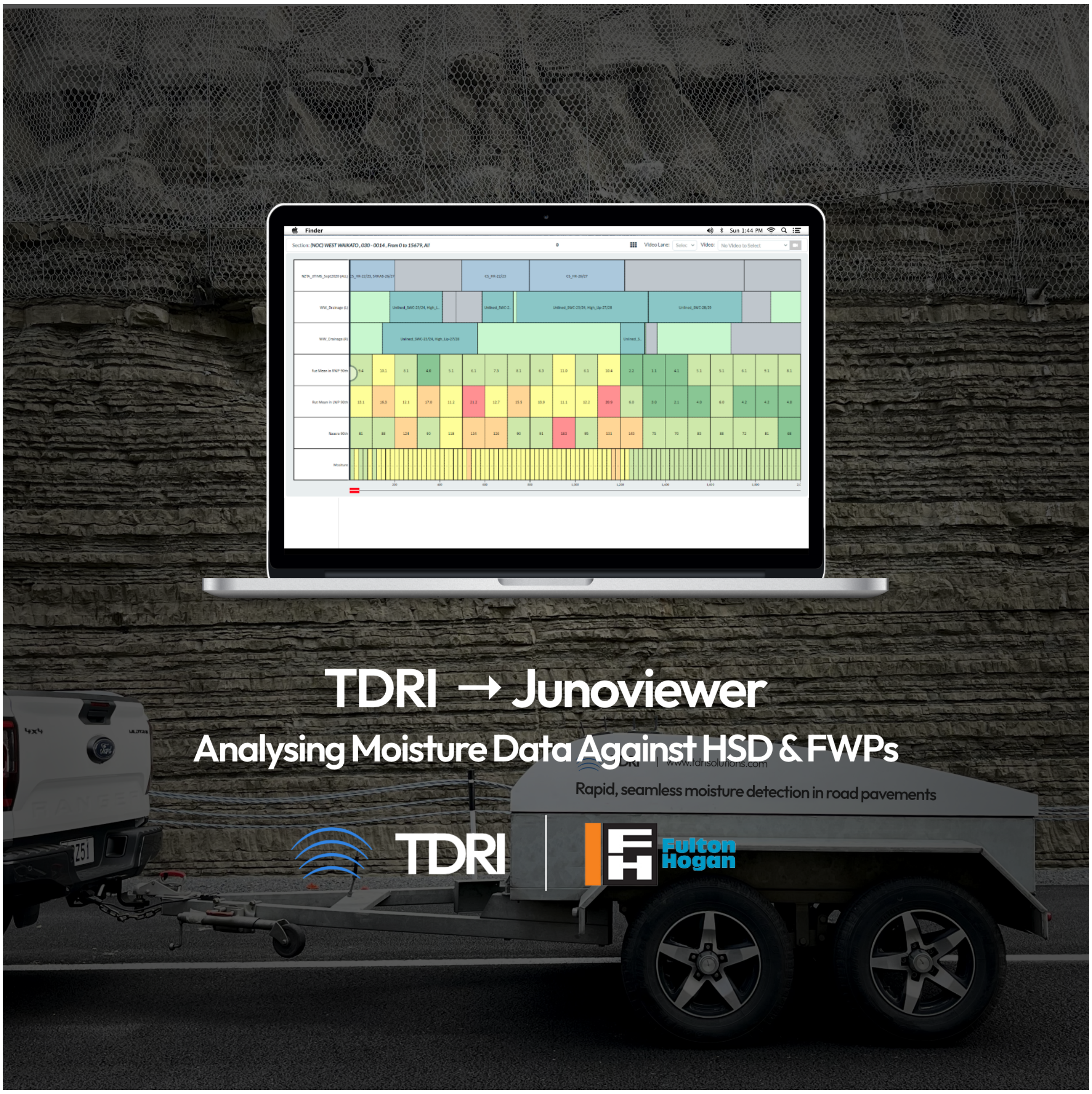



Client: Fulton Hogan | Network: West Waikato NOC
Surveyed: December 2022 | Published: April 2023

# Introduction

Fulton Hogan, as a tier one road construction and maintenance contractor, knows how subsurface moisture can impact road deterioration. As such, they are naturally attracted to the prospect of measuring subsurface moisture right across an entire network, and have engaged TDRI to do this across a number of SH NOCs in New Zealand.

