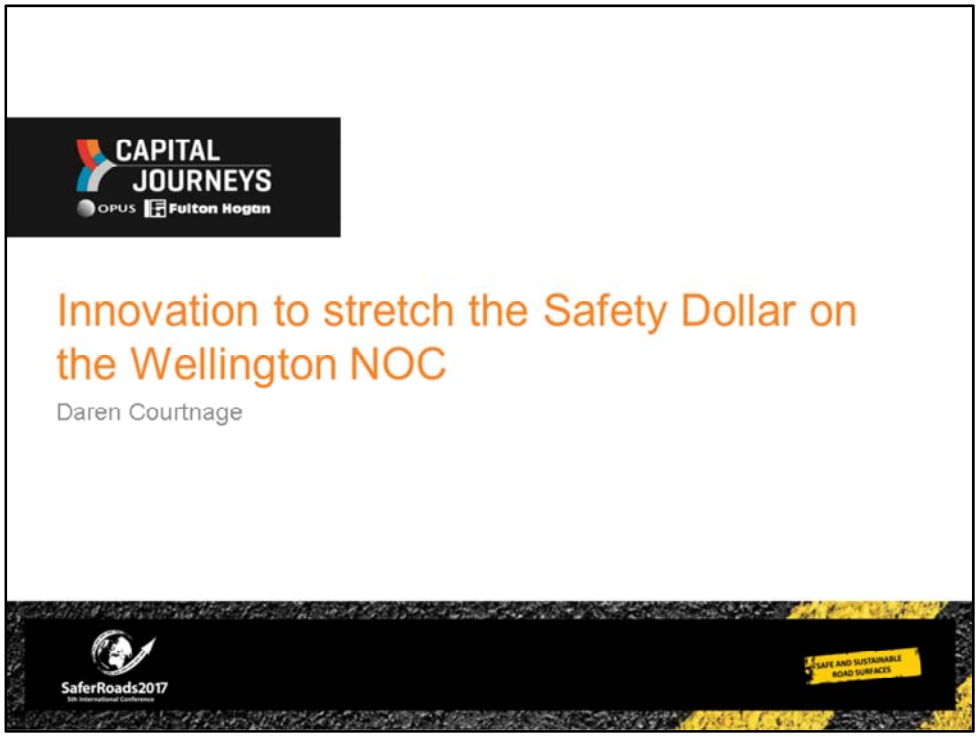
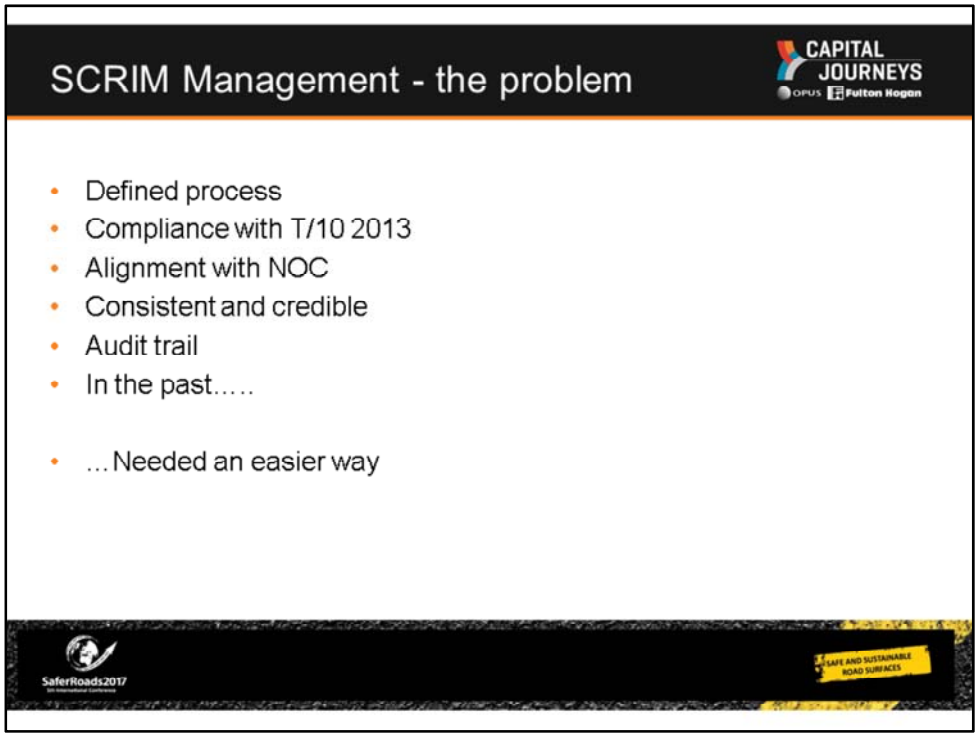


Good morning, may name is DC, Acting contract manager for Capital Journeys, a joint venture between Fulton Hogan and Opus consultants, established to deliver the Wellington Network Outcomes Contract.
With our network stretching from Wellington to Levin on SH1 and up to the Mt Bruce on SH2 we maintain 685 lane KM of State Highway.

With the NOC being a combination of measure and value, and lump sum elements, there are opportunities to generate savings for both Capital Journeys and the transport Agency.

Two areas in which potential savings have been identified in the safety arena, are those of managing the SCRIM process, specifically through the junovoewer WEB tool - giving savings to Capital Journeys, and

Extending SCRIM asset life through micromilling and Friction seals- a saving to the transport agency.



So SCRIM Management, what was the problem.

The data for analysis, the exceptions report, received annually from the transport agency, through RAMM, consists of, for wellington over 3000 lines of data.

