Revision of the South African Pavement Design Method Phase 3

Road Pavements Forum

7 November 2012

Project SAPDM/D-3: Stabilised Material

H Theyse

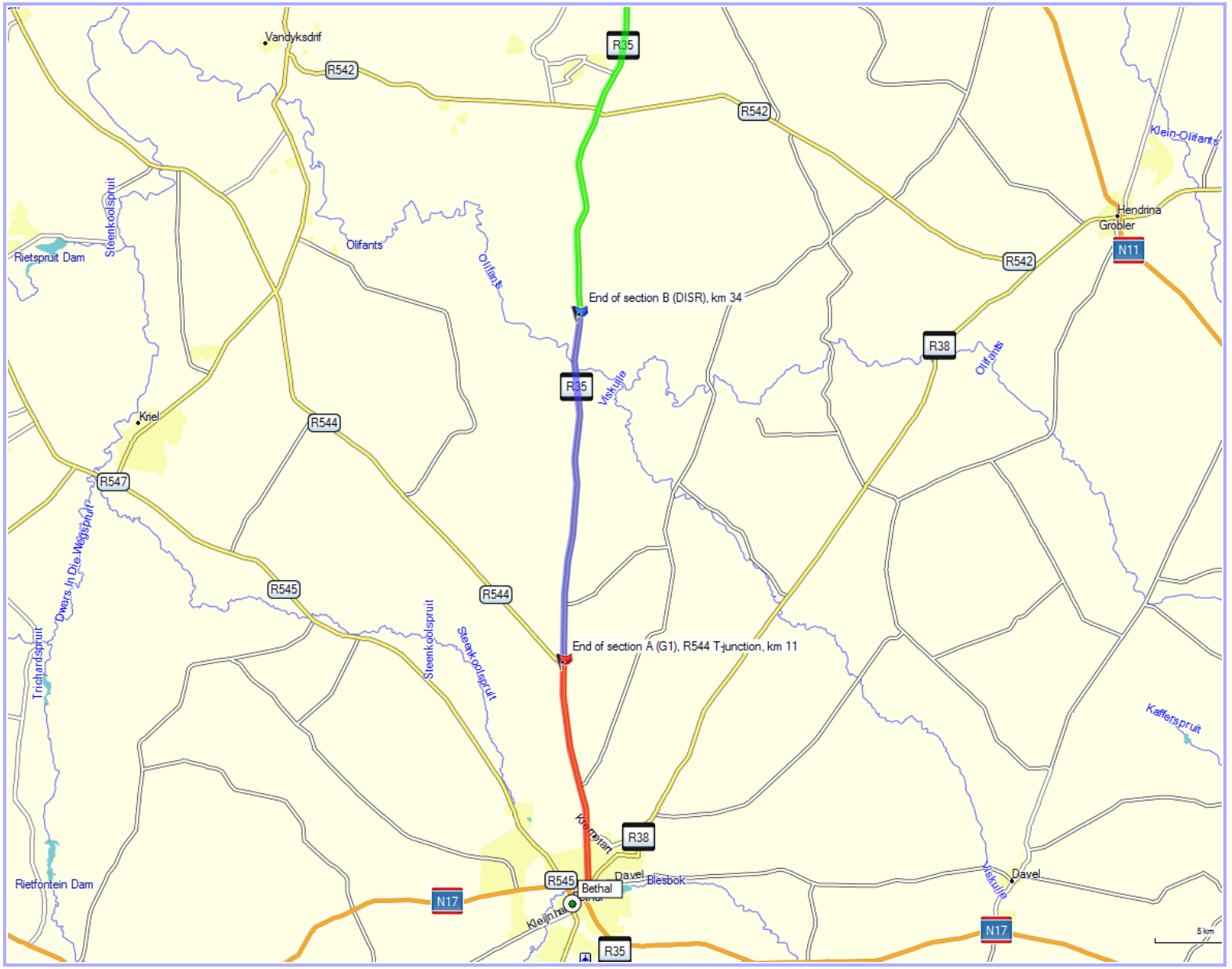
Long-term tasks

- In-service sections
  - Cement
    - N14-5 Upington
    - N17-05 Ermelo
  - Emulsion
    - D2388 Cullinan
    - N2-16 East London
  - Foam
    - R27 Nieuwoudtville
    - N7-01 Cape Town
    - **N11-08 Hendrina or Bethal-Kriel or R22 Mseleni-Phelendaba?**

Long-term tasks

- New sections – R35 Bethal
  - Planning document completed
  - Pavement and mix design completed
  - Construction in conjunction with IC project
    - Southbound base construction
      - Started on **11 April 2012**
      - Completed on **7 May 2012**
    - Northbound base construction
      - Started on **1 August 2012**
      - Completion on - **6 September 2012**

