

Density Profiling System (DPS) for Continuous Density Measurement

Brian Diefenderfer, PhD, PE
Principal Research Scientist

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Background

- Density is an essential property to assure good durability
 - Low density can lead to premature deterioration
 - 1% increase in air voids leads to x% reduction of service life
- Common areas for density challenges include
 - Longitudinal joint, end of truck load, where compaction was attempted at low material temperatures



Background

- We currently assess density using either a nuclear density gauge (QC) or by measuring samples cut from the road (QA)
- A SHRP2 study stated that these methods typically only measure about 0.003% of the road surface



Density Profiling System (DPS)

- Assess asphalt pavement density continuously (AASHTO PP 98-19)
 - Assess a higher percentage of the pavement surface
 - Could be the foundation for an incentive-type provision
 - Evaluate process changes



VTRC Study

- Phase 1 - Field Testing (2021)
 - 5 projects (multiple NMAS)
 - Compare DPS results with field core density
- Phase 2 - Field plus Lab Testing (2022-2023)
 - 6 projects (multiple NMAS)
 - Compare DPS results with field core density
 - Compare DPS-L results with lab pill density







CBR / MCC
Boring # 54862

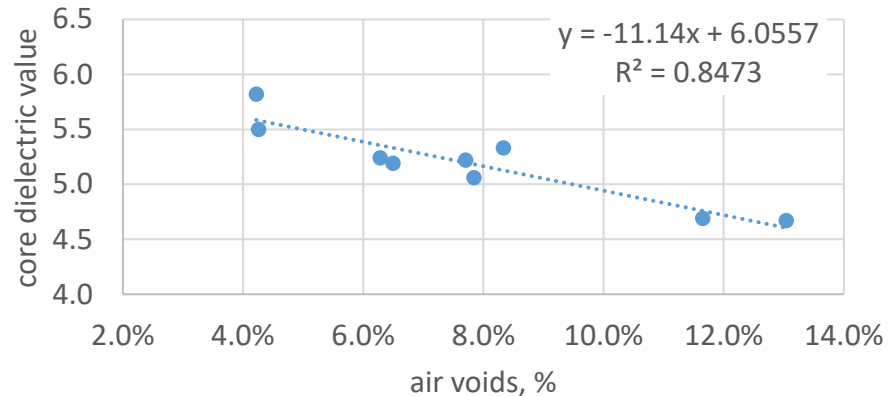
2021 Field Testing

- Scan pavement surface after compaction is completed
- Collect cores at selected locations
- Correlate DPS output with density from cores

