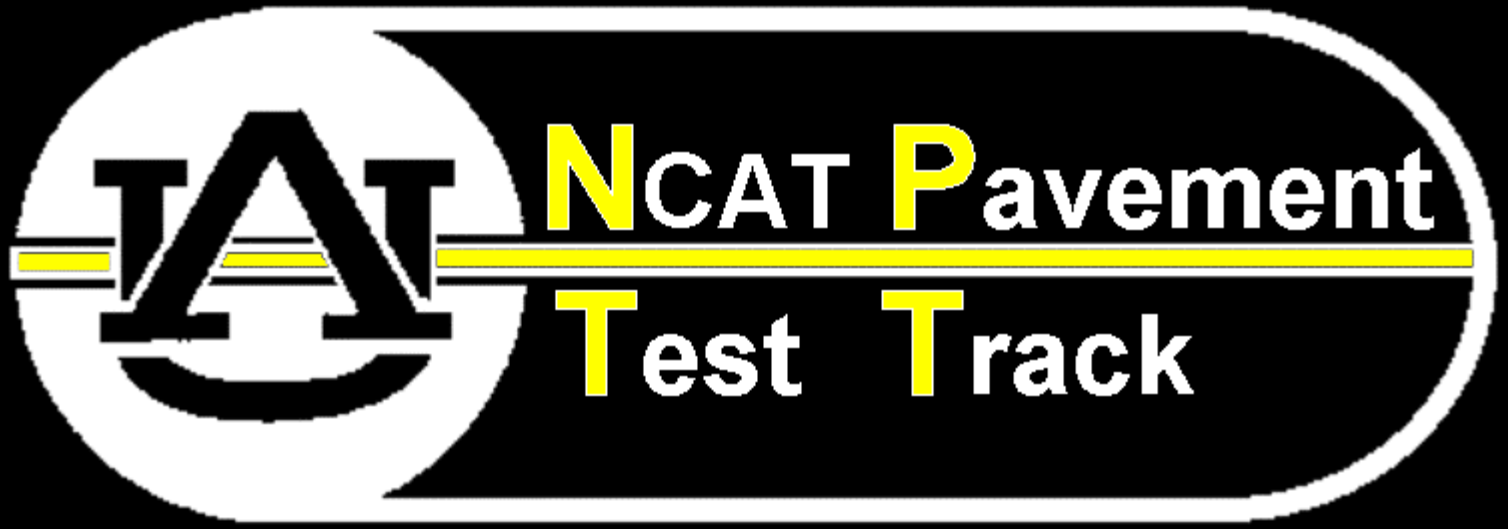


National Center for Asphalt Technology
1600 Lee Road 151
Opelika, AL 36804
(334) 844-6228

Nation Center for Asphalt Technology

- Established by 1986 NAPA-AU Joint Agreement
- Financial Endowment “Seed” from Contractors, Suppliers, & Equipment Manufacturers via NAPA-REF
- Facilities and Faculty from Auburn University
- “Improve the Performance of HMA Pavements via Practical Research, Education, and Information Services”
- Broke Ground at Test Track in September of 1998…