New sections – R35 Bethal



Pavement structures

Southbound

Cement content:	2%	2%	1%	1%	2%	2%	1%	1%	2%	2%	
Lime content:	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	
Bitumen content:	0%	0%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
425	**575**	**350**	**350**	**350**	**350**	**350**	**350**	**350**	**350**	**350**	**350**
G1(1)	G1(2)										
200 C3 Sub(1)	200 C3 Sub(2)	200 C3(1)	200 C3(2)	175 ETB1	200 ETB1	175 ETB2	200 ETB2	175 FTB1	200 FTB1	175 FTB2	200 FTB2
425	425	150	700	700		700		700		700	
SANRAL											
km 6,925	km 6,350	km 6,500	km 6,850	km 7,200	km 7,550	km 7,900	km 8,250	km 8,600	km 8,950	km 9,300	km 9,650	km 10,000

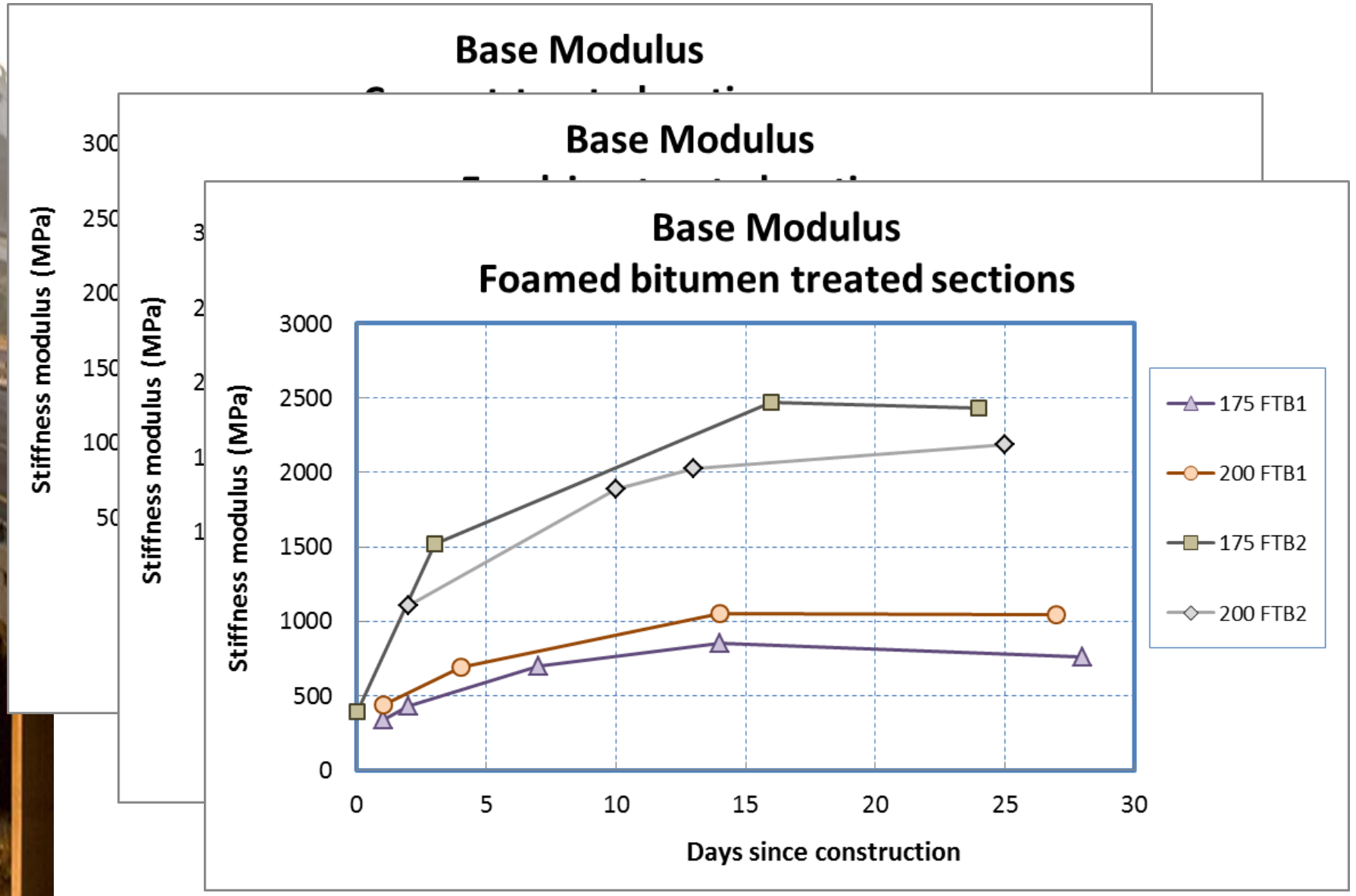
Northbound

Cement content:	2%	1%	1%	1%	2%	2%	1%	1%	2%	2%	
Lime content:	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Bitumen content:	0%	0.9%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
333	**333**	**334**	**350**	**350**	**350**	**350**	**350**	**350**	**350**	**350**	**350**	**350**
G1(1)	G1(2)	G1(3)										
200 C3 Sub(1)	200 C3 Sub(2)	200 C3 Sub(3)	200 C3(1)	200 ETB3	175 ETB1	200 ETB1	175 ETB2	200 ETB2	175 FTB1	200 FTB1	175 FTB2	200 FTB2
333	333	334	350	350	350	350	350	350	350	350	350	350
SANRAL												
km 5,833	km 6,166	km 6,500	km 6,850	km 7,200	km 7,550	km 7,900	km 8,250	km 8,600	km 8,950	km 9,300	km 9,650	km 10,000