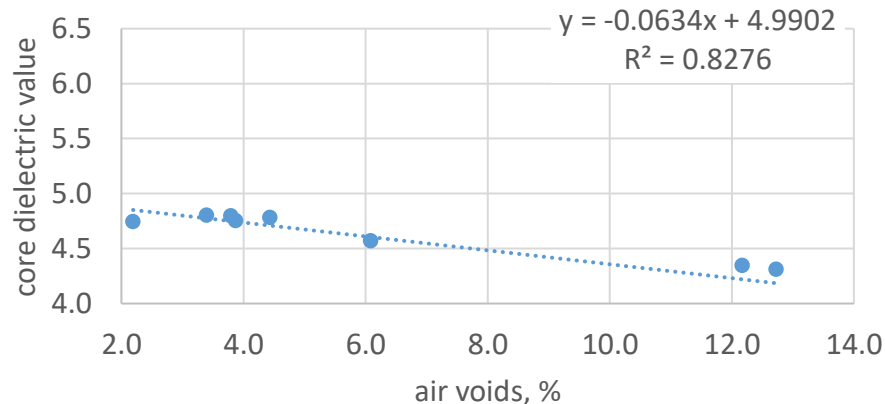




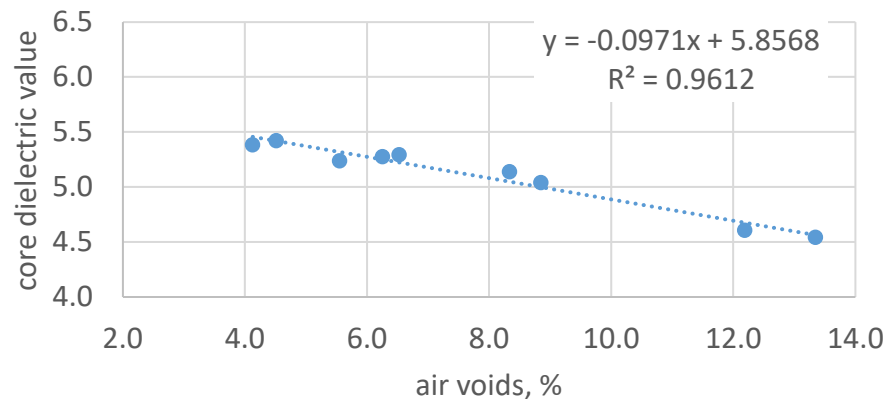
Rt 22, Albemarle



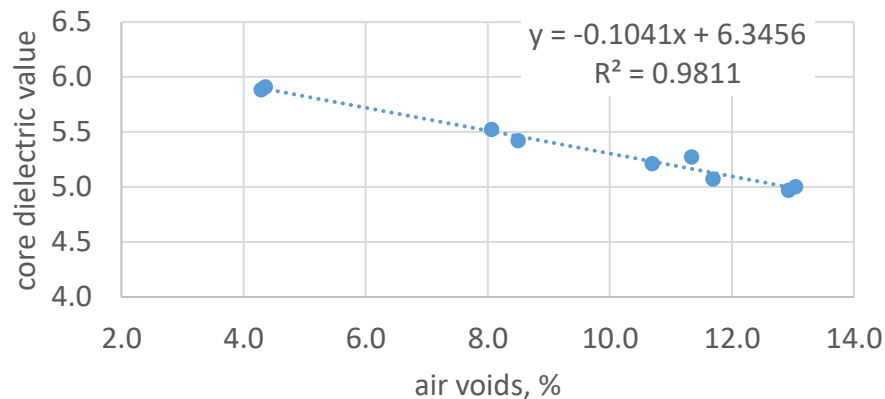