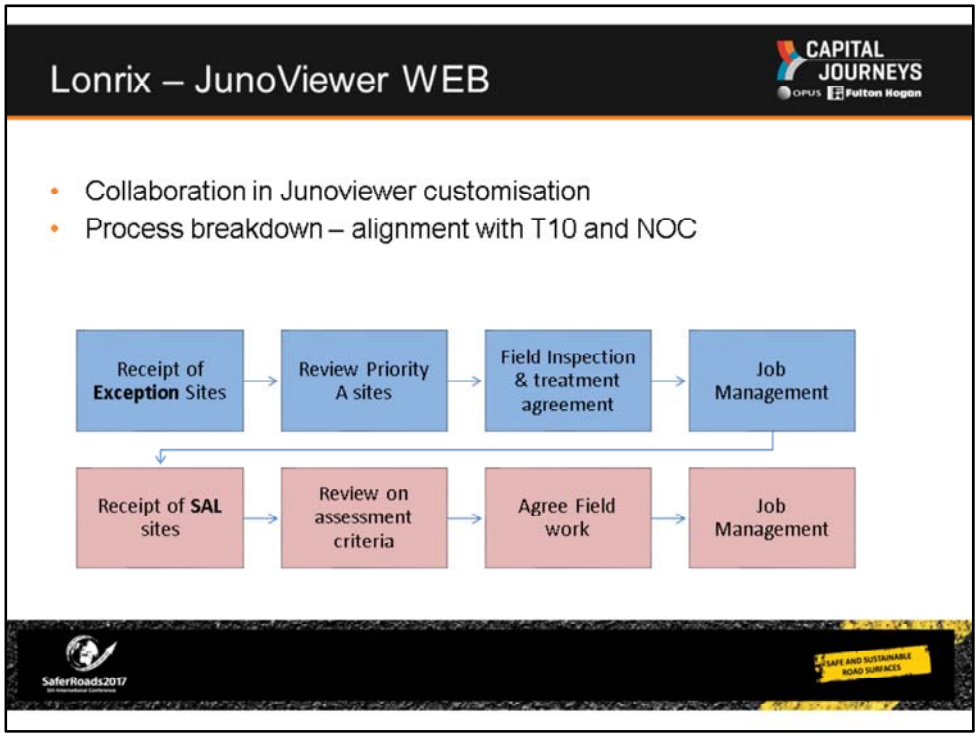
To analyse the this data, there is a defined process, T/10 2013, and also the additional NOC specification requirements.

To prepare this data for review, we have to combine our various Forward works programmes, Crash and accident details, from CAS, other elements of the annual High Speed Data, and previous years findings and treatments.

In looking more into the problem also found that each region undertook the process differently with some methods being more efficient than others, this resulted in a large quantity of time to undertake the analysis, and reliance on a small number of key staff undertaking some of the background processing.

For the transport agency, the output reporting also varied form region to region, generating more review time and therefore cost. These varying methods, and unmanaged spreadsheets also created potential for error and issues in maintaining a secure audit trail for decisions made.

We needed an easier way, this is where Lonrix came in, with their customisation of Junoviewer WEB to manage the SCRIM process.



We already had a good starting point with Junoviewer WEB, **we** use the junoviewer to manage our Forward works programme, and also as a tool to integrate data available to us through RAMM, from the High speed data, to geospatial, Falling Weight Deflectometer, network defects and maintenance requirements.

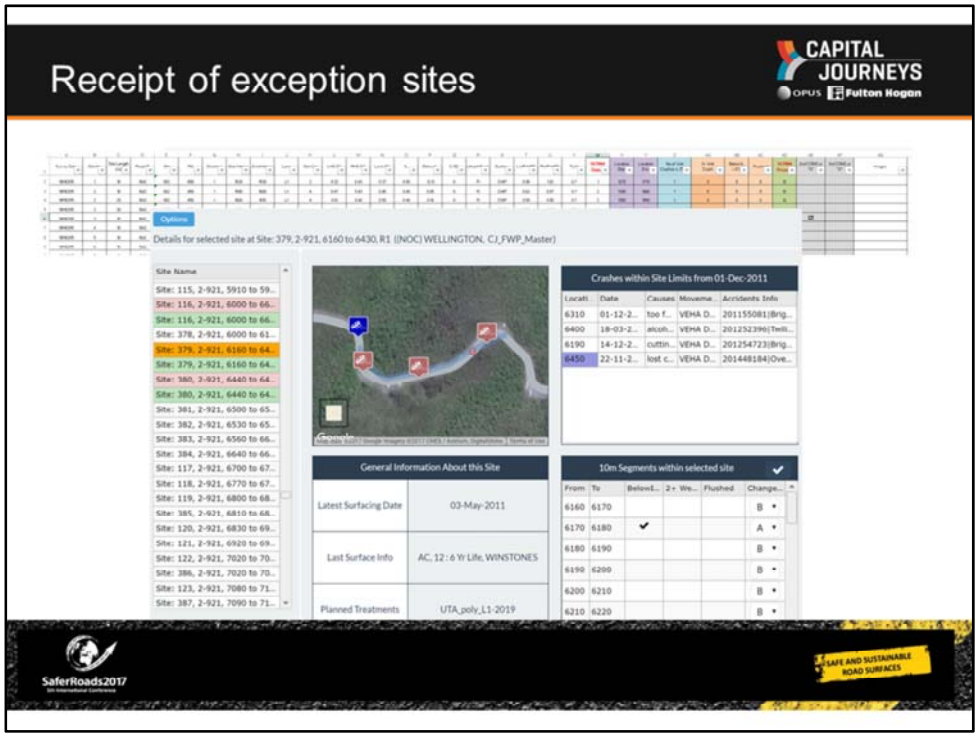
The next stage was to break down the SCRIM process and identify how we could incorporate what we had already to speed up and streamline the process.

It gave us the opportunity to collate all the process we had across the various Transport agency contracts, and combine into a process which could firstly provide consistency, and then also a framework for product development.

The process essentially had two elements, the initial analysis of the exceptions – involving immediate treatment of the highest risk sites,

Then the Skid Assessment Length - SAL process, dealing with the remaining SCRIM deficient sites.

With each element, a desktop review process, followed by field review, then job management and reporting was required.



So what did this look like

At the top you can see an example of the RAMM data, indicating each 10m exception – or deficiency, **an** interface was developed in Junoviewer pulling out this information and displaying graphically, the exceptions are listed on the left, distinguishing the A's and B's through colour.

we also show in the centre general site information, surface dates, aggregate source, and the position of the site in the FWP.