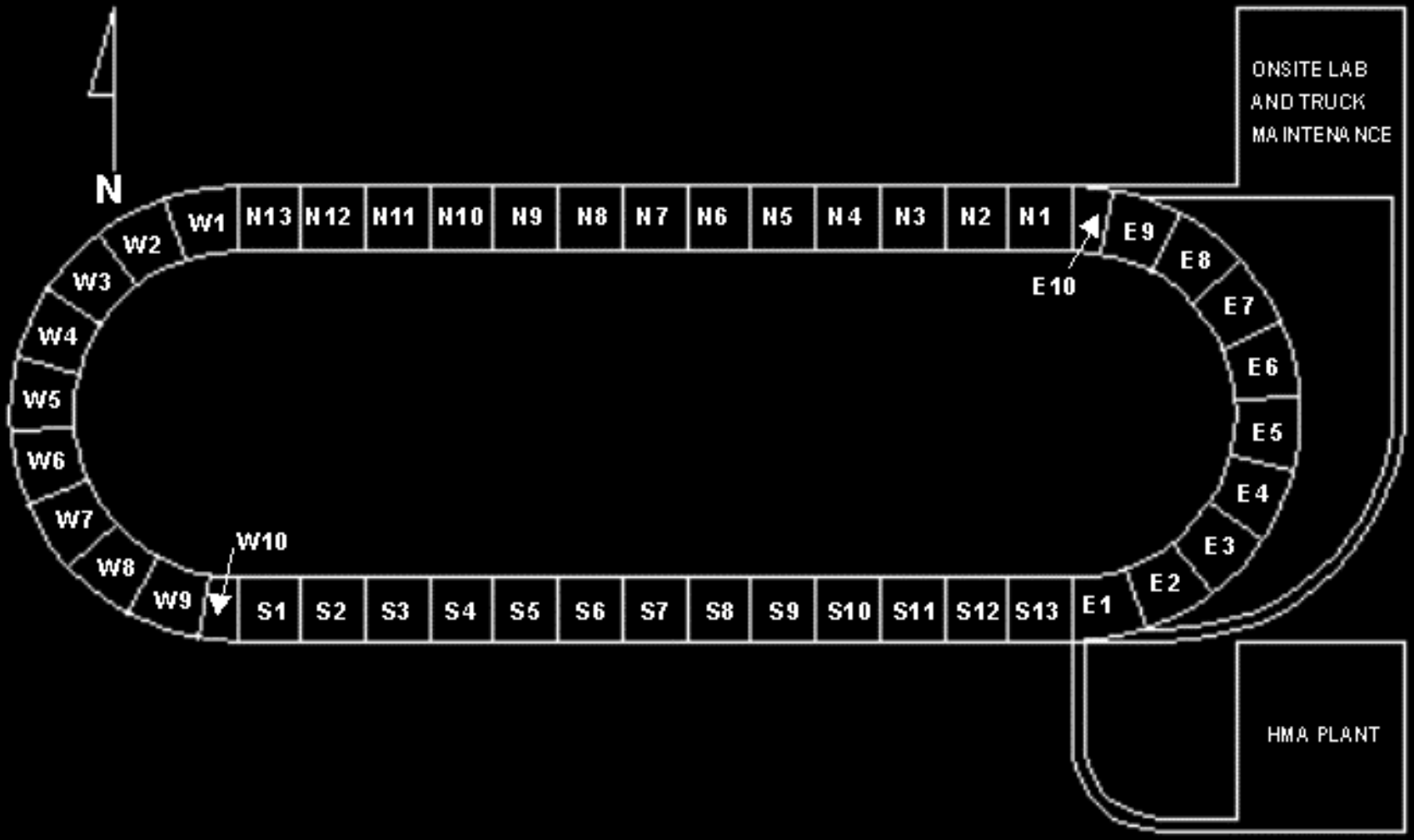
NCAT Pavement Test Track

PROJECT OVERVIEW

- Materials and Methods (Not Thickness) are Study Variables
- Determine Which Mixes Perform Better Under Actual Traffic
- Identify Laboratory Tests That Best Indicate Field Performance

