Scottish Surfacing
- 10 Years of Development and Assessment

IAT 2019 Annual Conference

Outline

- Background
  - – poor durability
- Development years
- TS2010 Specification
- Assessment
- Summary

High-speed friction testing, M8 (2008)

Team effort…

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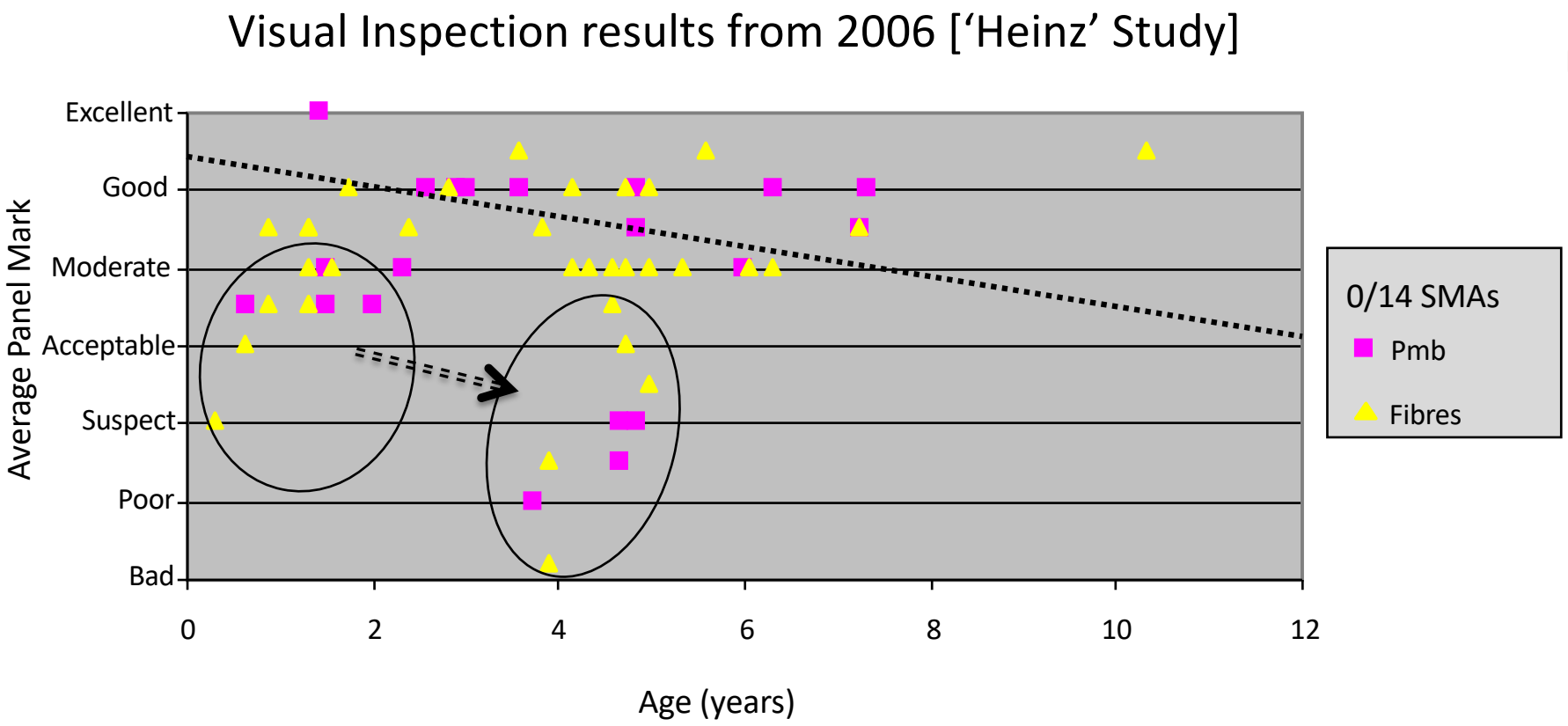
Background (…2006)

OCs reported problems with the performance of SMA surfacing



[‘Heinz’ Study]

Background

DURABILITY ISSUES…

Site:

Route - M90
Year - 2006
Age - <4 years
Material - 0/14 SMA

Specification:

	Spec	Tested
Binder (pmb)-	4.2-5.4 %	4.1-4.5%
Texture -	≥1.5mm	1.9mm
Air Voids -	-	*(10%+)*

Development years (2007)

Transport Scotland Pavement Forum

TSPF

- Promote and develop best practice and knowledge sharing.
- Chaired by TS & meets 1/4ly with members, representing:
  - Scottish Trunk Road Operating Companies
  - MPA
  - SCOTS
  - Eurobitume
  - Design & research Consultants

Development years (2008)

Scottish Inspection Panel

- To document the current performance of asphalt surface course.
- Record the extent of any defects.
- Provide estimates of typical service life
- To recommend improvements.

Visual inspection method

Originally developed by RRL (Lee, 1957)

Development

- Recording features such as fine cracking, disintegration, aggregate loss, uniformity…
- Revised to a 7-point scale in 1990s (known as TRL Inspection Panel Methodology).
- System used effectively by Transport Scotland & HE over the last two decades.

Development years (2007/8)

Study visits to Germany to gain knowledge & experience of SMA

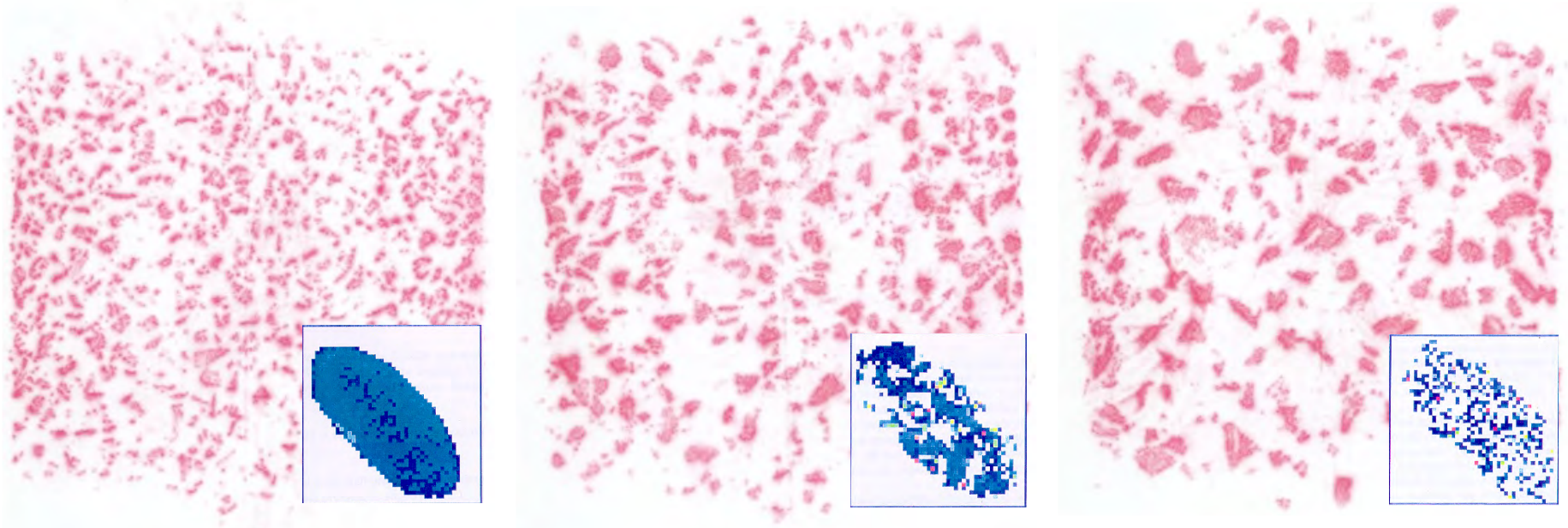
Munich Autobahn:

- Typically 0/8 mm
- Tight grading envelope
- ~ 7% bitumen
- Cellulose fibres + Pmb modification with highest traffic
- Very few joints
- Gritting applied at a rate of 1 to 2 kg/m^2
- 16 years +++

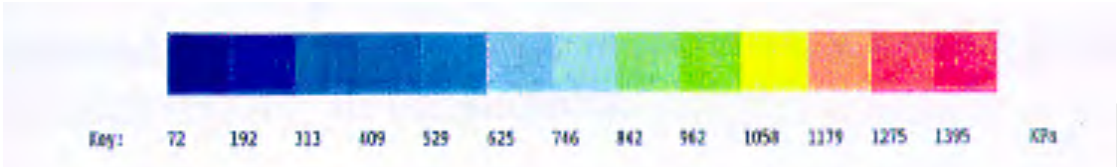
Development years (2007/8)

Emerging knowledge….

Increasing aggregate size



Increasing contact area

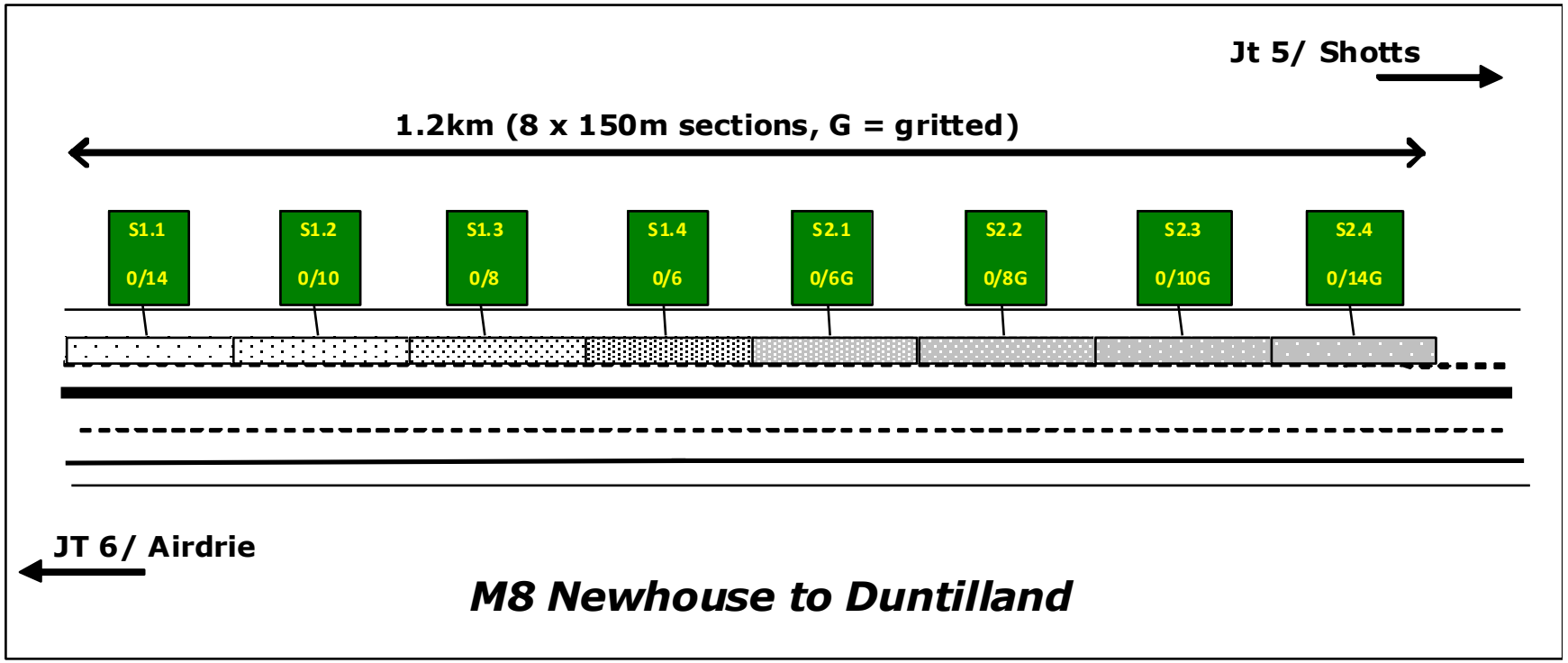


Development years (2007/8)

M8 Trial – 60,000 veh/day (Nov 2008)

Development years (2007/8)