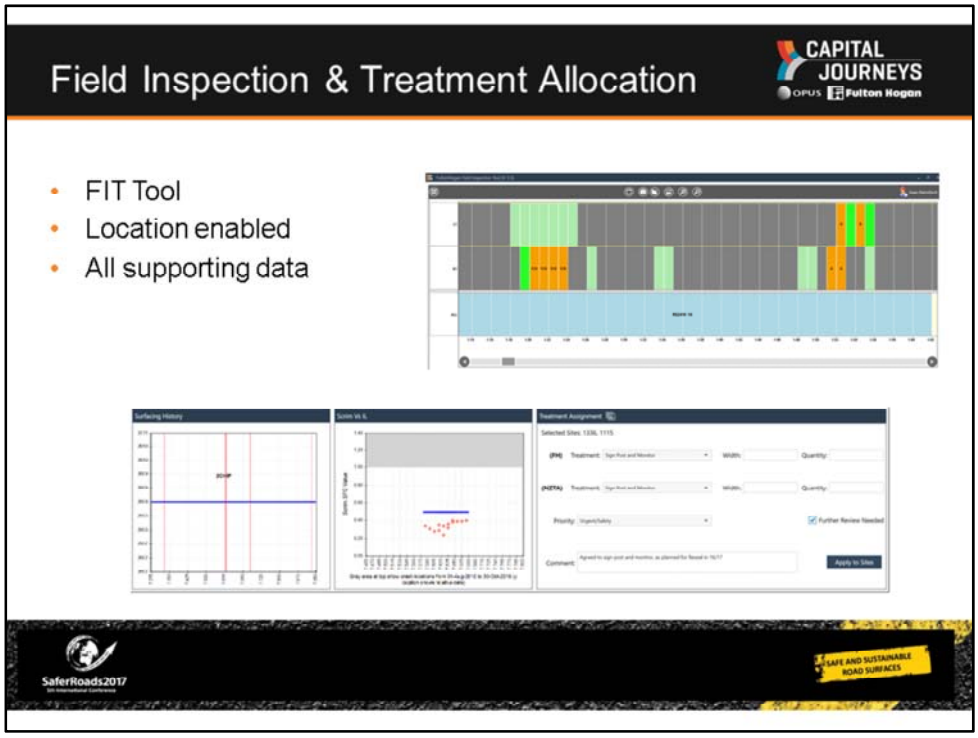
A key part of the initial analysis is to assess the relevance of the recorded wet crashes, we therefore show the location of the wet and dry crashes (for context) on the map in relation to the exceptions, **clicking** on each accident brings up the detail, dates, movement and conditions,

crashes can then be excluded if appropriate, and the decision for the exclusion recorded for audit and review.

We also pull the other key drivers for the exception, whether it be the value below the IL, and specifically for the NOC, if the site is recorded as flushed as this helps establish the risk profile for the treatment.

Other information being available through scrolling down the page are the condition graphs…. to see the extent of the deficiency, along with the rate of deterioration.

With this review we can record any initial decisions made for the exception treatment, ready for taking into the field for site review



One of the benefits of the Junoviewer tool is its cloud location, however full access to the internet in the field can be expensive, and is not always available through incomplete data coverage in New Zealand.

To bridge this problem the Field Inspection Tool, or FIT was developed.

This enables a cut down dataset to be downloaded to a field tablet.

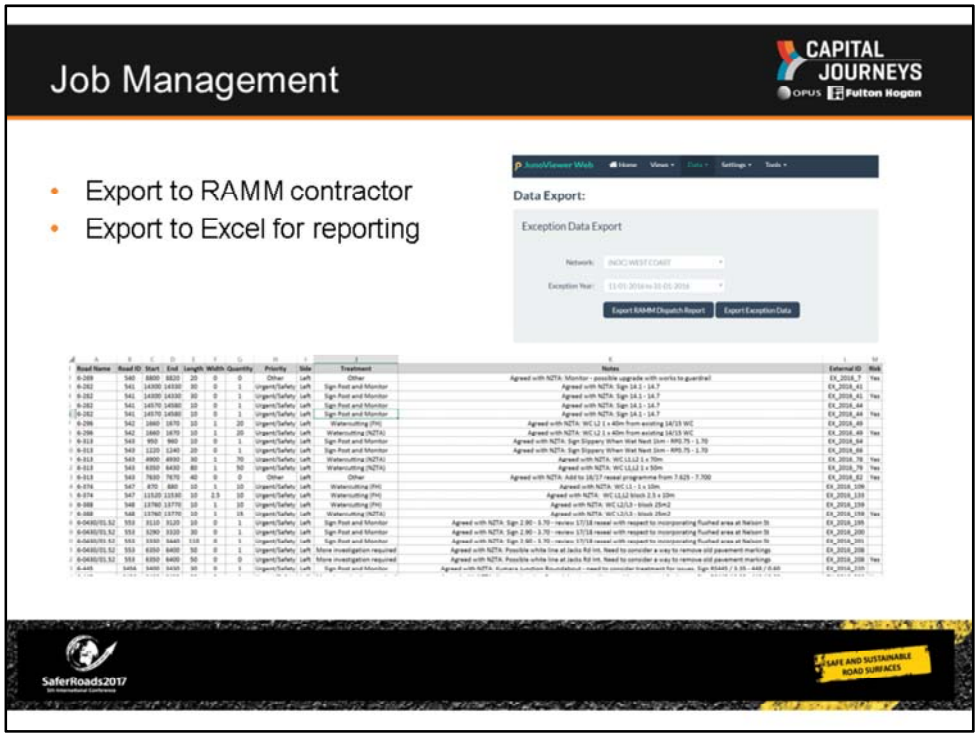
This provides a view, which , when linked to a GPS device provides the user with data relevant to their position.

The top view scrolls along as you drive down the road, providing you with the exception detail at your current location, at the bottom you can see the current Forward works Programme, condition data and area for recording decisions.