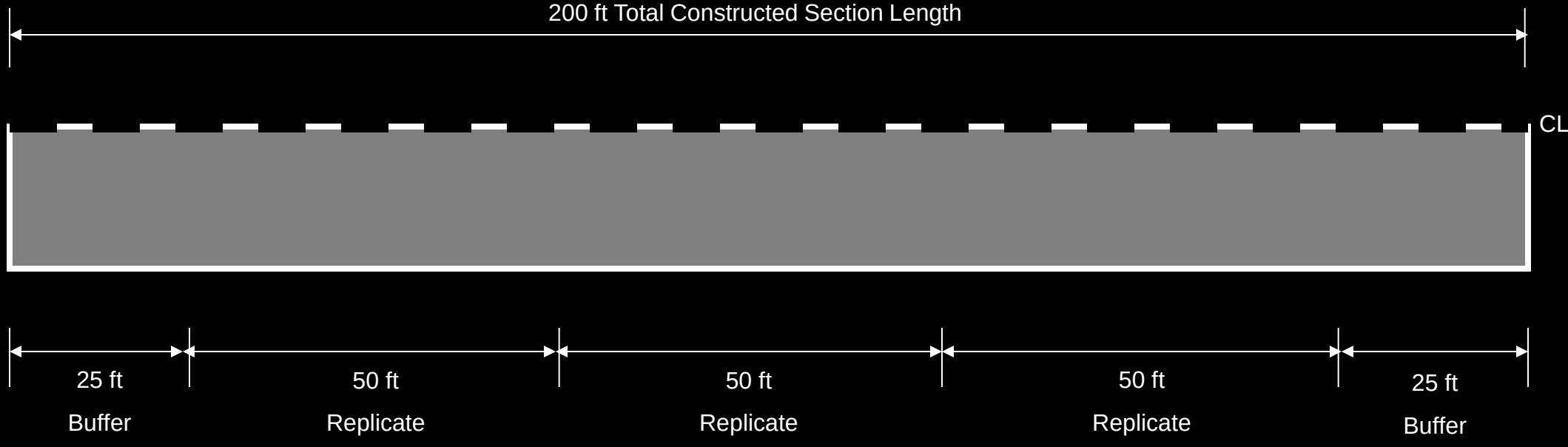
NCAT Pavement Test Track

SECTION LAYOUT



NCAT Pavement Test Track

RESEARCH TEMPLATE



NCAT Pavement Test Track

CONSTRUCTION (April – July, 2000)