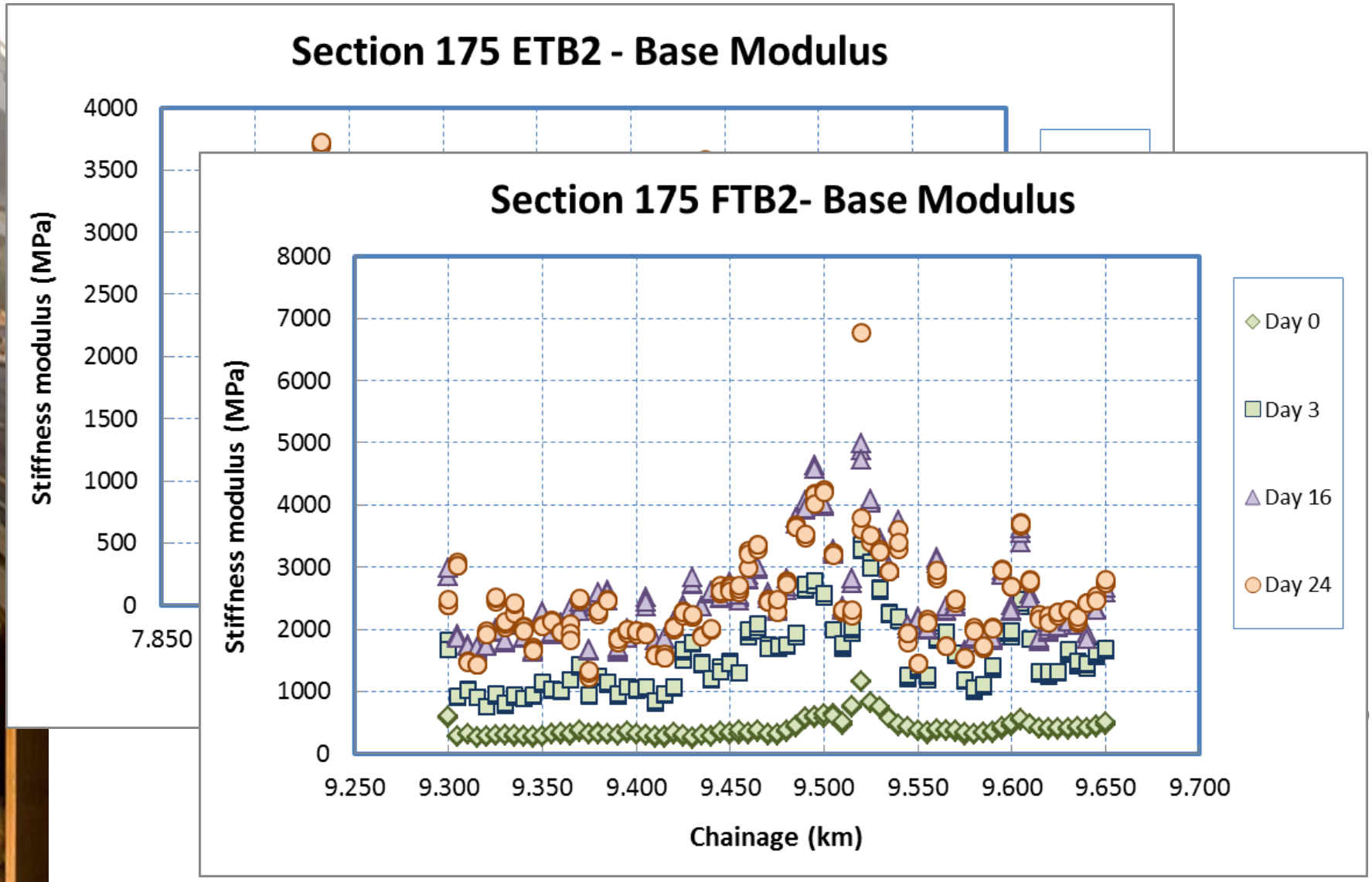
Monitoring of curing period

Days since construction	Tests	Responsibility
1 day	1) Visual condition 2) FWD 3) LWD 4) 3 x cores for UCS, ITS and moisture content	Site supervision SRT CSIR/SSI Site supervision
7 days	1) FWD 2) LWD 3) 3 x cores for UCS, ITS and moisture content	SRT CSIR/SSI Site supervision
14 days	1) FWD 2) LWD 3) 3 x cores for UCS, ITS and moisture content	SRT CSIR/SSI Site supervision
28 days	1) FWD 2) LWD 3) DCP 4) 3 x 150 mm Ø cores for UCS and MC 5) 3 x 150 mm Ø cores for ITS and MC 6) 10 x 150 mm Ø cores for tri-axial tests and MC 7) 1 x 500 mm x 500 mm slab for flexural beam tests	SRT SSI PMC Site supervision