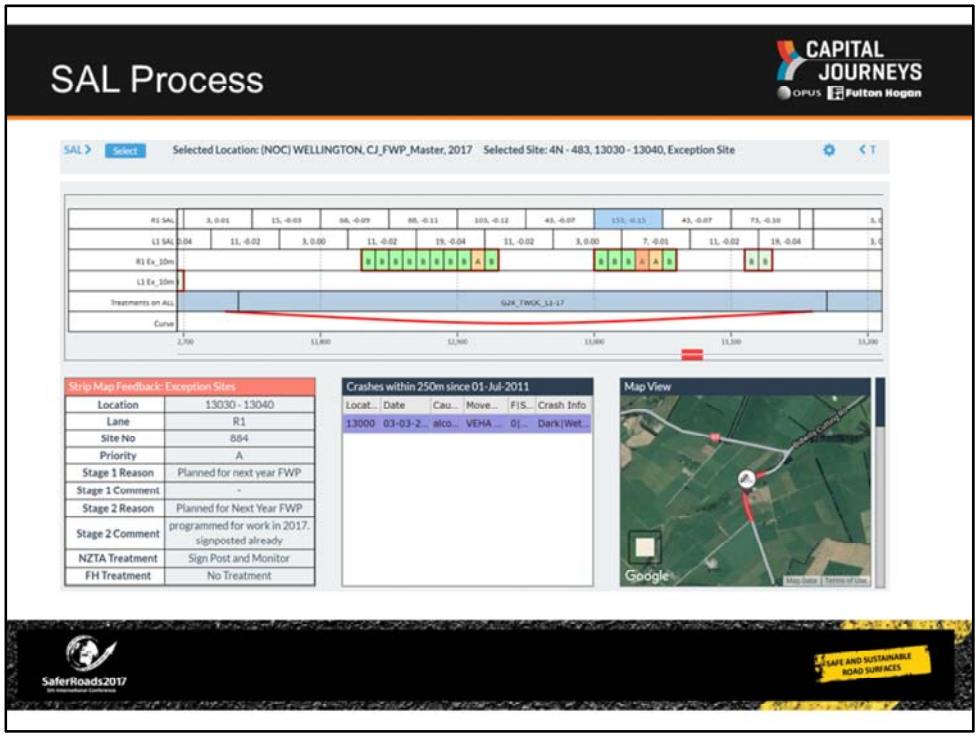
At a exception location you can view the site details, the IL against the SCRIM value measured, and as you decide on an appropriate treatment, you can record the details and risk profile of the treatment. You also have the ability to add a site measure for the treatment, and upload photos of the site.

This site review process is undertaken with the Client, providing the opportunity to agree

treatments and complete the approval process.



On completion of the site assessment, the tool allows for an export direct to the RAMM format required in our case to generate works orders to complete the works,



Building of the exceptions process, our most recent customisation is that of the SAL process.

The seasonally corrected SCRIM data is again provided through RAMM.

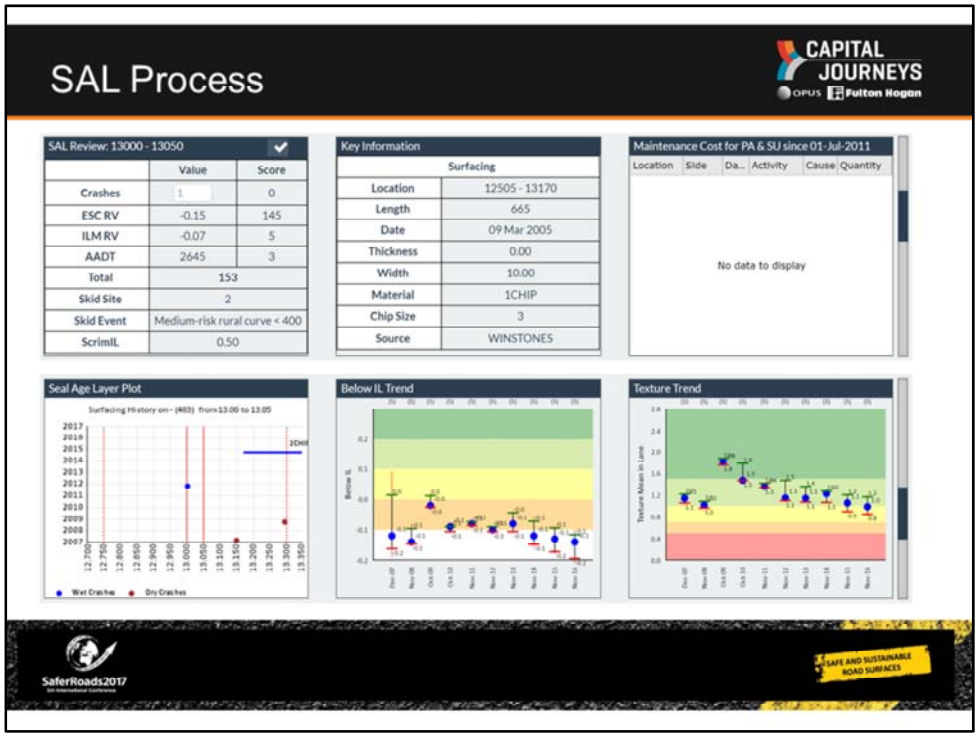
Desktop analysis is again required, reviewing not only the updated Crash data from CAS, but also the decisions and actions arising from the exceptions review.

Prior to the junoviewer customisation, this is where the excel process started to become unmanageable through the shear quantity of data to be collated and reviewed. This usually required four screens of data to be running.

The graphical interface, shows us the SAL site at the top, with the corresponding exceptions directly below. Followed by the FWP.

On clicking on the exception, the data box on the left, pulls out the exceptions review along with other key site details. Again the map provides us with the accident and specific details.

As in many cases we are looking at curves in the SAL review, we also pull through from RAMM the curve details. This helps us determine the length required for treatment.



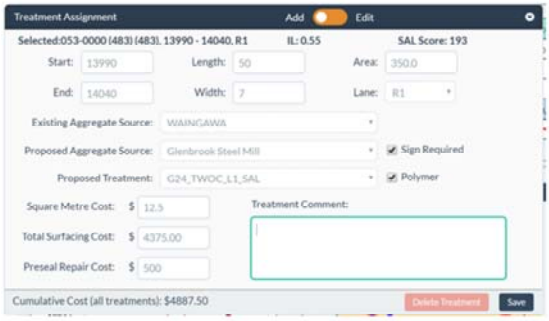
As with the exceptions, everything we need to review dosent fit onto the one page, a scroll down reveals further detail on the trends and drives, also allowing us to record decisions made during review.

At this stage the tool has to be dynamic, as you exclude or add relevant wet accidents, the resultant SAL score changes, a reduction in accidents reduces the site's priority, and may as a result, depending on the annual funding allocation, and treatment score cutoff, may remove the site from treatment.