Trial Layout



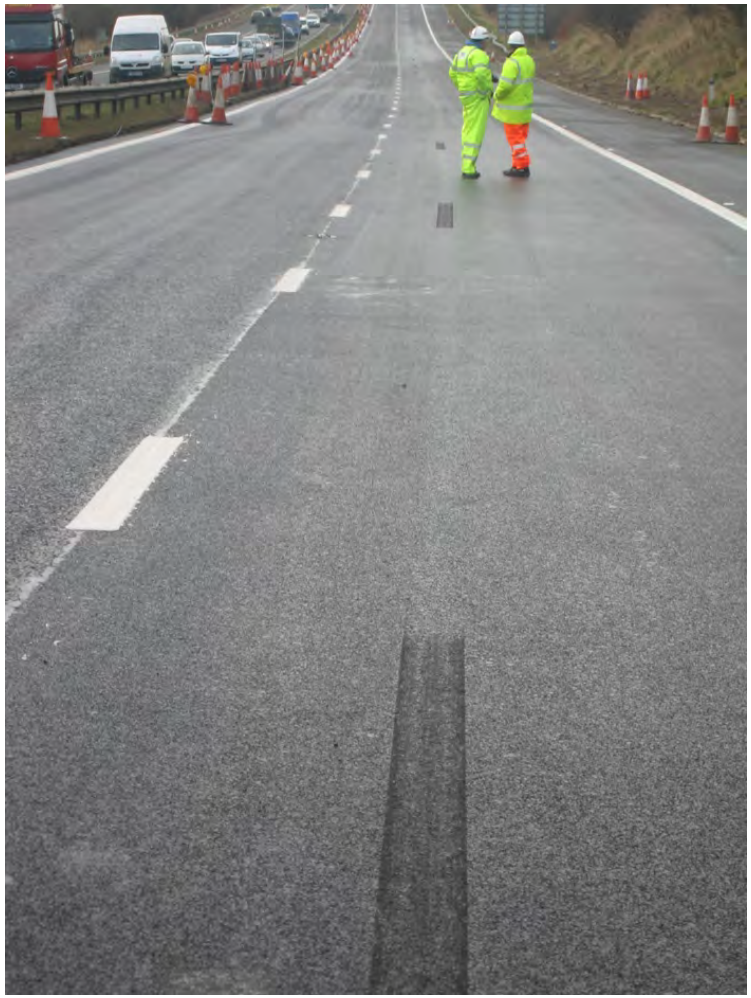
Development years (2007/8)

Gritting…

Close-up of 0/14mm before (left) and immediately after gritting (right)

Development years (2008/9)

Friction….



Low speed

SCRIMtex:

- At test speed of 50 km/h
- Also laser sensor to measure SMTD

GripTester:

- at a test speed of 50 km/h

High speed

Pavement Friction Tester

- up to 120km/h

Development years (2010)

Further consultation with Germany & TSPF…

Refine Specification

- Adoption of Pmb to address 0/10 mm SMA
- Grading curves finalised
- Air voids content
- Confirmation of need for Type Approval Installation Trial (TAIT) approach
- Performance-based in-service skid resistance requirement.

The arrival of TS2010! (April 2011)

First laid:

Route - A985
Year - April 2011
Material - 0/10mm

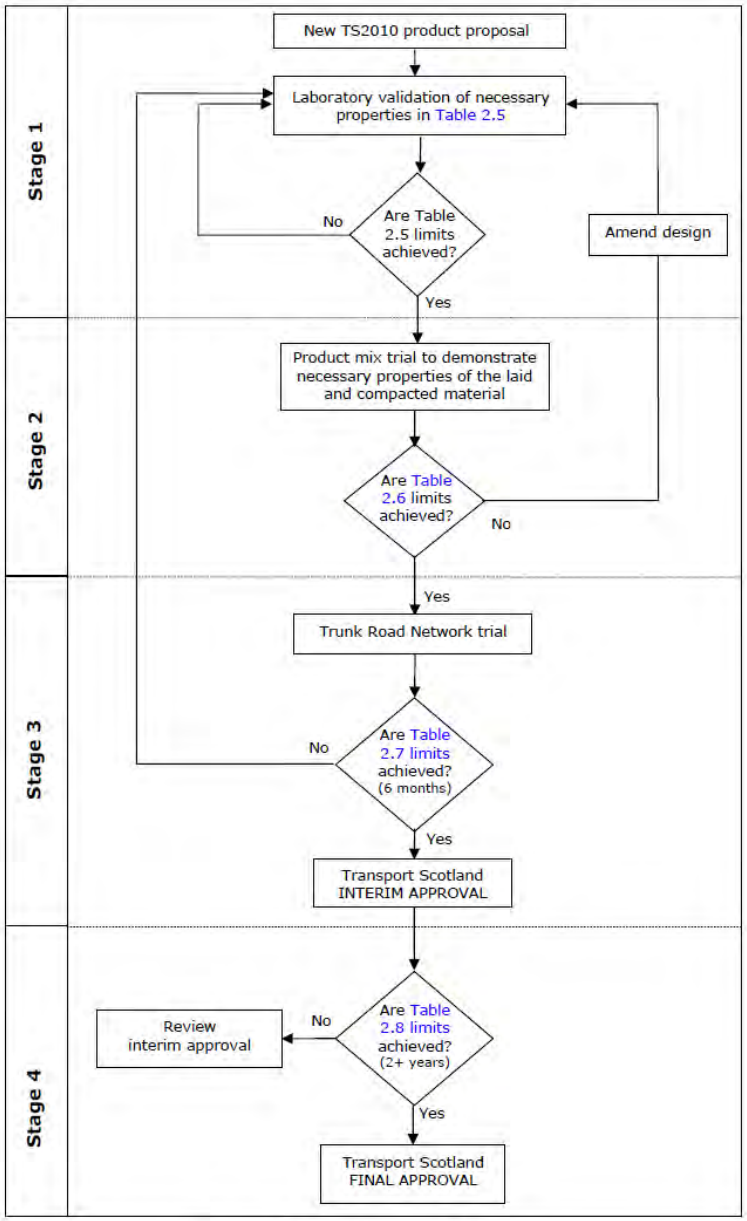
Specification:

	Spec	Tested*
Binder (pmb)	>6.7%	6.8%
(D)	<0.3%	0.2%
Texture -	-	1.2mm
Air Voids -	2 - 5%	3.7%
GripNumber -	0.62	0.8

