Impact of Poor Drainage on Pavement Life
Case Study - SH20

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SH20 - Wiri Station Rd
Background

- Dual carriageway urban state highway
- Highest HCV in NZ 26%
- Severe alligator cracking over the entire length of 3.5km both directions
- Rehabilitated in 1993 using cement modification with OGPA surfacing in 1995
- Alligator cracking started in 1997/98
- Area wide treated in 1999/2000 with thin mill/surface 35mm using AC14 mix
- Alligator cracking observed in 2001/02
SH20 Wiri Station Rd Pavement Failure - Site Investigation

- Underground Services
- Deflections using Geo-beam/ Benkelman Beam
- Test pits & scala testing of subgrade
- Laboratory Soaked CBR of the subgrade
- Grading, clay index of existing granular material
- Percentage of HCV per design lane
- Subsoil Drainage inspection using CCTV and full invert levels surveys

Site Investigation Findings

- High surface deflections 1.5-2.5mm
- Depth of pavement 700-1000mm
- Existing pavement material is unbound aggregate and wet at the bottom
- Existing silty clay subgrade is softer and wetter in the top 100mm with avg 1-2% CBR
- CCTV shows blocked, broken and disjointed earthenware subsoil pipes
- Subsoils outlet and inlet are both connected to the same catchpit
- Subsoils draining into the subgrade
SH20 – Wiri Station Rd
Existing Subsoil Drainage

Block all existing subsoil inlets
Install new subsoil drains F/2 high strength pipes along the entire length adjacent to channel
Install new subsoils along the central grass median adjacent to the kerb
Construct new manholes where necessary to meet the design invert levels of the new subsoils
New subsoils left for 1 year to drain wet subgrade and lower subbase.
Deflection testing carried out prior to rehab
Remdial solution - Pavement 2004
Structural asphalt incl SMA surfacing

- Design traffic 1.35 x 10^7 ESA
- Concept of SAC is to transfer the load to the top layers and retain existing sub-base material
- Generally 3 layered system. High fatigue resistance base, high strength intermediate, and surfacing modelled individually
- Actual mixes moduli used in Circly design model
- Acceptance criteria on top of the sub-base
- Fatigue Criteria is maximum tensile strain at the bottom of the AC layers

\[ N = \left[ 6918 \left( 0.856 V_b + 1.08 \right) \right]^{0.36} \]

Resilient Modulus for Asphalt for Different Speeds
SH 20 (Wiri Station Rd) – AC14
Performance to date

- Over 2 years now in very good condition with no cracking or rutting

Deep Lift / Structural Asphalt

- Suitable for intersections, urban SH's, motorways & arterial roads with high %HCV and with ESA in the order of $10^7$
- Minimal traffic disruption, no permanent lane closure
- High road user benefits during construction
- Minimal future maintenance
- Existing pavement retained
After

Thank you