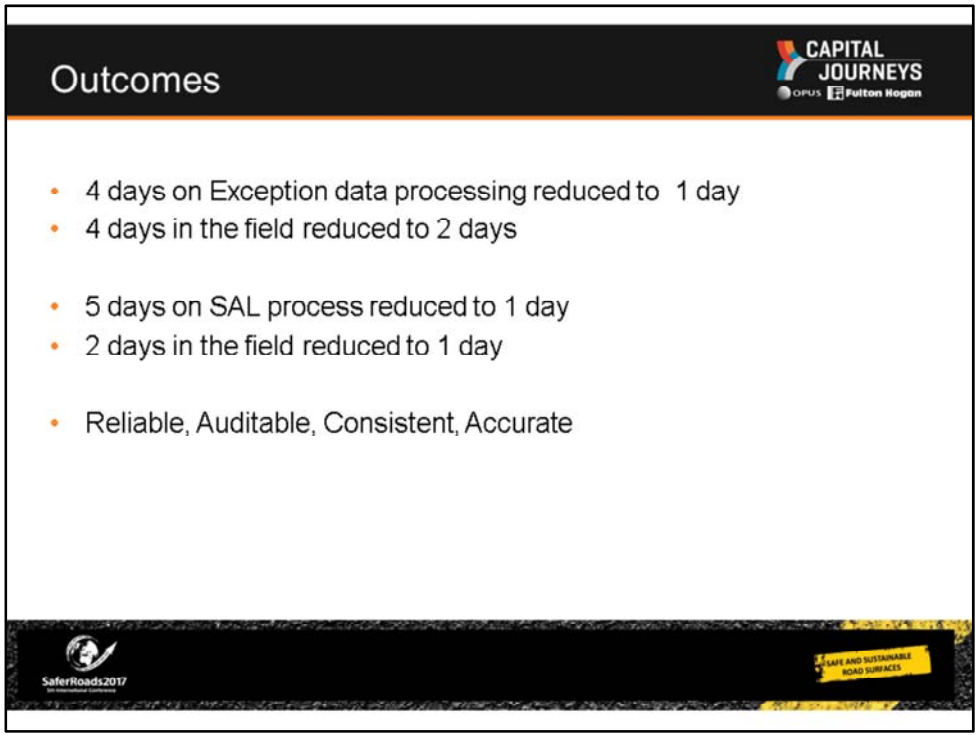
Again having a record of decisions and reasons for those decisions is essential in meeting the T10 and NOC requirements.

Site treatment

- Taking process all the way through
- On site measure
- Cost
- Agreement with client



Again following desktop analysis, the data is taken into the field with the FIT.
With the GPS enabled, the treatments can be reviewed, site markup completed, and recorded for upload along with photographic site records. Additional functionally now built in records the cost of the treatment in line with the approved schedule, giving up to date visibility of budget allocation and remaining funds.



So with the junoviewer customisation, we have recognised a number of benefits.

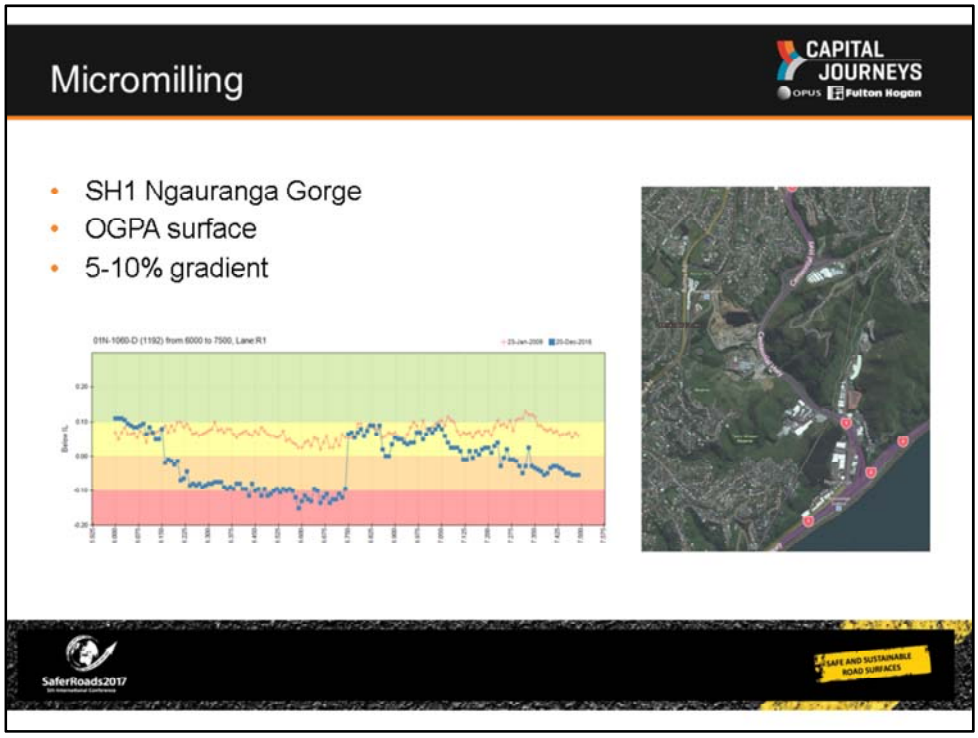
In terms of time spent on the exceptions we have saved 3 days processing time, and 2 days in the field. A 63% time saving

on the SAL process we have saved 4 days on the desktop and 1 day in the field. A 71% time savinhg

These have been direct savings to the NOC.

In addition, through collaboration with the Transport Agency during development we have been able to reduce the SCRIM review process by 50% savings for both the supplier and Transport agency.

As a result we are able to deliver a consistent auditable process, using up to data, ready for review by the transport agency.



So with safety savings now being recognised by the supplier we looked into how we could get more out of our existing surfacing in relation to SCRIM. We found that in many cases, the asset life was not matching the SCRIM life, or demand. Therefore we were loosing good asset life.

One location, and material type where we recognised an opportunity to do this was Stare Highway 1, Ngauranga gorge. While the surfacing showed little sign of distress, we found that the aggregate , a locally sourced Belmont quarry stone, in the sections with a high IL had reached a point of non compliance over a period of 7 years 3 remaining estimated.