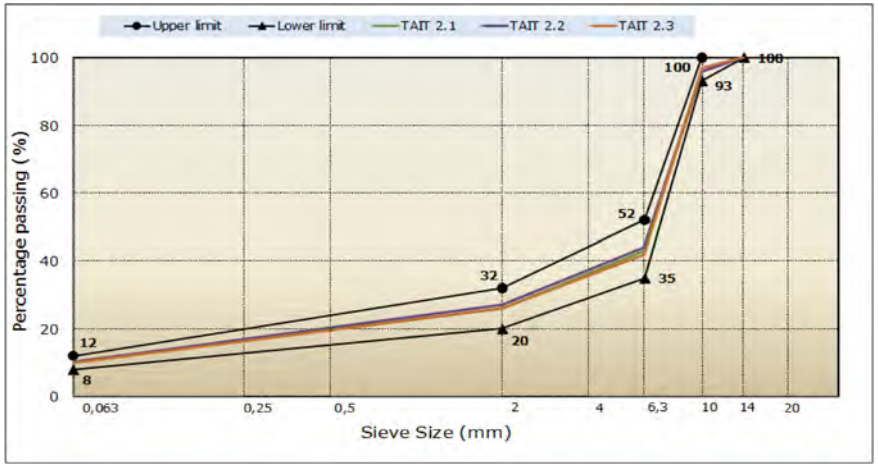
**TAIT Stage 3 results*

2006 Failure
4.1 – 4.5%
-
1.9mm
(+10%?)
-

Assessment (2011-15) - TAITs

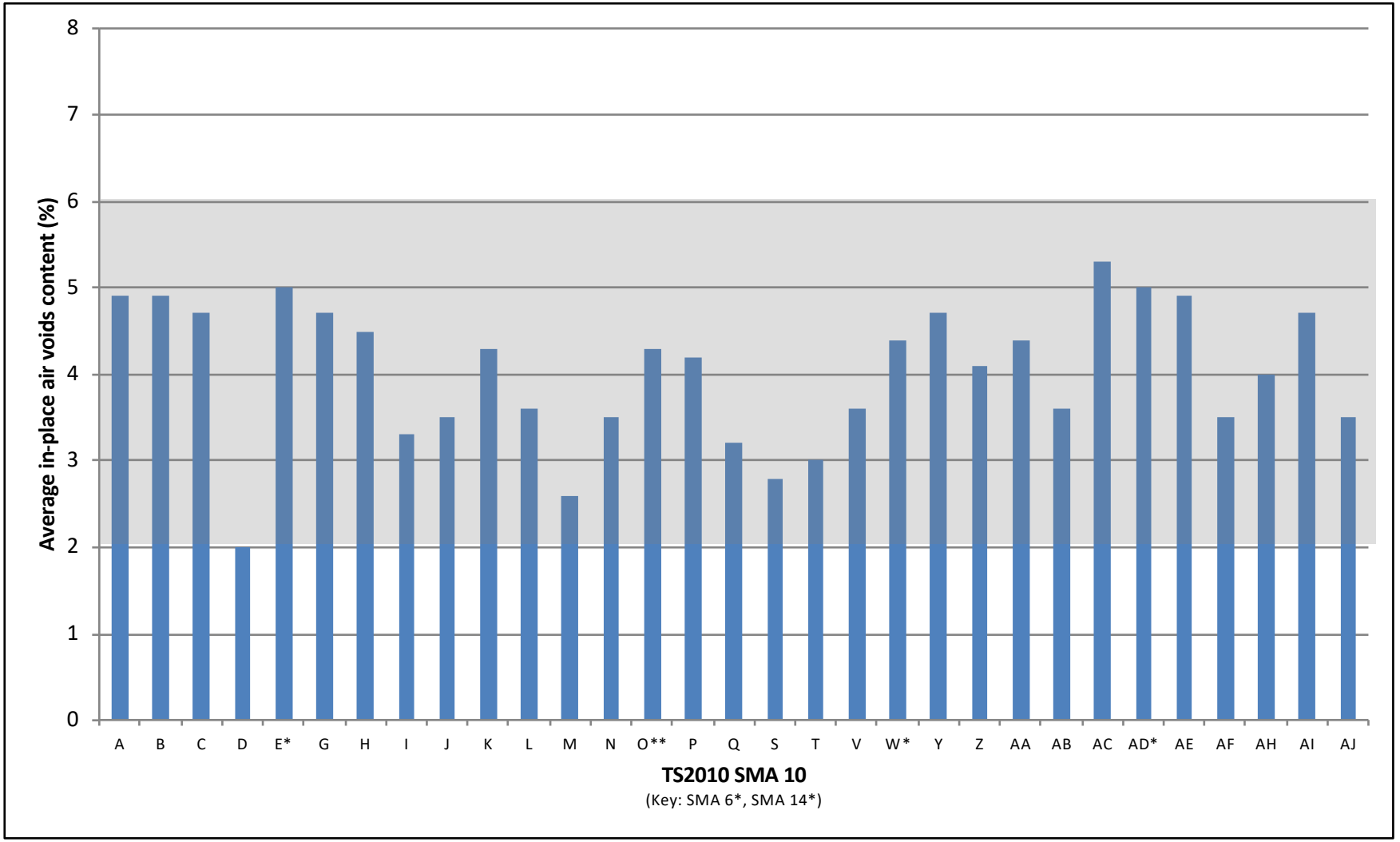


Assessment (2011-15) – Stage 2 TAIT



Assessment (2011-15)