Monitoring of curing period: FWD temporal variation on SB



Monitoring of curing period: FWD on SB – spatial variation

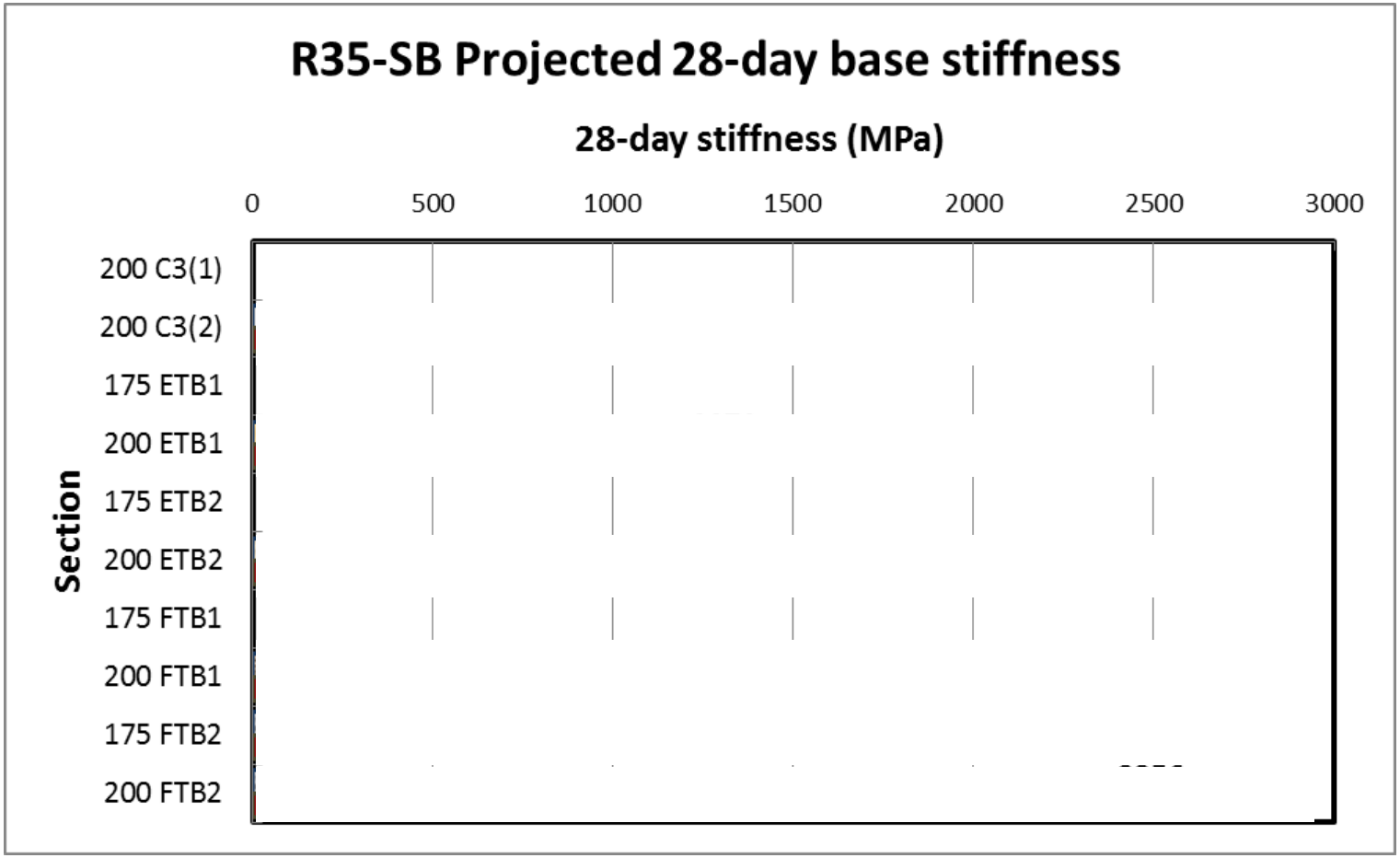