NCAT Pavement Test Track

QUALITY CONTROL SAMPLING

NCAT Pavement Test Track

PAVING EXPERIMENTAL MIXES - April 2000

NCAT Pavement Test Track

DENSITY TESTING

NCAT Pavement Test Track

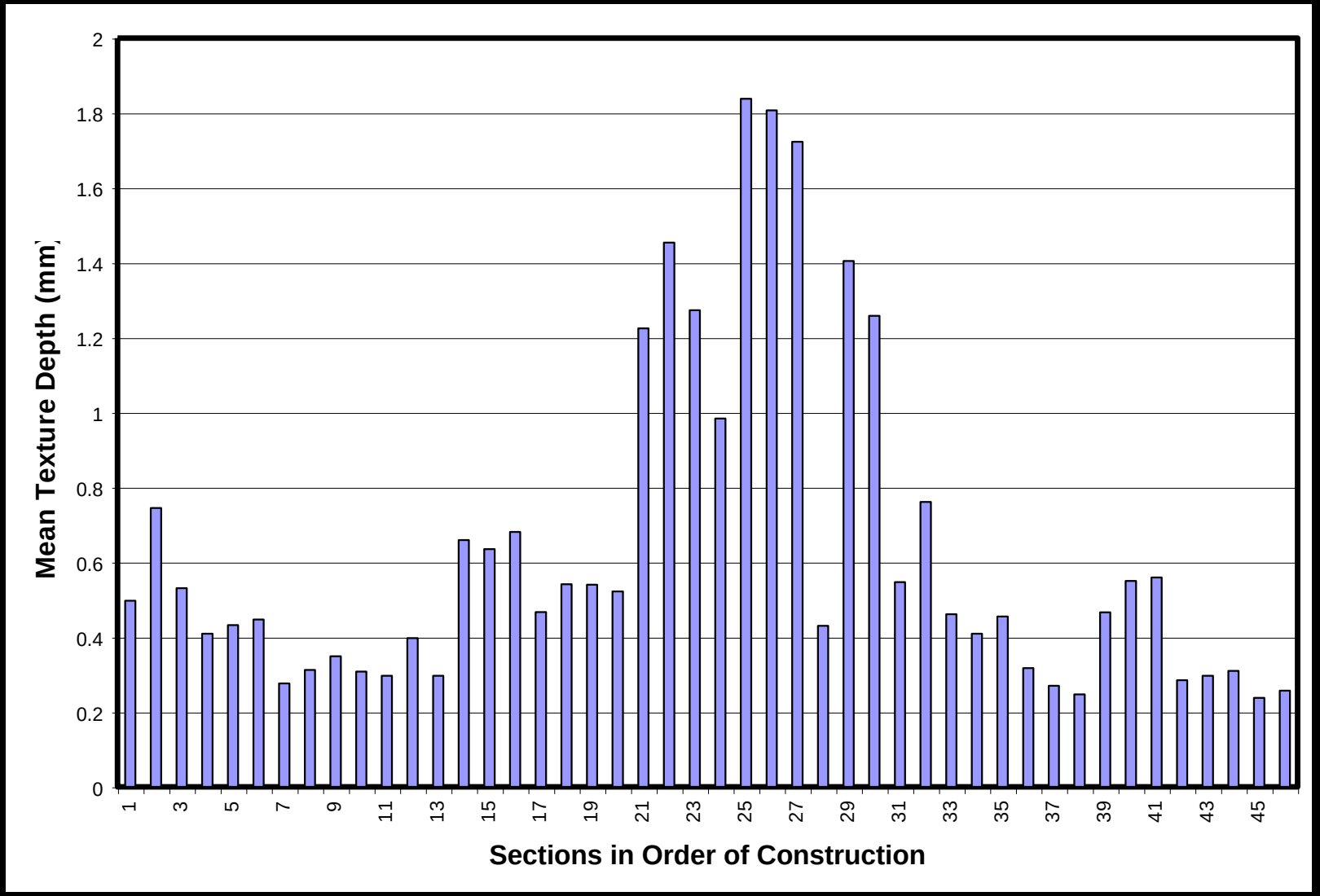
TRUCKING OPERATIONS

- 4 Trucks Currently Run 17 Hours a Day (2800 Miles, 1600 Laps)
- Truck ESAL's Logged Continuously via VIS, Mileage Log, & Tubes
- No Trucking on Monday for Data Collection & Vehicle Maintenance
- On Schedule to Apply 10 Million ESAL's (1.6 million Miles) by Nov 2002