Results of Stage 2 – Air voids content

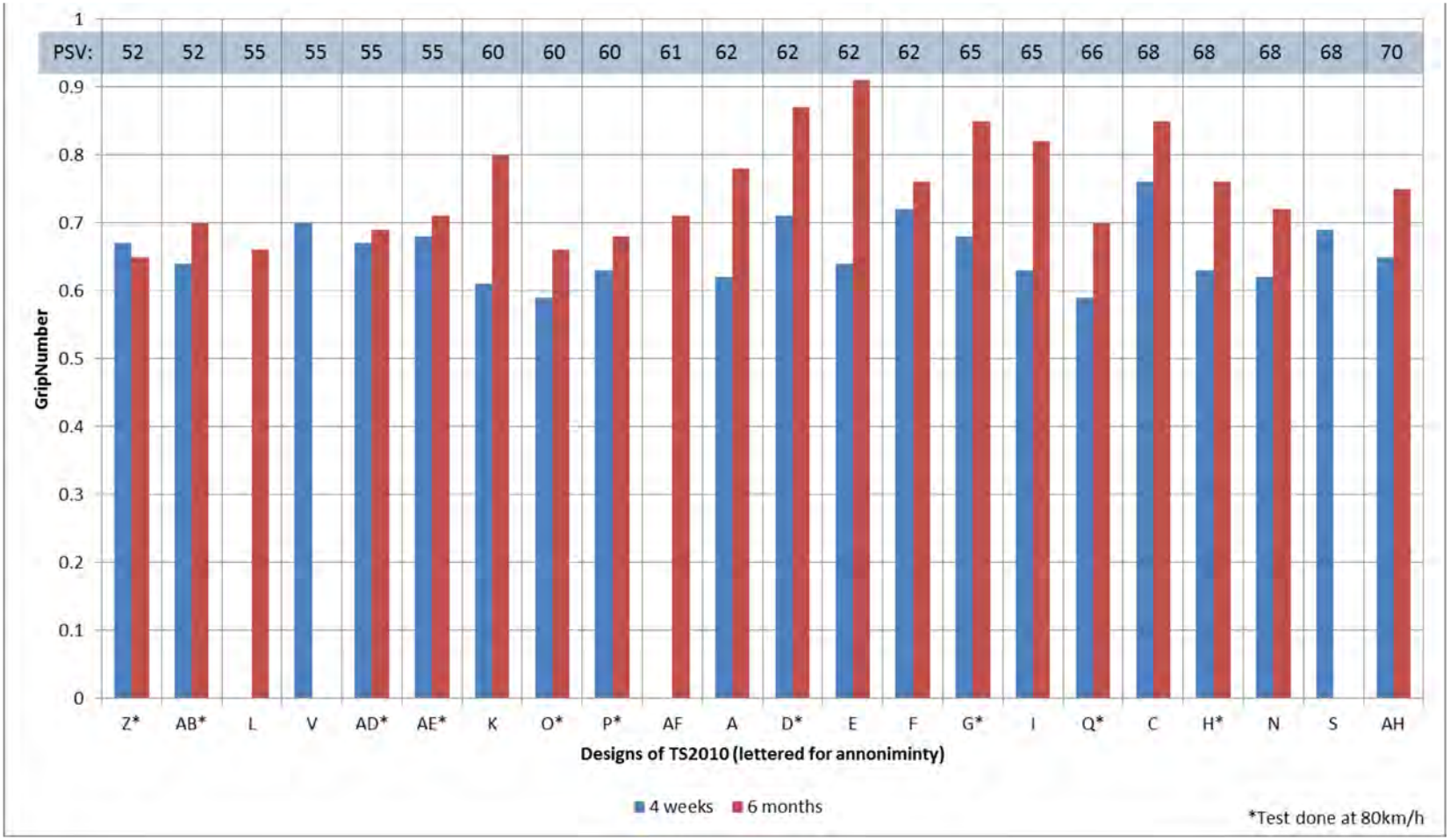


Assessment (2011-15) – Stage 3 TAIT

No joints, 3-lane echelon paving…in Scotland!

Assessment (2011-15) – Stage 3 TAIT

PSV a predictor of performance?



Case Study on Isle of Skye (2015)

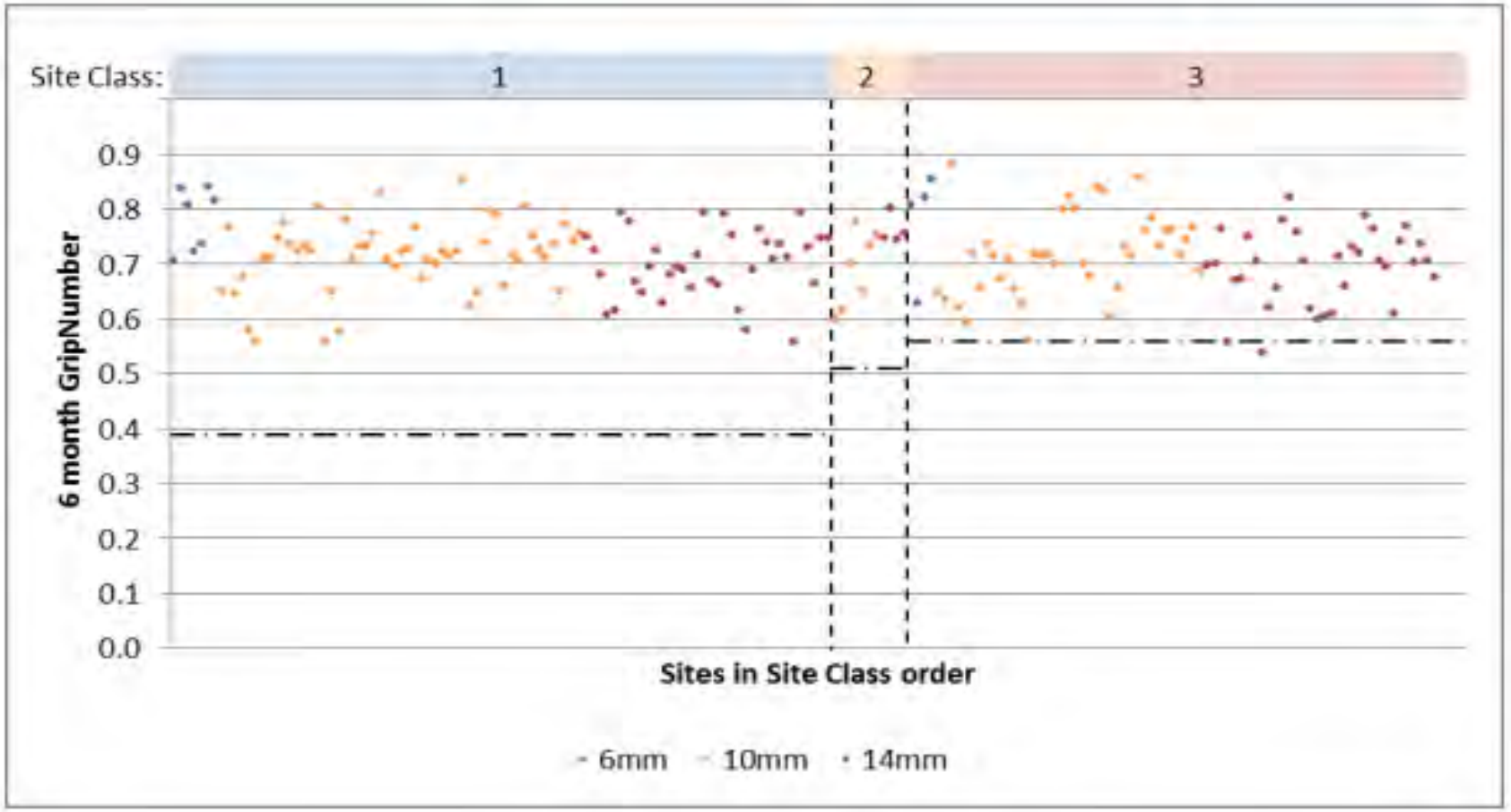
Local roads
Sconser aggregates (PSV51)

Trunk roads
Various aggregates (PSV55-65)

- Local Sconser aggregate performs at a similar level to many of the higher PSV (55-60) aggregates currently used on the A87.
- 1,750 tonnes of Sconser aggregate were laid on the trunk road on Skye in 2017

Assessment (2016-19)

GripNumber at six months in Site Class order with aggregate size (Martin, 2019)



- Work also showed that six month GripTester results for TS2010 show a broad relation with SCRIM results between one and three years.

…ongoing development of TS2010

Benefits:

- Improved durability & service life
- Increased use of local aggregates based on performance
- Low noise
- Low rolling resistance

Disadvantages:

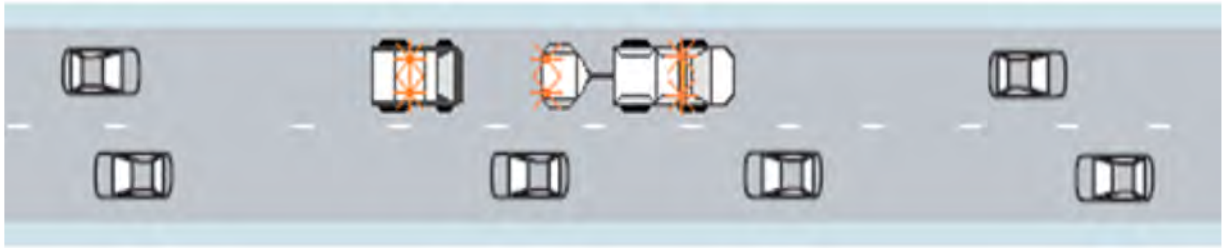
- Reluctance in some areas of the UK to using denser, lower texture mixtures as high speed friction could be compromised

Brief

To take high speed friction measurements that will allow comparisons with a range of conventional materials.