While they've used the TDRI portal to visualise and analyse our data in a number of ways, they've also seen potential in aggregating this moisture data against other high speed road condition data (HSD) and proposed forward works plans (FWPs) in Junoviewer. In doing so, they have found a way to apply the moisture data to justify, prioritise, challenge and identify certain works - all with a goal of optimising the use of maintenance budgets.

For this case study, segments of a two-way subsurface moisture survey totalling over 1140 lane kms across the West Waikato SH network were chosen. This type of survey is typically known as a TDRI 'Network Scan'.

This Network Scan included a single survey pass in each left hand lane - containing continuous subsurface moisture readings (at approximately 1-4m intervals), which represent the measured water content within a 1.3m W x 0.25m D section of pavement.

This case study provides an explanation of how TDRI data has been integrated into Junoviewer, and shows scenarios of where TDRI moisture data can help justify, prioritise and identify more optimal maintenance works.

# Integrating TDRI moisture data into Junoviewer

### Accessing the TDRI Portal and downloading survey CSVs

Upon delivery of the Network Scan, you receive a data access email, alongwith our TDRI Portal & Data Guide. This provides you with guidance on how to interpret and apply the data in our portal, but also how to extract individual surveys to CSV files that can be uploaded and used in other software applications.

For this project, we had multiple surveys across the West Waikato NOC, which Fulton Hogan wanted to aggregate in its entirety against other HSD and FWPs in Junoviewer. As such, we created a feature that enabled a bulk export of all completed surveys into a linked zip file that could be sent onto the team at Lonrix (the company that manages Junoviewer).

### Modelling TDRI moisture data against chainage blocks in Junoviewer

Lonrix uploaded the csv files and attributed the moisture data to relevant NOC road segments in Fulton Hogan's account in Junoviewer. Lonrix then conducted statistical modelling to establish a number of key representative parameters for the moisture data in 20m chainage blocks. These included:

- Mean value
- Standard deviation
- 25th percentile value
- 75th percentile value

These parameters were what Lonrix and Fulton Hogan chose for this dataset. However, should a client wish to establish different parameters, such as worst reading in a chainage block or otherwise, the Lonrix team and system would be able to facilitate that.

Where moisture readings have been analysed and applied in the examples below, Fulton Hogan has used the mean moisture value for each 20 m chainage block.

Lonrix also set up colour coded ranges for different levels of moisture readings, so the severity of moisture level could be ascertained when assessing the moisture readings against other HSD and FWPs.