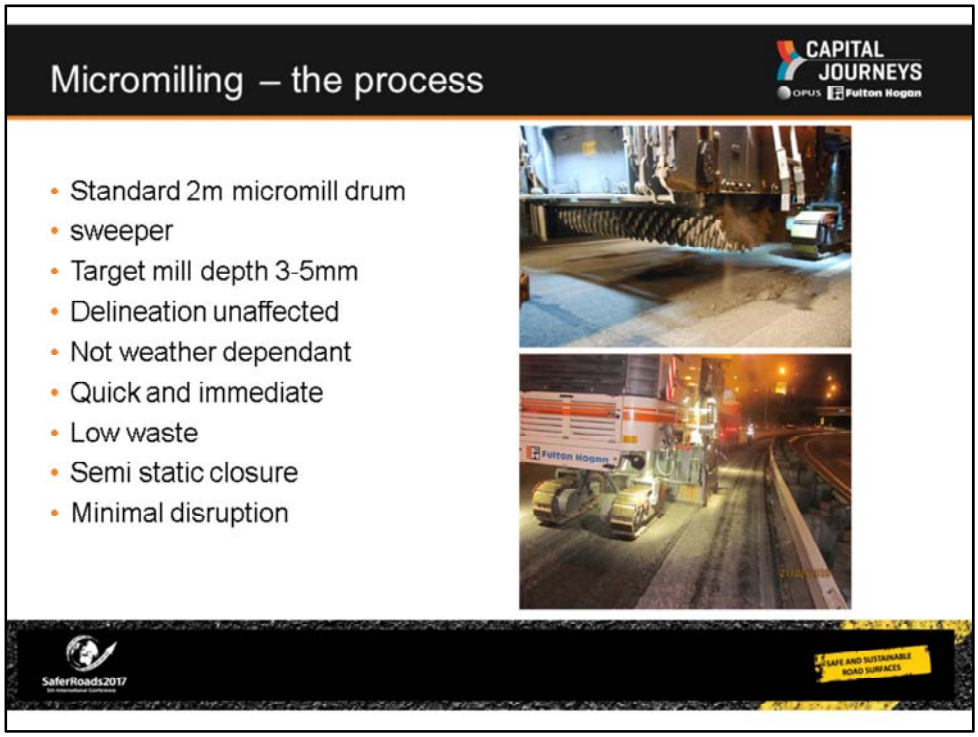
The surface treatment in this location is a 20mm OGPA, laid at 50mm deep over a structural asphalt pavement. In looking into various options, we established, very few were feasible due to the site constraints, a gradient of 7%, 4 lanes of traffic, an AADT of 36,000, with a HGV could of 6 %, much of which travels at slow speed in the uphill direction, and us under breaking on the downhill.

We considered
Watercutting, very short term, effective for flushing, but limited success in refreshing the aggregate
SCRIM seal – high risk in successful spray rate being established – due to high void

content of the OGPA, water under the seal in the OGPA. Not a viable location
Scabbling, slow, limited success from pervious treatments, high dust generation

Options largly came back to full surface replacement, before the ‘asset’ had failed.

We then looked more into the option of Micromilling. A process of removing the whole of the top surface only.



The micromilling process involves removing the top 3-5mm of the surface by using a specialist mill head - with over 600 picks - fitted to a standard 2m mill.

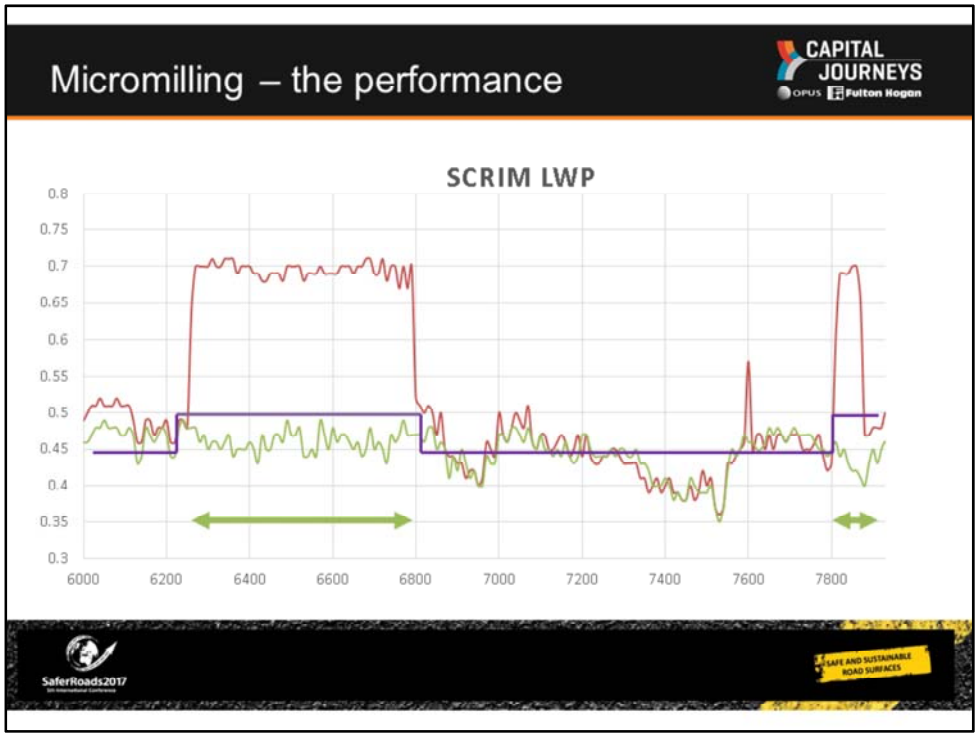
Milling at this depth requires the surface to be of a constant shape, primarily in terms of rutting.

This we confirmed through the High speed data, and site measures.

Removal of this shallow nature, will clearly result in low levels of waste product, and consequently be of a very fast construction time, with good planning, we were able to undertake the operation under semi static closures, again keeping costs in check, and reducing customer disruption.

Milling at this depth, has also enabled us to minimise the quantity of delineation removal. The milling was able to be undertaken between the edge lines and lane markings.