Testing procedure (New)

- Previously involved road closures
- A new safe operating procedure has been developed in consultation with Highways England (HE)
- PFT is followed by high-vis escort vehicle in free-flowing traffic with good visibility and weather conditions
- Standard test speed of 90km/h (56mph)



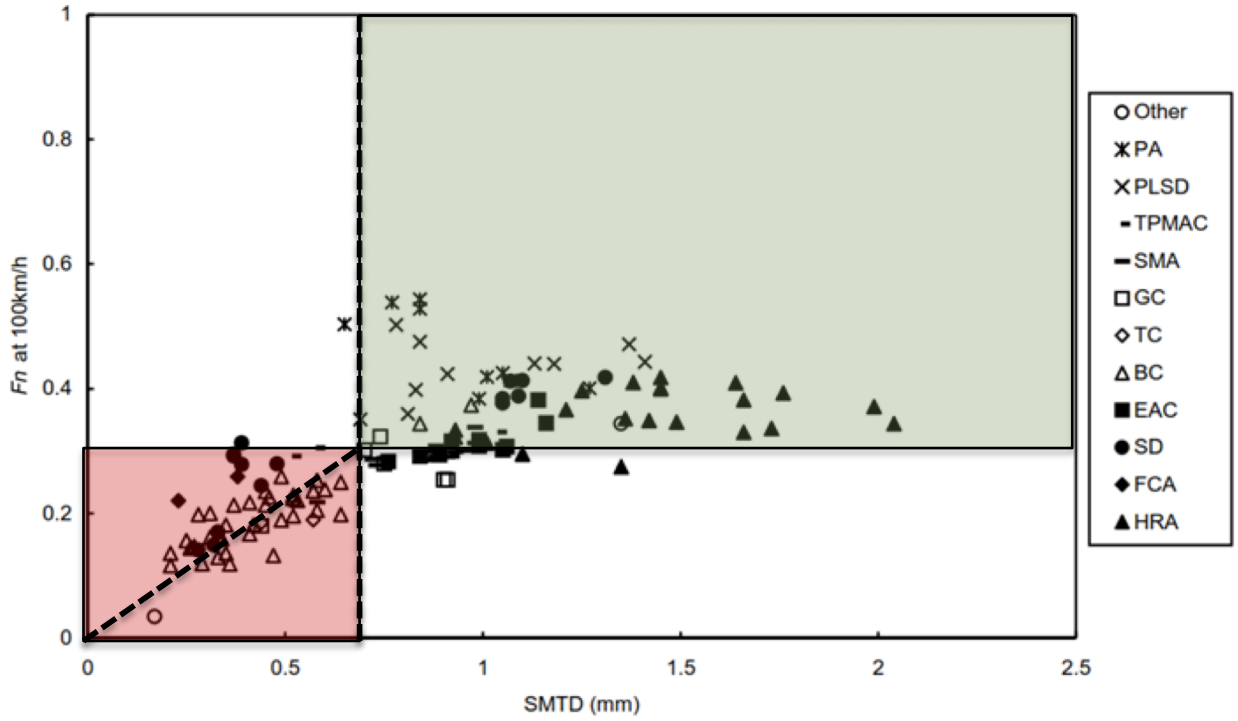
- Data base of 6000 measurements (1998-2015) taken on thin surface course systems (TSCS)

Site selection

- IRIS used to identify potential sites
- Trimmed down to accommodate criteria:
  - > 500m, straight sections
  - ≥ 1 year
  - 50-70mph
  - Similar material sources with different aggregate sizes (0/6, 0/10, 0/14mm)
- In total on 59 sites tested:
  - 450 measurements
  - 32 TS2010
  - 27 Cl942

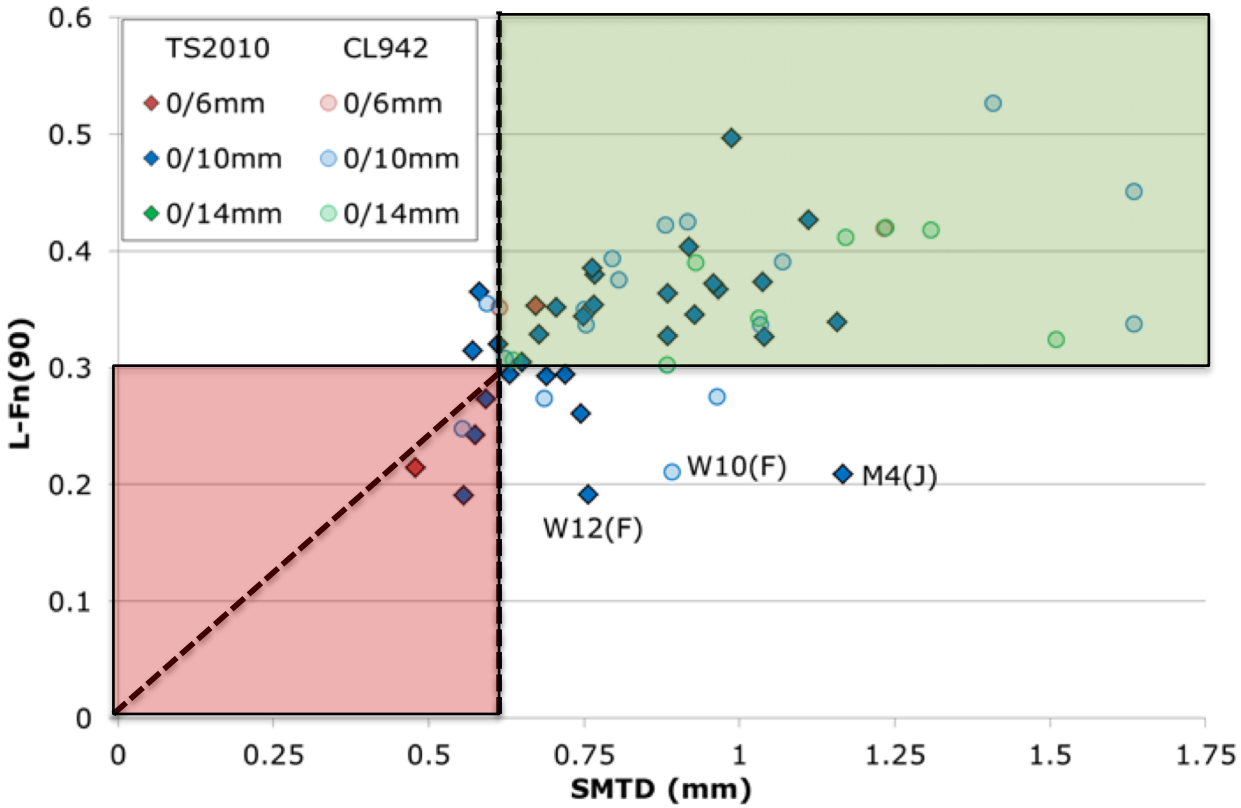
Analysis

Texture depth – historical research (Roe, Parry & Viner, 1998)