**Figure 1**

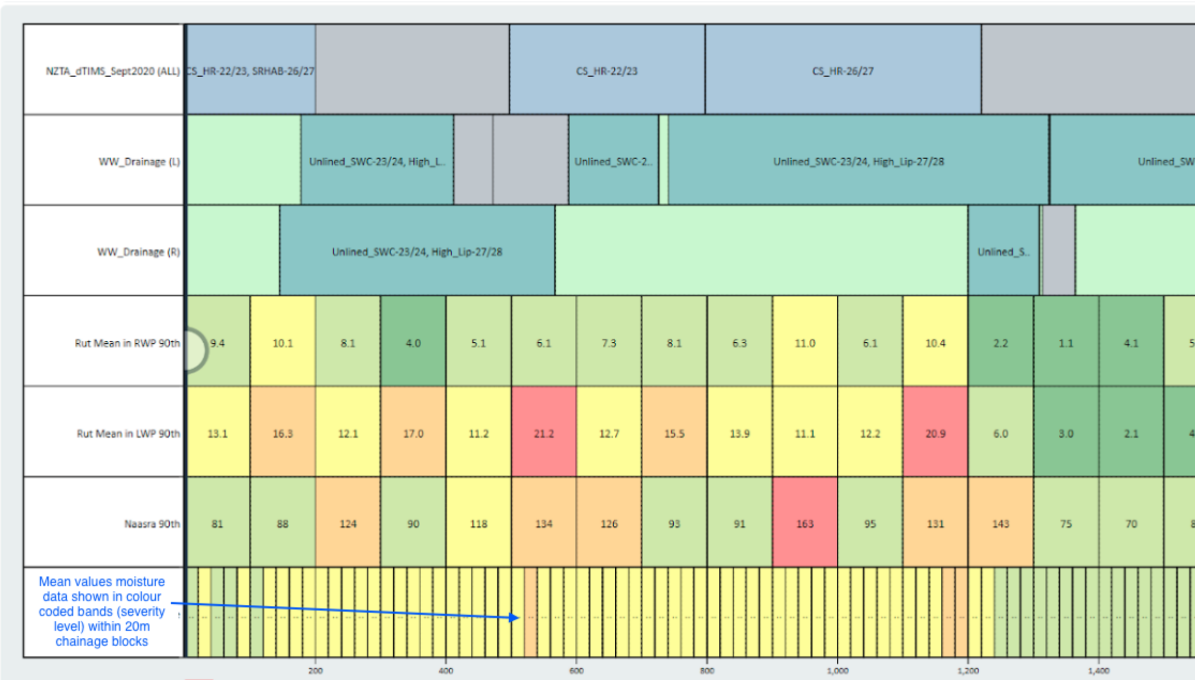



Figure 1 above shows data in the following order (top to bottom):

- dTIMS FWPs
- Drainage FWPs (L & R sides of road)
- Rut Mean (90th percentile - LWP & RWP)
- Naasra (90th percentile)
- Moisture data (mean values, colour coded in 20m chainage blocks)

# Moisture Data Application Findings

The following examples of moisture data application opportunities are extracted from aggregated views of road segments in Fulton Hogan's Junoviewer account. These show some (not all) examples of how the moisture data can be used to:

- Justify and prioritise planned forward pavement and drainage works
- Investigate and challenge the need for, and extent of any planned FWPs
- Propose drainage maintenance to prevent deterioration for high risk moisture sites

## Where moisture, pavement deterioration and FWPs correlate

Figures 2, 3 & 4 below show correlations between higher moisture measures, higher pavement deterioration, and FWPs. Moisture measures in these scenarios can be used to:

- Better understand or validate the root cause of the roughness / rutting issues, and inform the most appropriate design / works for remediation
- Justify and prioritise works in these segments over those with less significant issues
- Provide support for bundling the FWPs together into one project to ensure the full extent of the issue is fixed at the same time (rather than different years