Bell Road, Powhatan

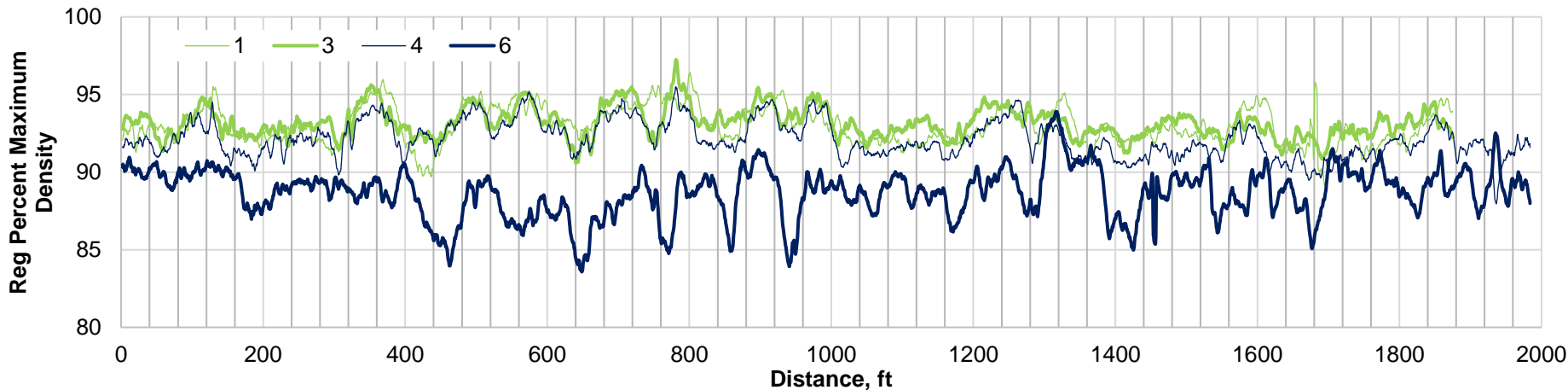
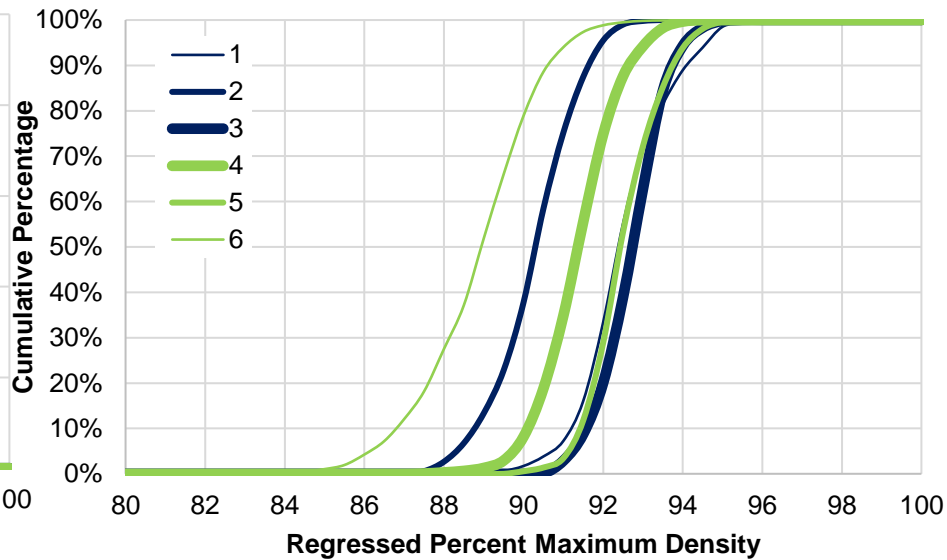
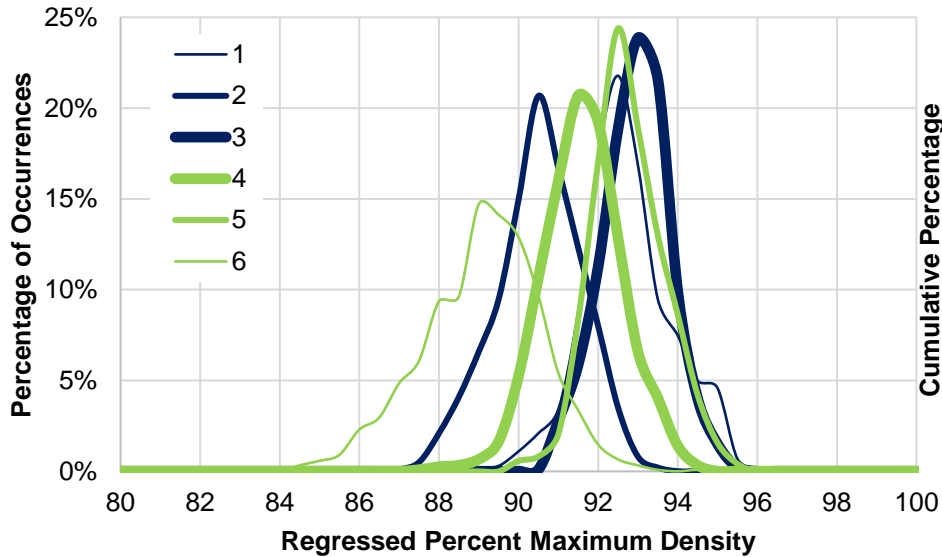