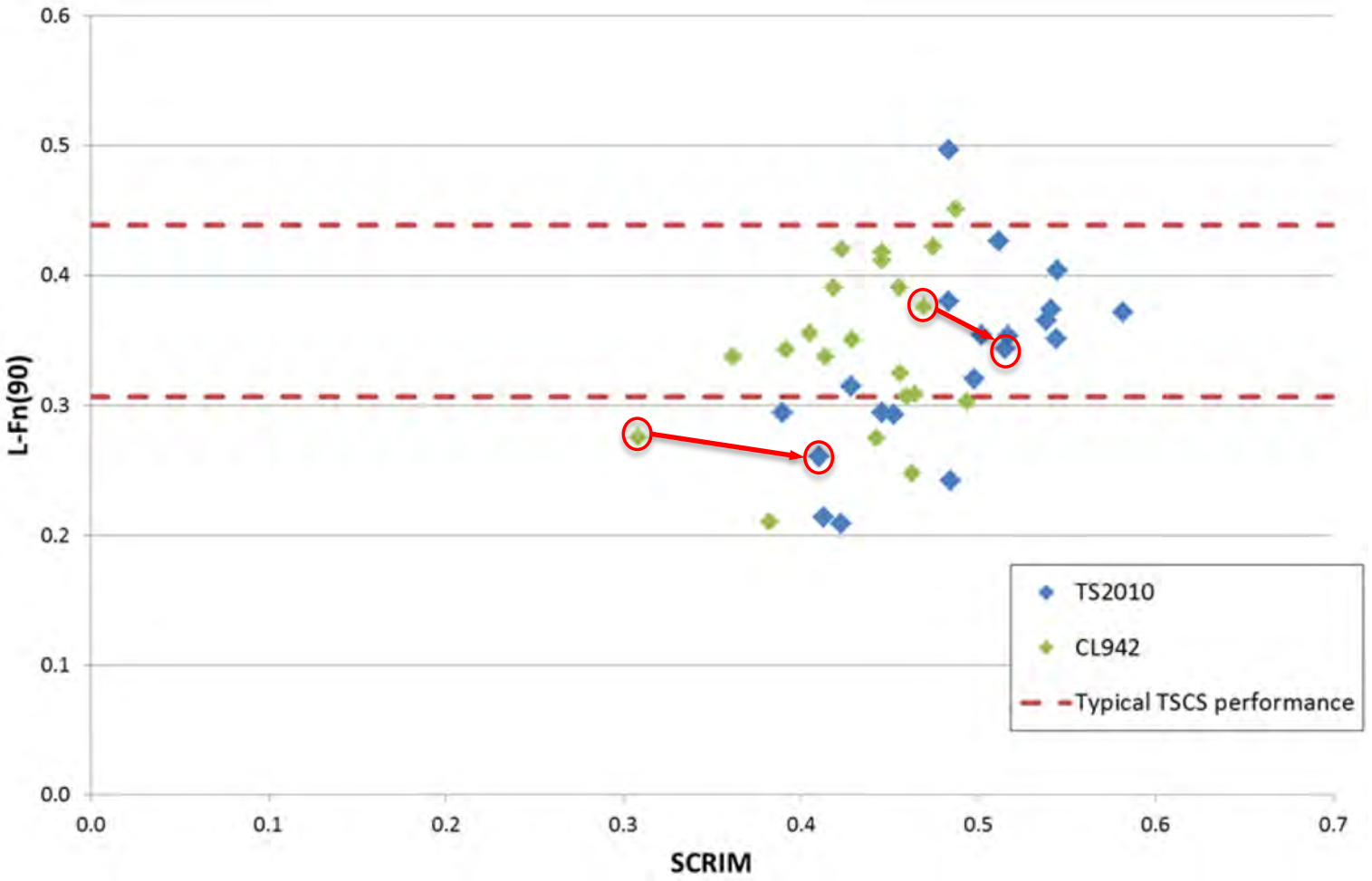
Analysis

Texture depth & L-Fn (TS2010 & Cl942)