Field Sampling on SB: Slabs

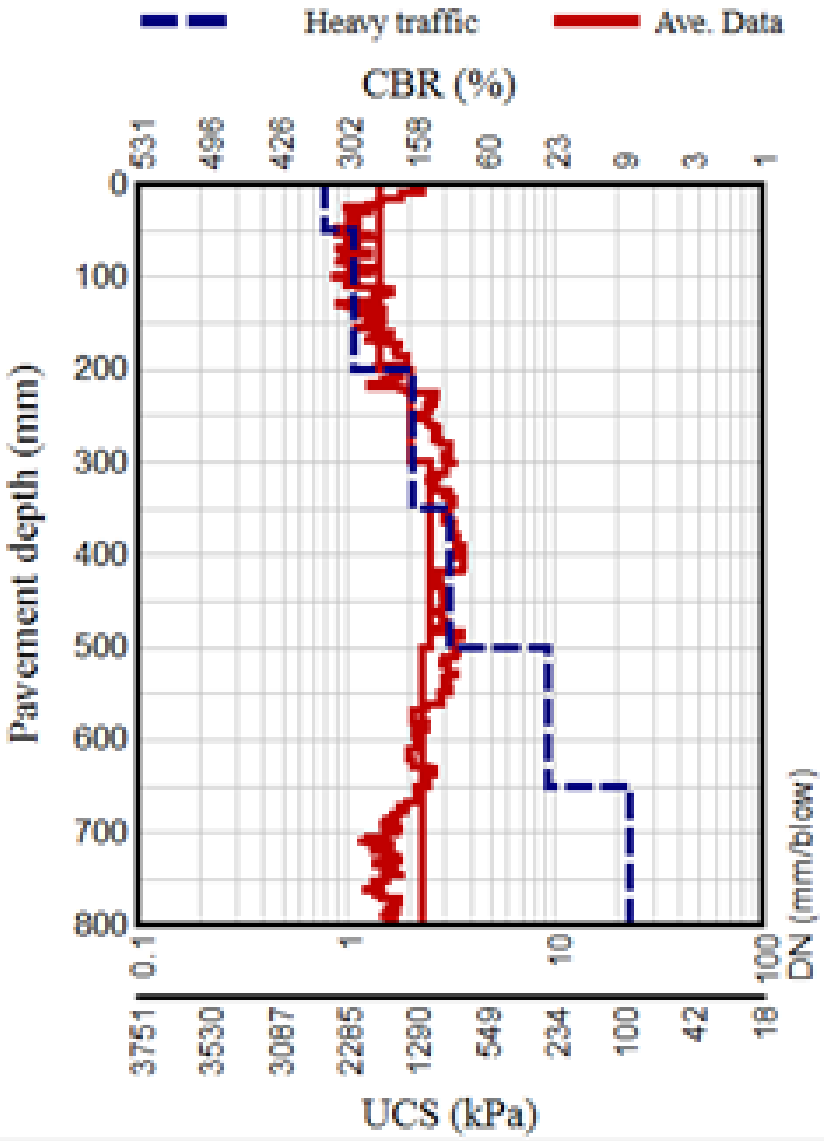
Field Sampling on SB: Cores

FWD vs Laboratory stiffness for SB

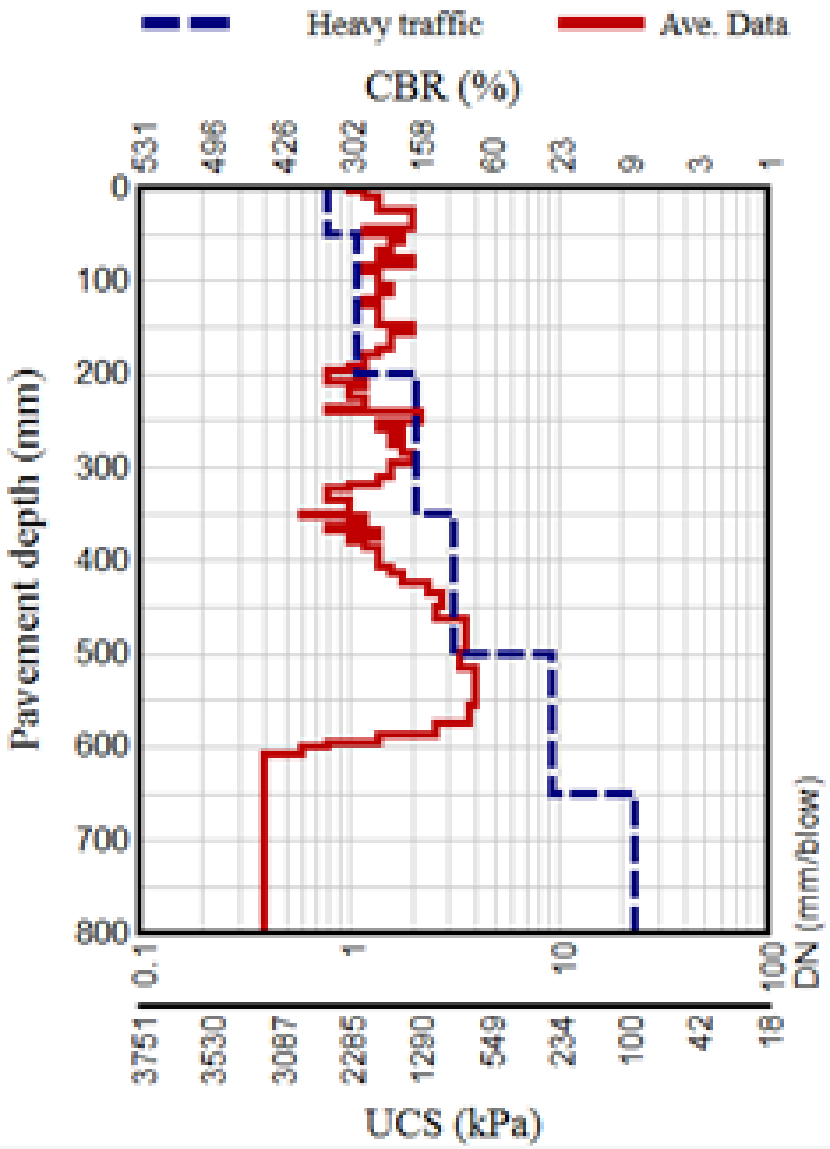