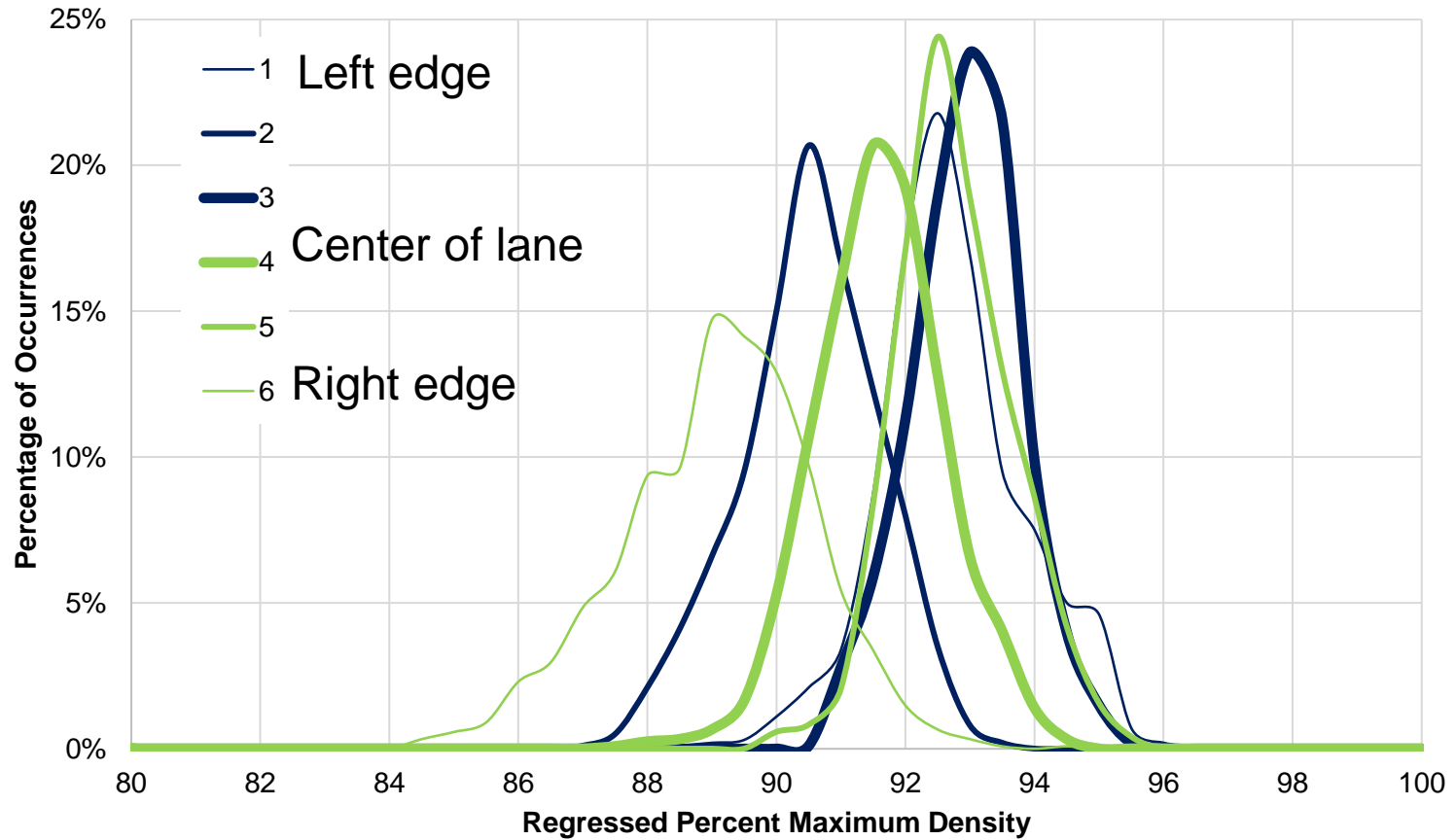
Rt 29, Amherst

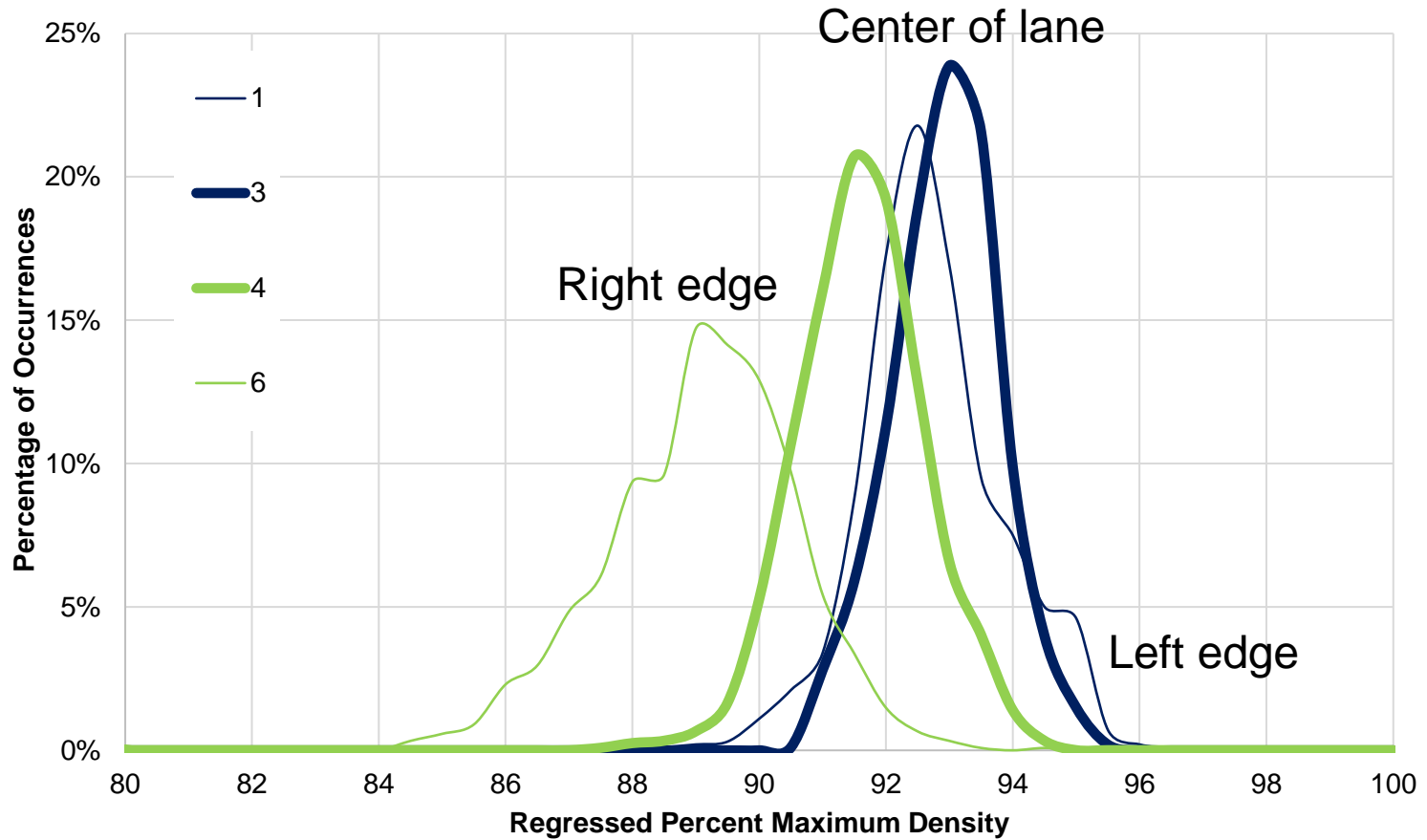


Fox Den Lane, Fairfax



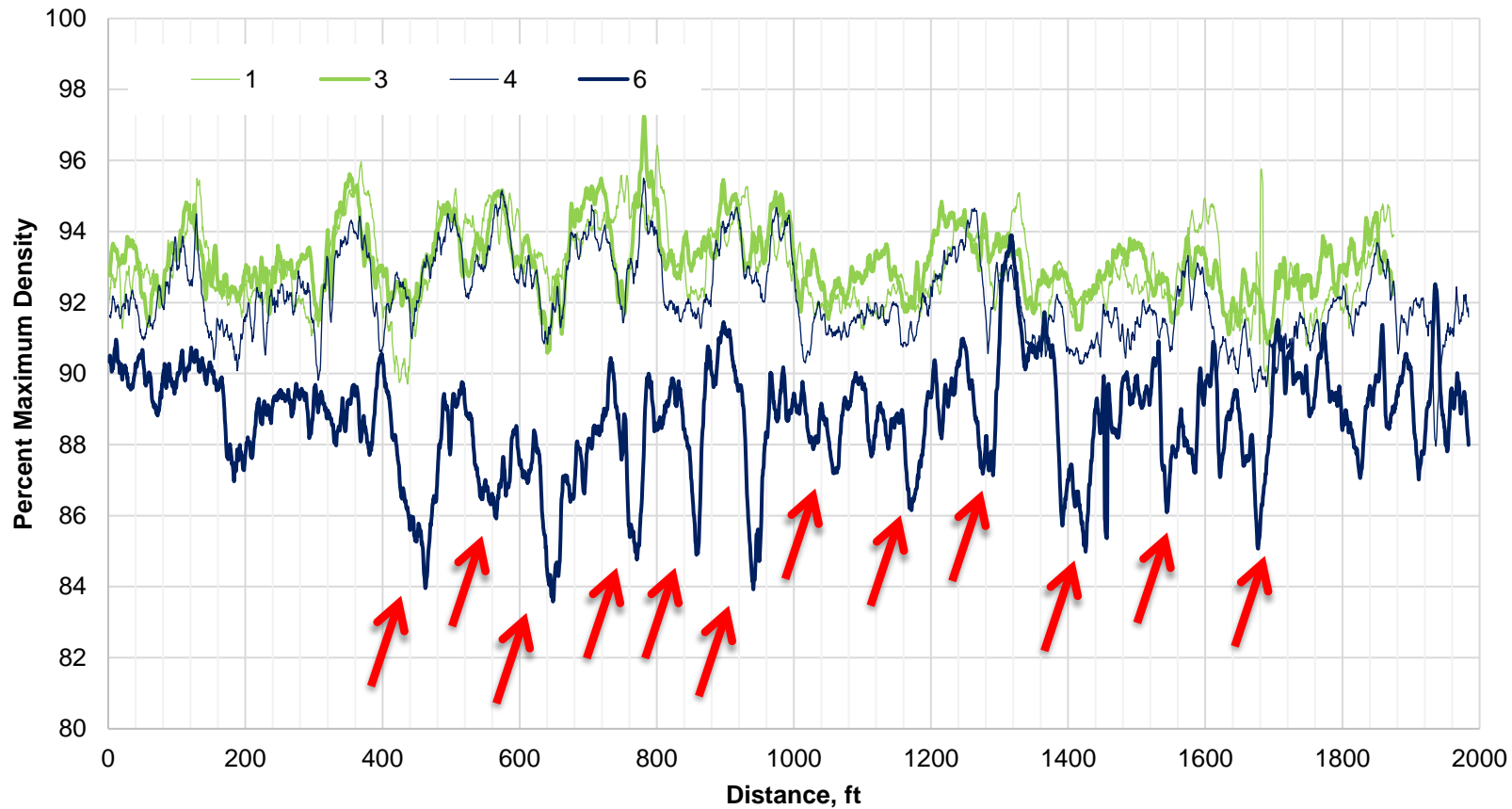






Left edge

Right edge



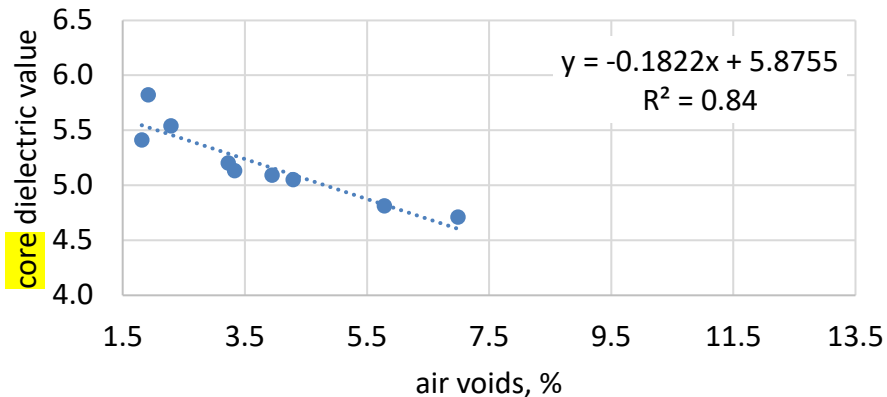
2022 Field Testing

- Same field process as 2021
- Also, collect loose mix to fabricate pills in the lab
 - Approx 2, 4, 7, and 10% voids
 - 3 measurements per pill
 - Use results to plot density directly in the field