With no fresh materials required, the environmental cost of the treatment has also been very low



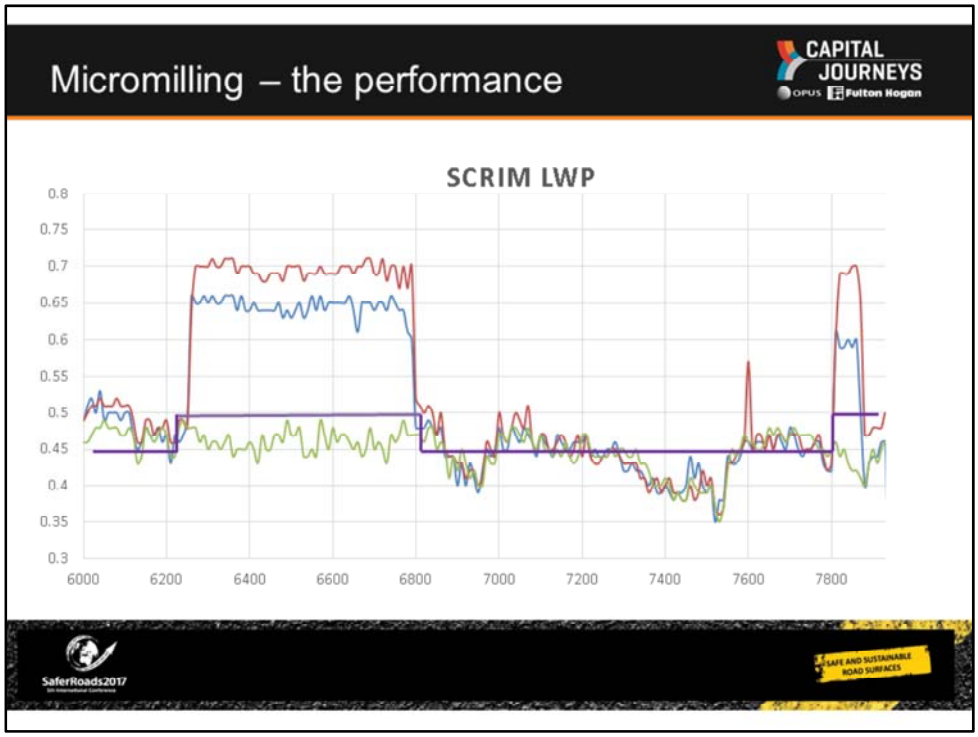
So what result did we achieve?

Prior to the treatment, we had data from the SCRIM survey some four weeks earlier, this provided us with a good baseline measure.

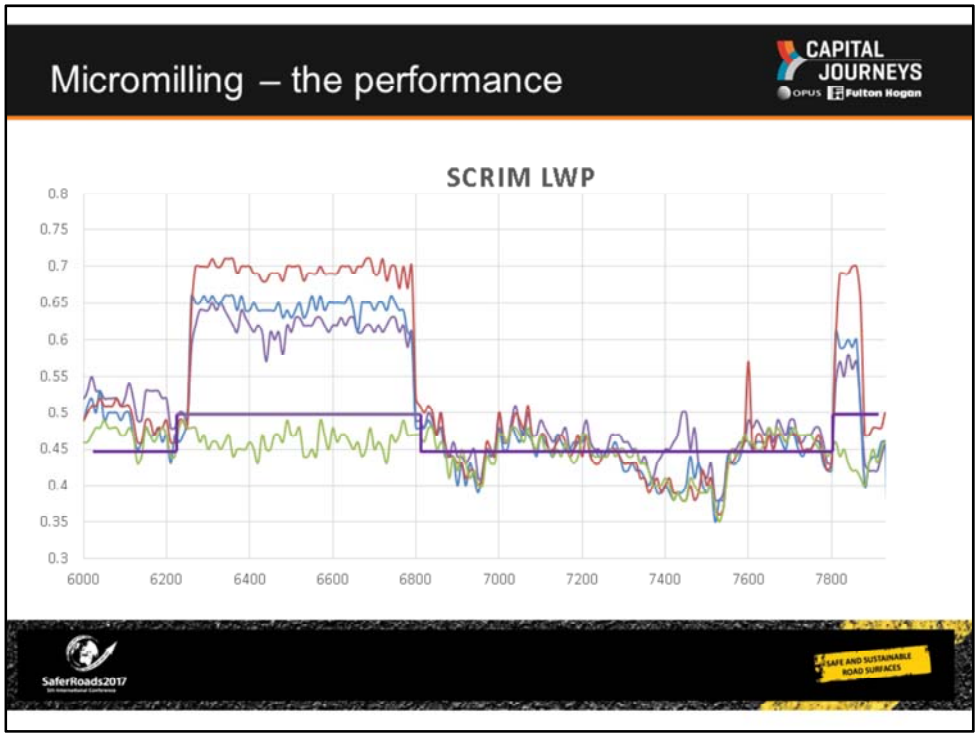
The graph shows two areas of failure the green line, prior to treatment being undertaken. With an IL demand of 0.5 between RP 6200 and 6800, and also at 7800, low levels of compliance can be seem.

Following the treatment, the first measure was undertaken the following March - 2 months after treatment. The red line clearly identifies the treated length, bringing the test site into compliance.

We fully expected the aggregate to polish following the treatment, after all, we hadn't changed the material properties in any way, to monitor this, additional testing was undertaken, again by the SCRIM + truck, to maintain consistency in the testing process.



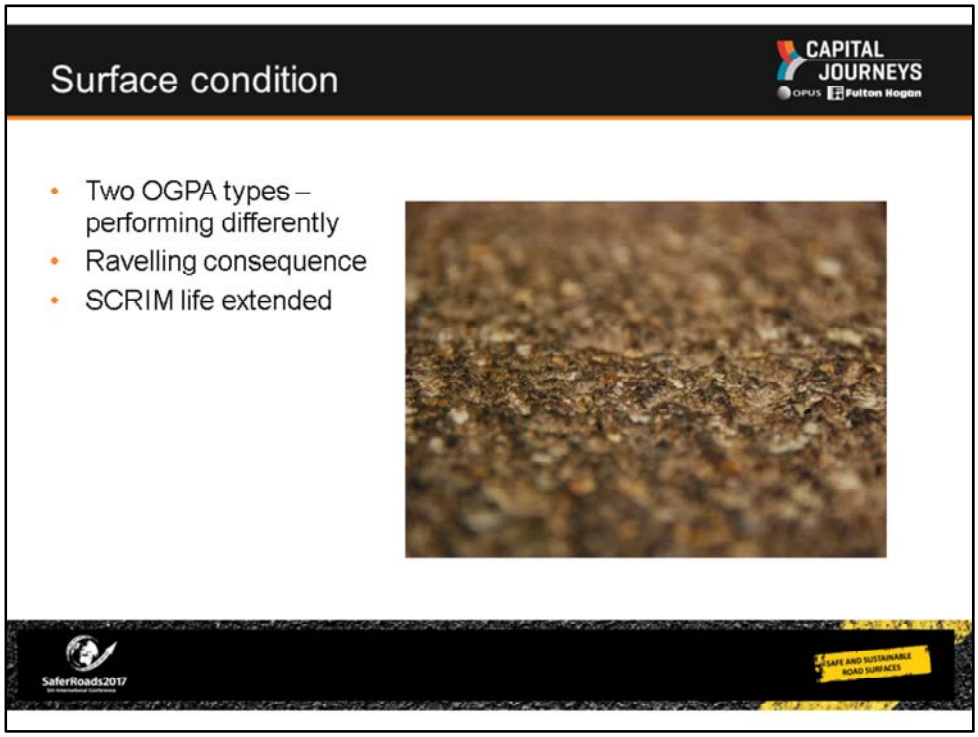
The next test, in May 2016, 4 months after treatment, shows the initial rapid polishing of the aggregate, on both of the test sites milled, of note the large site was the OGPA 20, the smaller on a OGPA 10, in terms od SCRIM, performing equally.