- Average M_c
  - 20 and 140 kPa confinement pressure
  - 40 % stress ratio



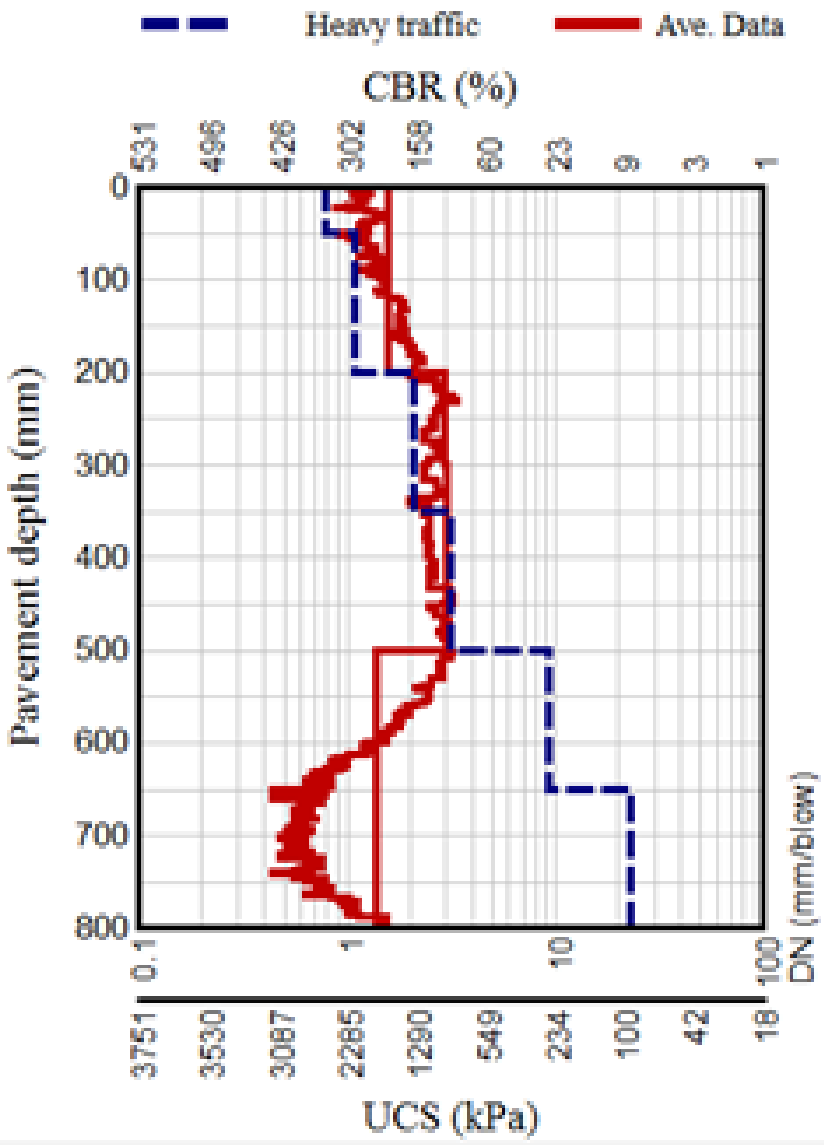
28 day DCP on SB – 200 C3(1)