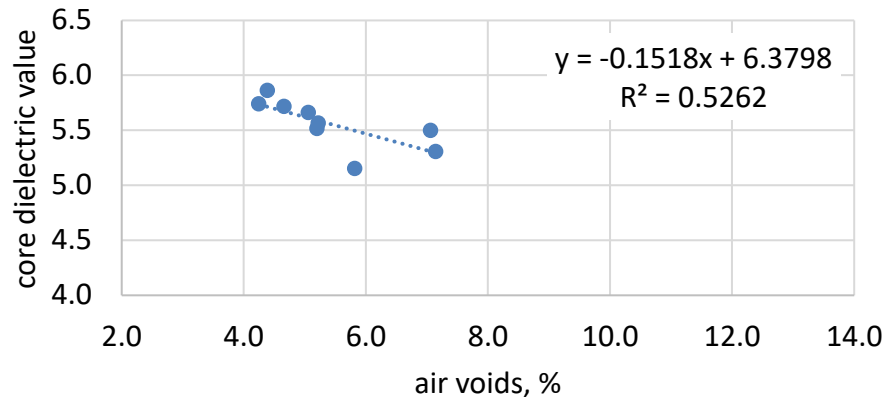




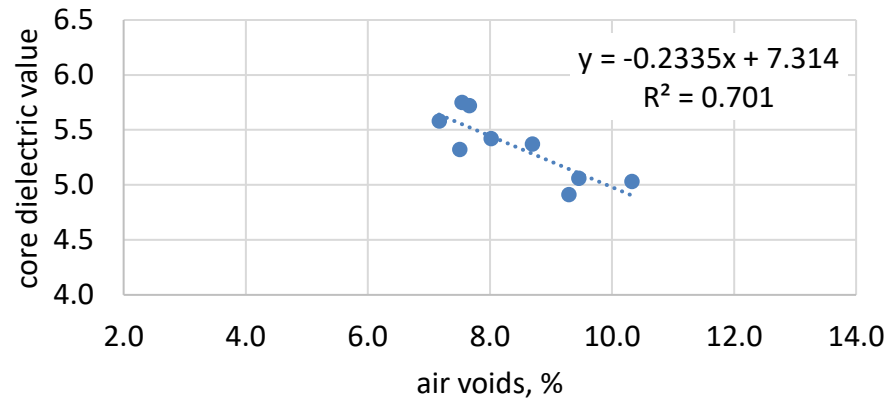
I-95, 25mm



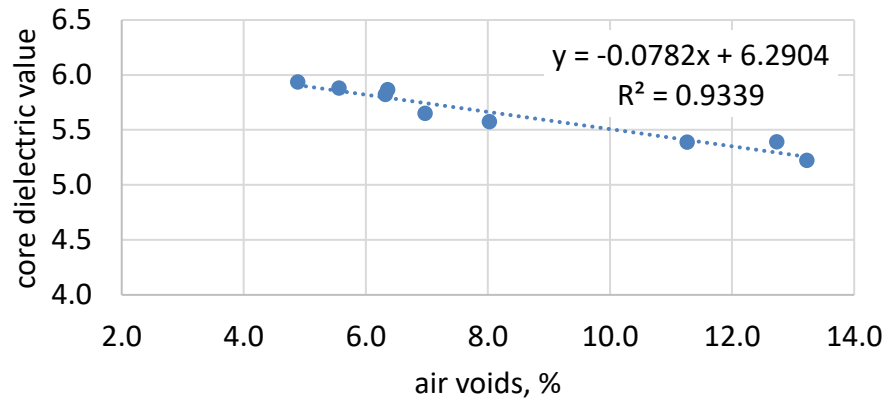
I-95, 19mm