The most recent testing, undertaken in December 2016, 12 months after treatment shows a slowing of the rate of polishing. This largely ties in with the expectation from knowledge of the performance of the Belmont aggregate through historical analysis of in field performance.

This performance indicates we would be able to recognise a 3 year extended life in terms of SCRIM in this location, this would tie us into the expected end of service life of the OGPA at 10 years.

However



While we have achieved the aim of SCRIM compliance, we have found as a consequence of the removal of the upper surface, we have accelerated the rate of ravelling, therefore failure of the integrity of the OGPA. This is most likely due to cracking of the bitumen during the milling process.

This has been observed to a larger extent on the 20mm OGPA only, with the 10mm OGPA site showing no ravelling distress

To arrest the ravelling, we have undertaken a further treatment, that of a rejuvenation seal over the 20mm OGPA, Having only been undertaken in the past 2 weeks, we are yet to see if this has solved the immediate problem, however we expect the ravelling to be held through the rejuvenation process of providing additional bitumen to secure the aggregate.

In terms of the effectiveness of the treatment in terms of cost, we have used a treatment that is only 20% of the cost of a replacement surfacing treatment.

To make this a cost effective option we need to realise 3 years of SCRIM compliance on the existing OGPA. Monitoring over the next two seasons will confirm if this is able to be realised, at this stage 1 additional year has been realised.

In terms of other benefits, we have reduced the need to fully replace the surfacing, therefore deduced customer disruption, reduced aggregate demand, and gained more out of the aggregate in the surface on site.

There have been minimal customer complaints due to the additional texture, and ‘milled surface’ through this area, and no complaints or comment on any additional noise from the ‘rougher’ surface.

While micromilling has achieved the desired outcome – when looking at specifically the OGPA 10 and this products ability to resist ravelling, this treatment is only appropriate for a limited number of sites. Alternative cost effective treatments have to be available.

One of these alternatives is that of a Friction Seal. While technically a chipseal, these seals use the smaller fraction of the aggregate grading, specifically the 3-5mm element, which is applied on a polymer modified emulsion.

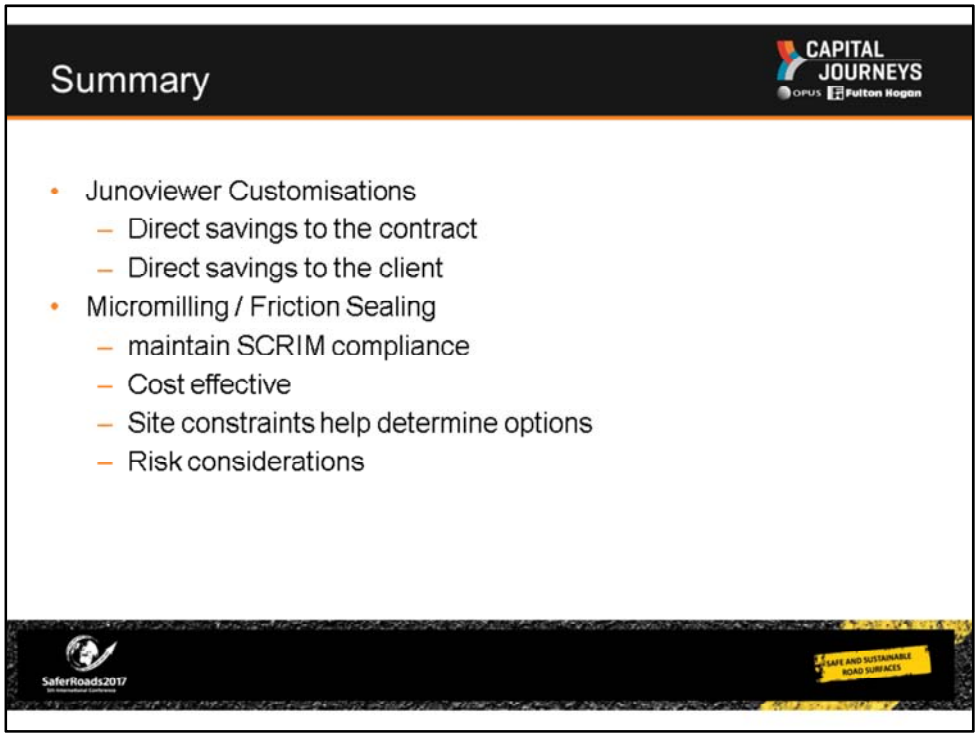
Of notable success has been the friction seal with a higher value Glenbrook Melter Aggregate, or GMA.

In using a resource which was of a relatively low demand at this grading level, we were able to achieve a relatively low cost friction seal solution when compared to anti skid treatments using a similar grade aggregate, such as resin adhesive products.

We found the seal could be applied to both existing Asphalt and Chipseal surfacings to provide compliant SCRIM and Texture in high demand locations such as intersections and the approach to roundabouts.

This approach has shown to be a viable alternative to enhancing Skid resistance on sites where the alternative would have been a full surface replacement or a nore expensive

anti skid treatment.



So in summary, we have identified a number of ways in which we have been able to stretch the safety $ for both the supplier and the transport agency.

Our junoviewer customisations have saved 63% of time on exceptions and 71% of time on the SAL process, with a 50% reduction in review time by the agency, while also providing consistent, auditable process, this has been able to be shared around other NOC contracts.

Our site treatments have concentrated in extending the life of the existing surfacing using existing materials through micromilling, and by developing lower cost treatments using higher performing aggregates.

One of the enablers for this innovation has been the NOC contracts, encouraging innovation and providing a platform to share information across the industry.

Many thanks for your time