**Figure 2**

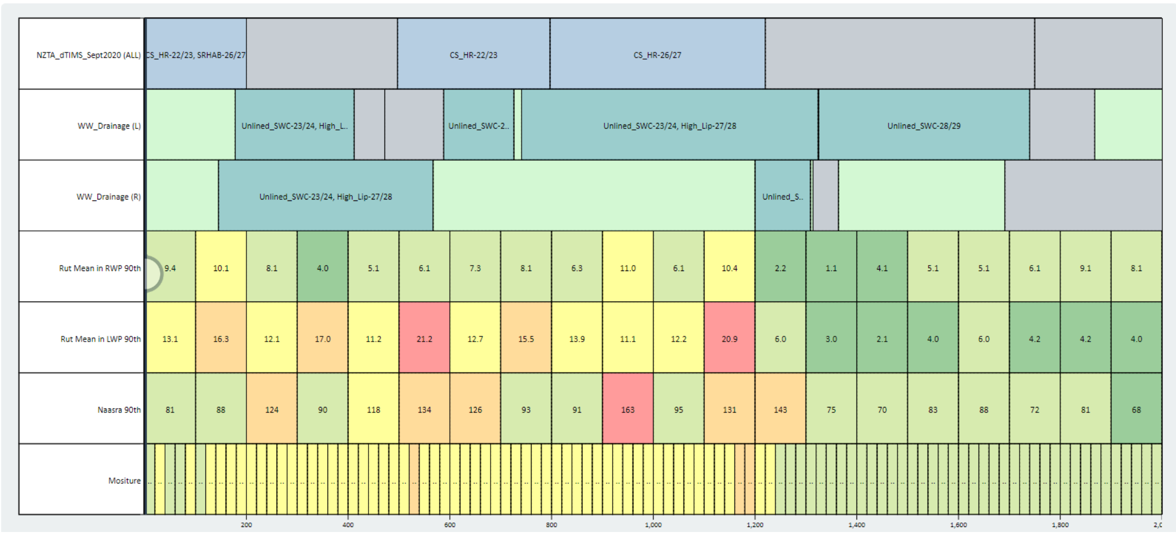


**Figure 3**

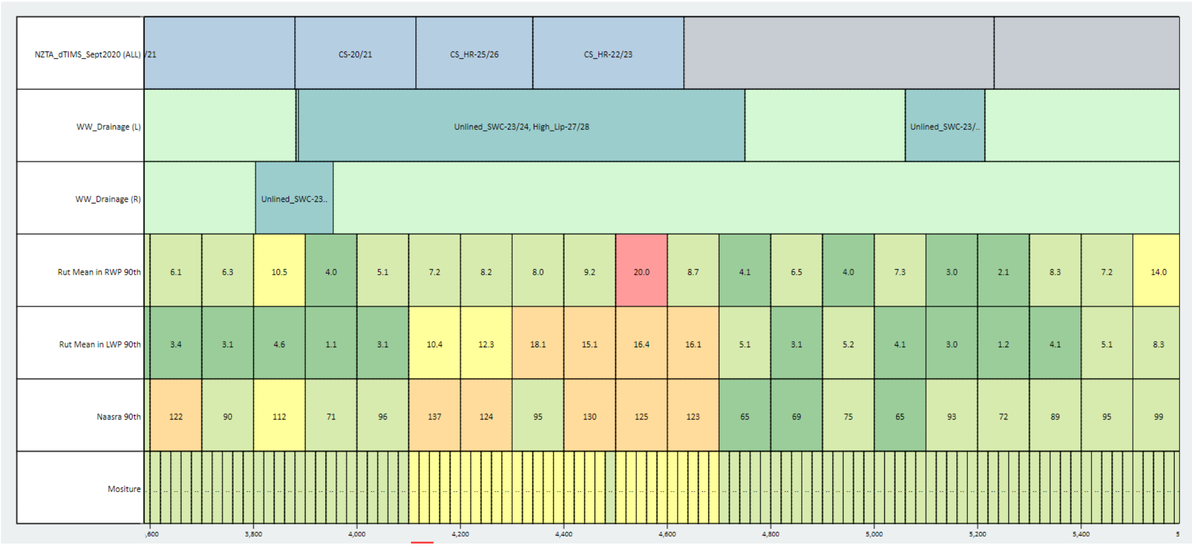
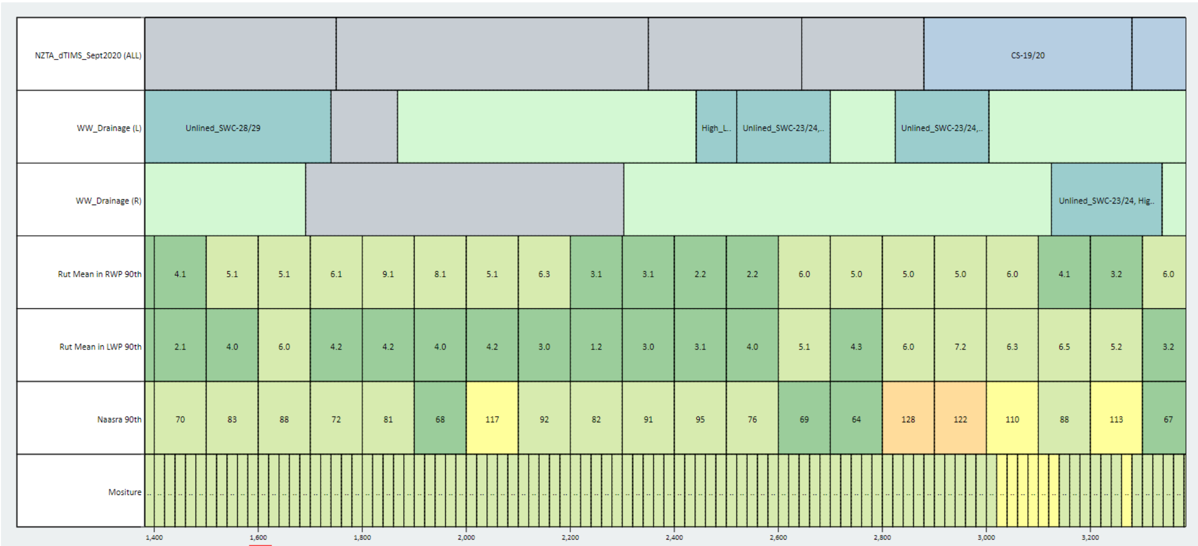