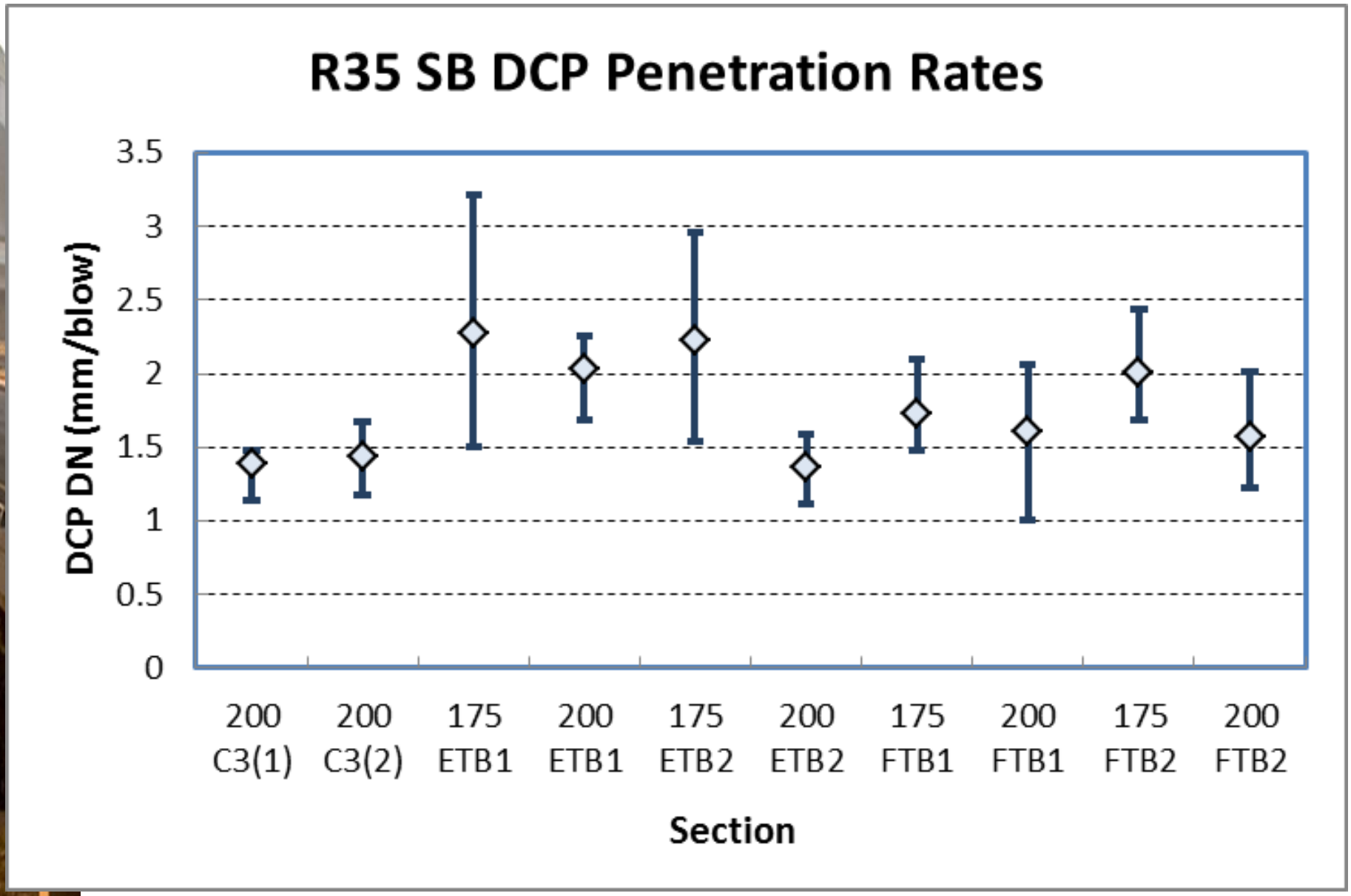
28 day DCP on SB – 200 ETB2



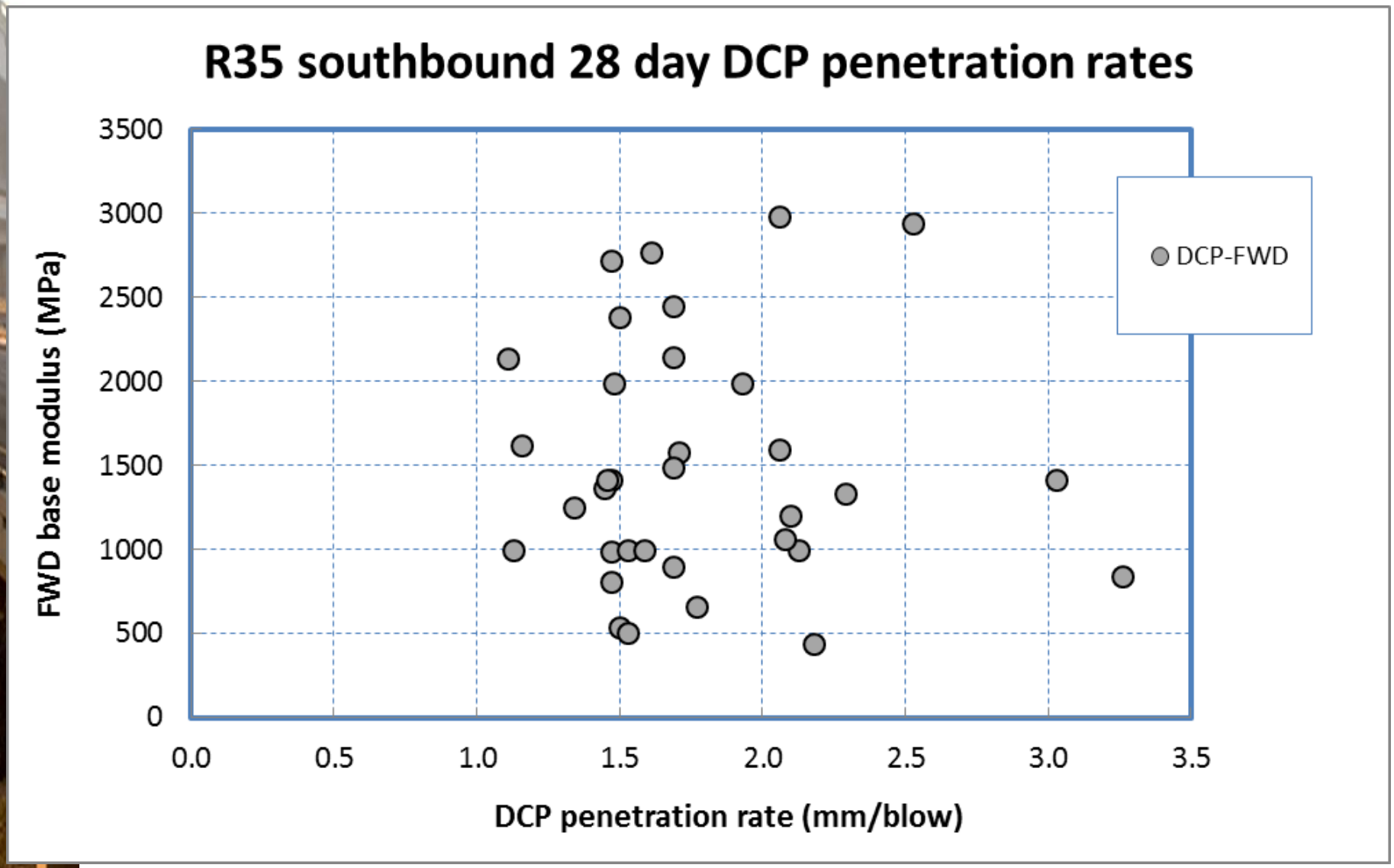
28 day DCP on SB – 200 FTB2



28 day DCP on SB



28 day DCP on SB – FWD base Mr



Lessons learned

- Field testing - FWD
  - Temporal variation
    - As expected
  - Spatial variation
    - Higher than expected
    - Not purely random – spatial pattern
    - More effort required to determine cause
      - Support conditions?
      - Compaction?
      - Stabilisation reaction?
      - Do FWD prior to recycling

Lessons learned

- Field testing – 28 day DCP
  - Base penetration rates generally low
    - Possible distinction between mix types
    - No distinction between mix design variation within a mix type
  - No correlation with FWD base modulus on a point-by-point basis