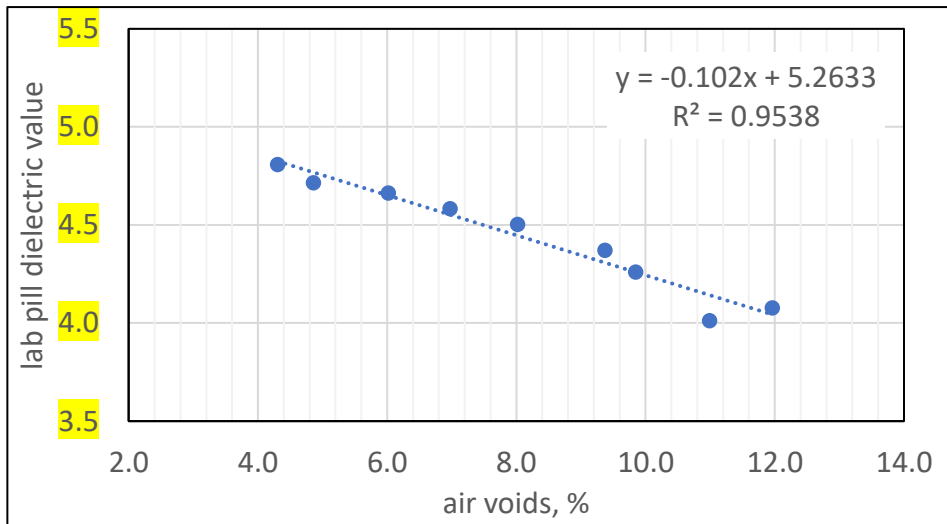
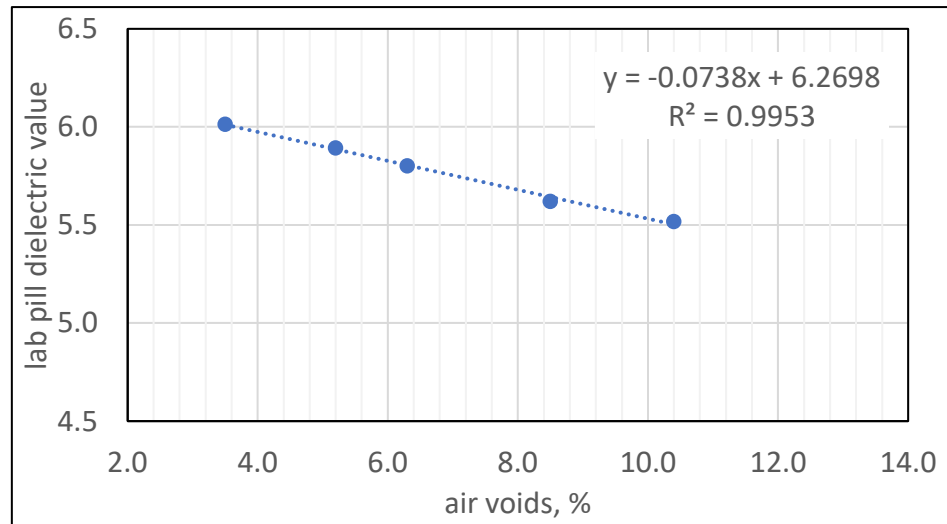
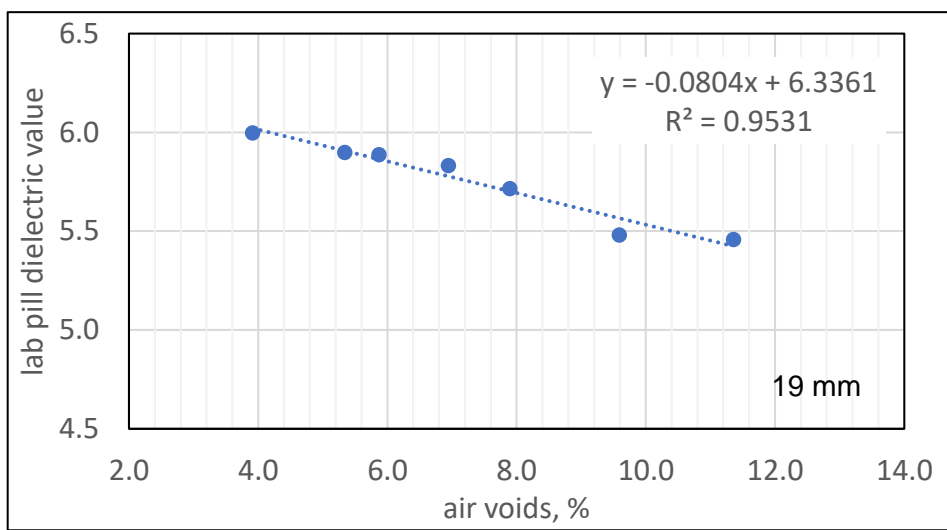
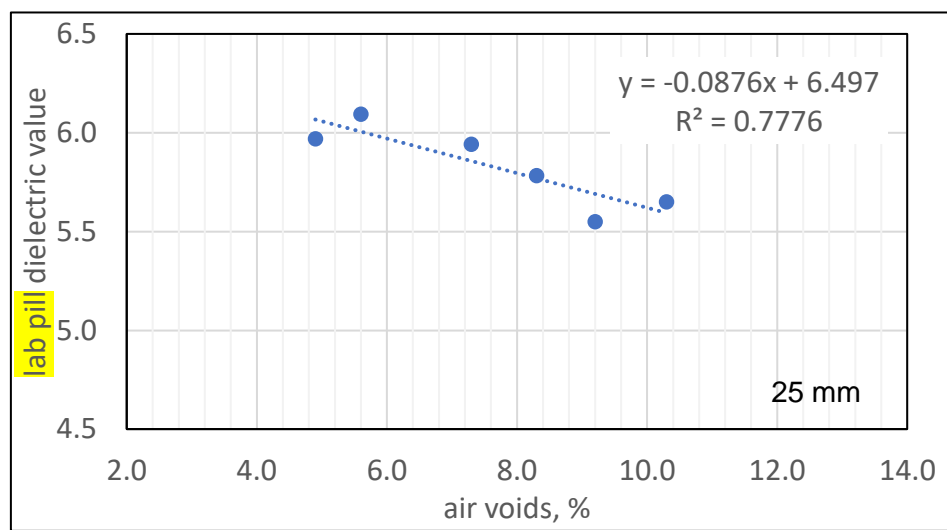