**Figure 4**

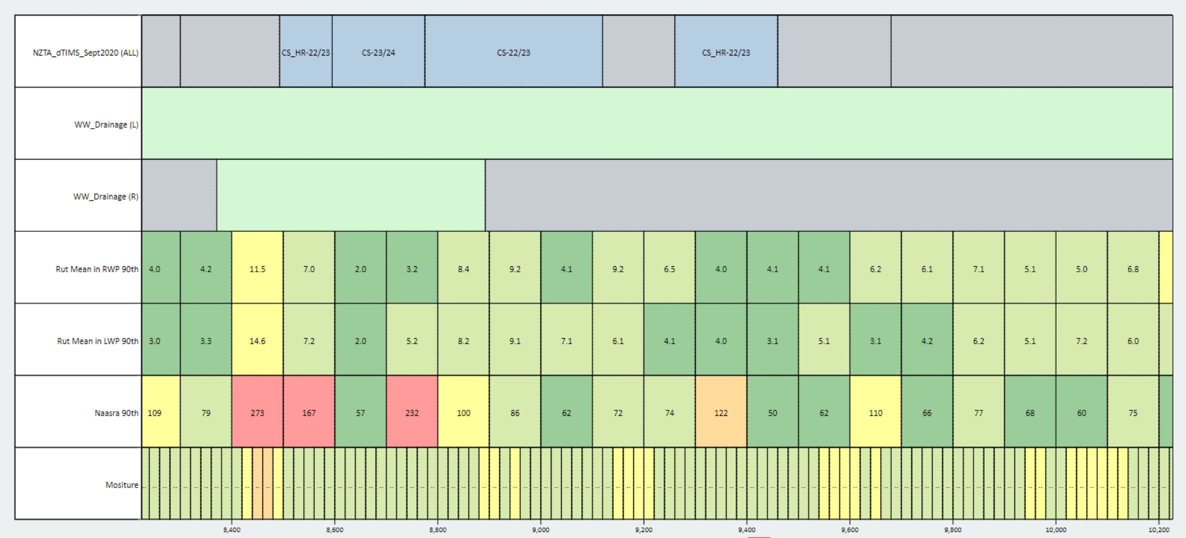



## Where moisture correlates with pavement deterioration, but not drainage FWPs

While the all the figures above show good correlations between high moisture, high deterioration and parts of the FWPs, there are also areas of planned drainage works where there are not correlations with higher moisture levels and / or pavement deterioration – there is a case for investigating and challenging the need for those works where correlations don't exist and redirecting budget elsewhere in the network.

Figure 5 below shows segments where higher moisture levels correlate well with roughness, and rutting in parts, but not with any planned drainage works. This is a good example of where moisture could be a key factor to deterioration* – maintaining the pavement without any drainage works could lead to the root issue not being fixed, and future rework.

## Figure 5




*There can be isolated instances where metallic objects interfere with the system's signal and return an artificially high moisture reading. For example, this can occur over utility covers or bridges, which have mesh within the concrete base. When you find readings that don't correlate with deterioration or FWPs, it's worth checking for these potential causes of interference as part of your site evaluation.