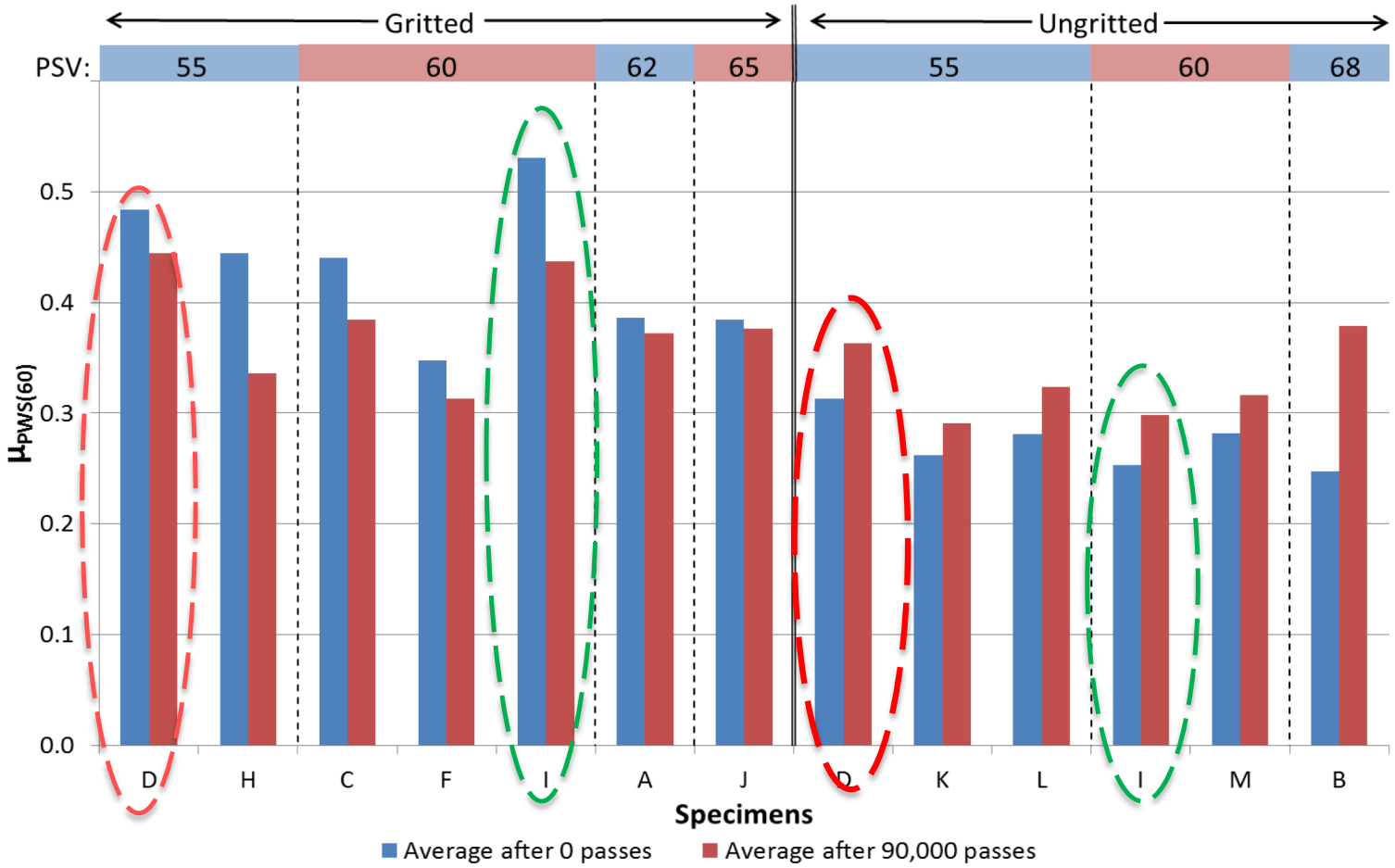


Analysis

SCRIM & L-Fn (low speed versus high speed)

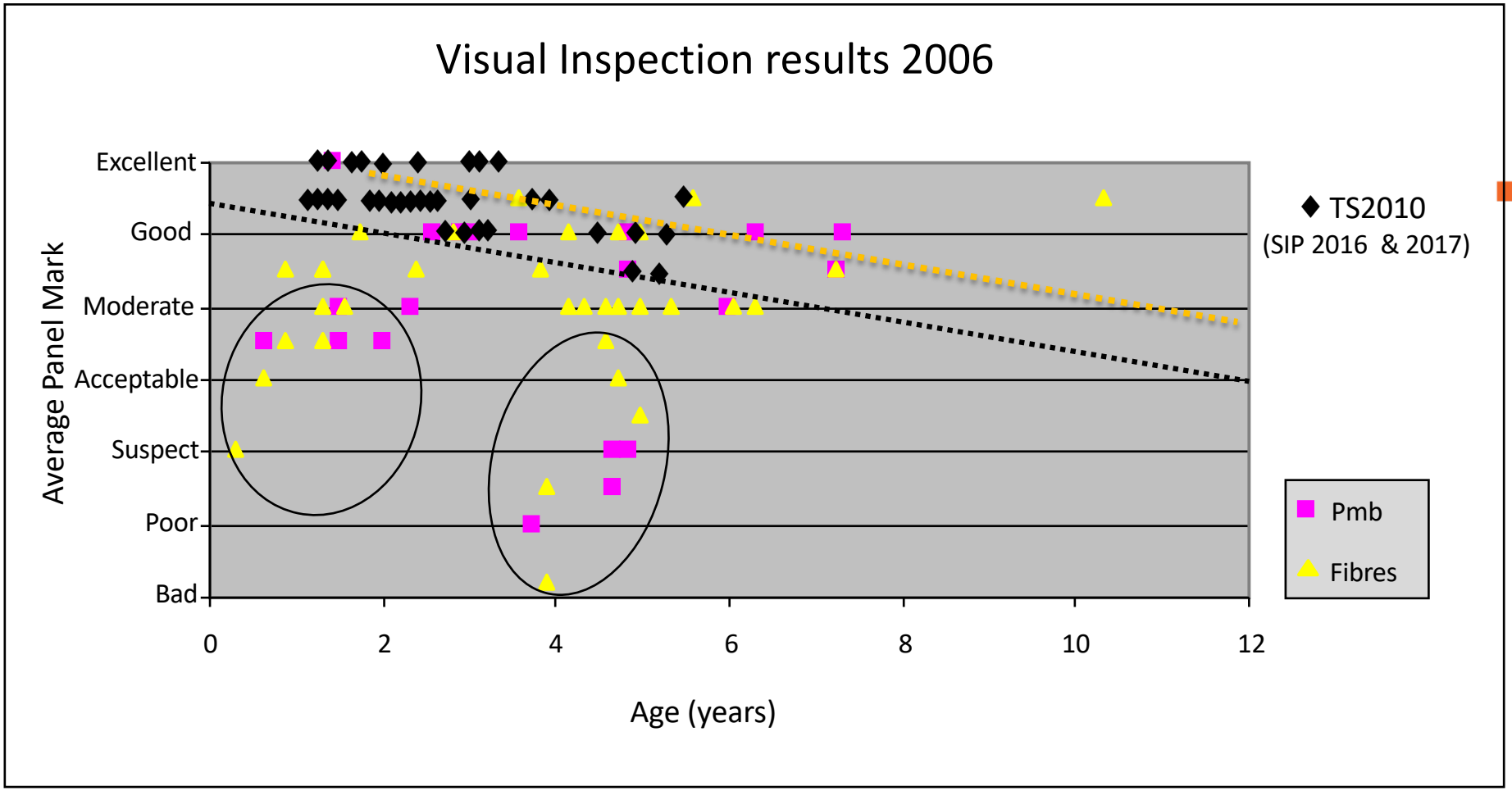


Wehner-Schulze testing on TS2010




EME2 BAR
SES SANDWICHS
Ouvert Jour
OK, one more and then I'll go!!

How is TS2010 Performing in service?



Summary

- Since the first SIP survey recommended reducing the open texture appearance of Clause 942 material in 2008, research has been undertaken to reconfigure the composition of Scottish asphalt surface courses so that it is durable and safe.
- The TS2010 SMA specification marked a new step change in approach by making the measurement of friction characteristics performance based.
- Subsequent assessment has led to further refinements to the specification to improve the quality and consistency of the material. Now in its 4th Edition (2018).
- New knowledge has led to a method for assessing the use of locally won materials and justifying their use based on in-service performance.
- The information collected has improved our understanding and behaviour of asphalt …hopefully further improvements can be made.

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