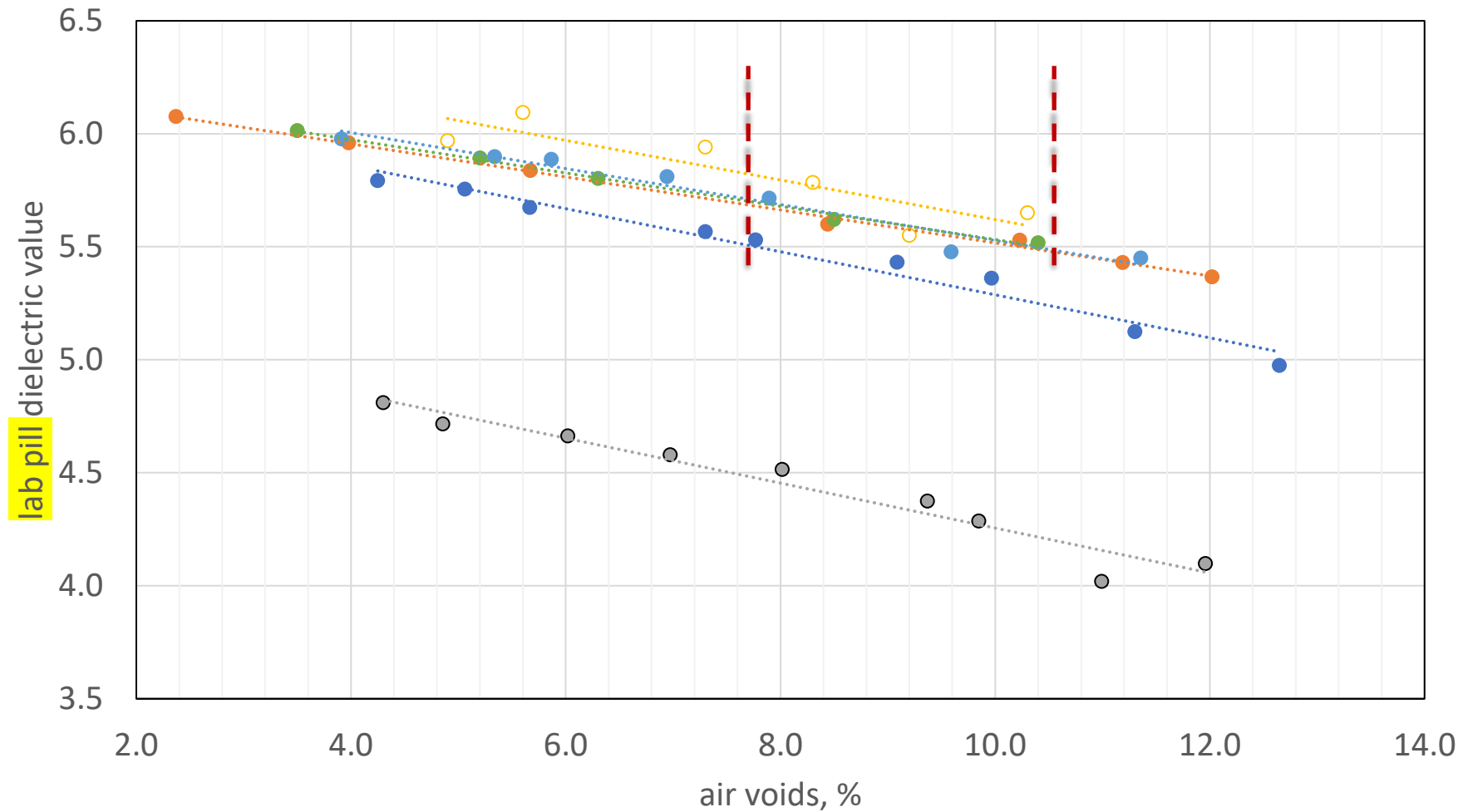
Buck Mountain Road



Spradlin Court







National Perspective

- Pooled Fund Study (lead state = MN)
 - Coordinate testing and analysis with other states
 - FHWA, ID, MD, ME, MO, MS, ND, NY, OH, PA, UT, WA WI
- Coordinate data between thermal profiler and DPS?



Random Thoughts

- Testing
 - Who? When?
 - Different answer for QC vs acceptance? Different road types?
- Equipment
 - Push cart vs roller mounted?
- Implementation by VDOT?





We bring innovation to transportation.

Thank you!

brian.diefenderfer@vdot.virginia.gov