FIELD PERFORMANCE

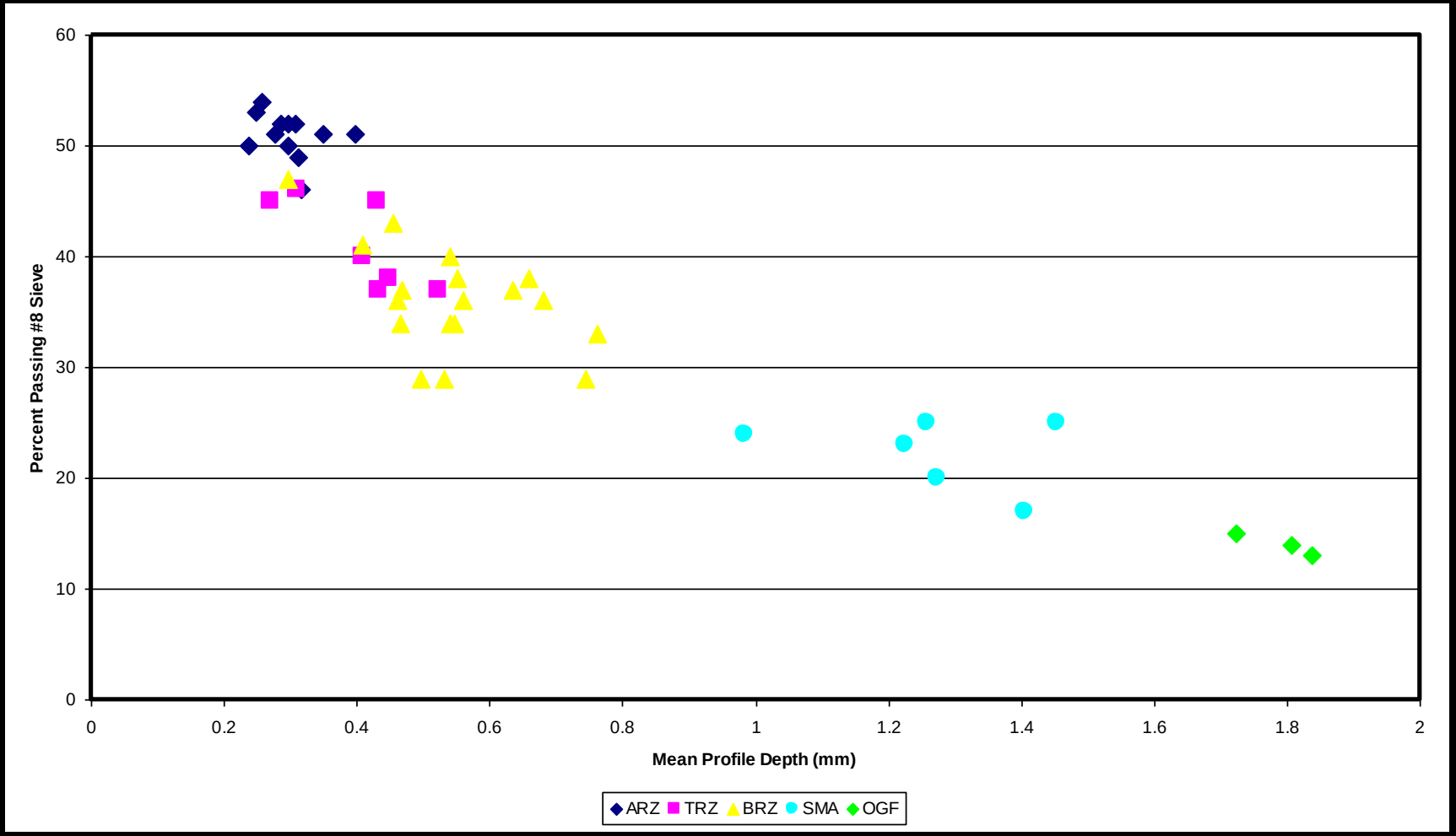
NCAT Pavement Test Track

TEXTURE DISTRIBUTION



NCAT Pavement Test Track

SURFACE TEXTURE

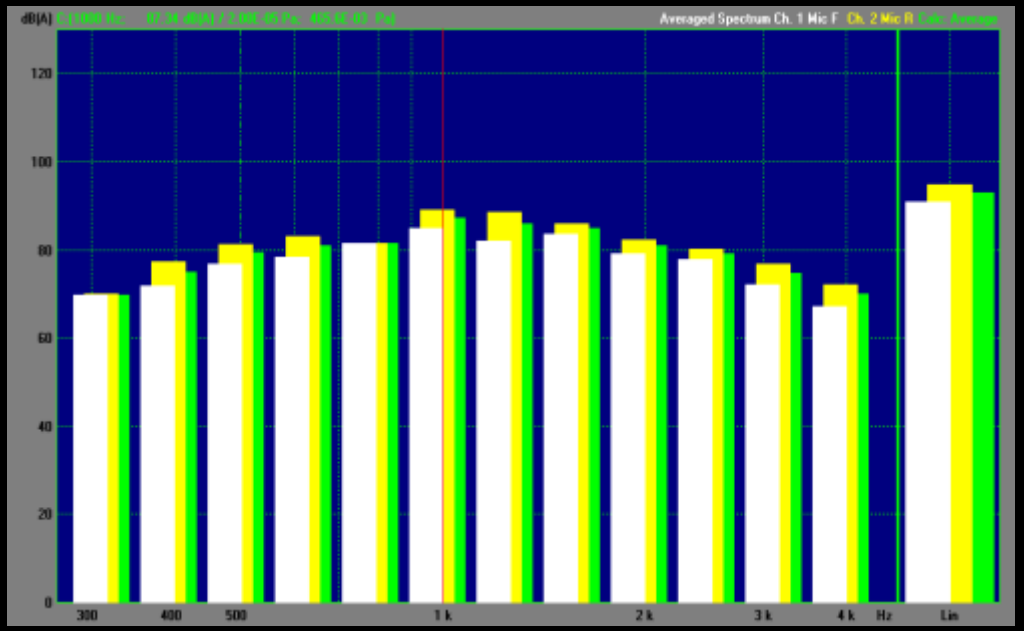


NCAT Pavement Test Track

- Coarse Superpave Mix
- Stone Matrix Asphalt Mix
- Open Graded Friction Course

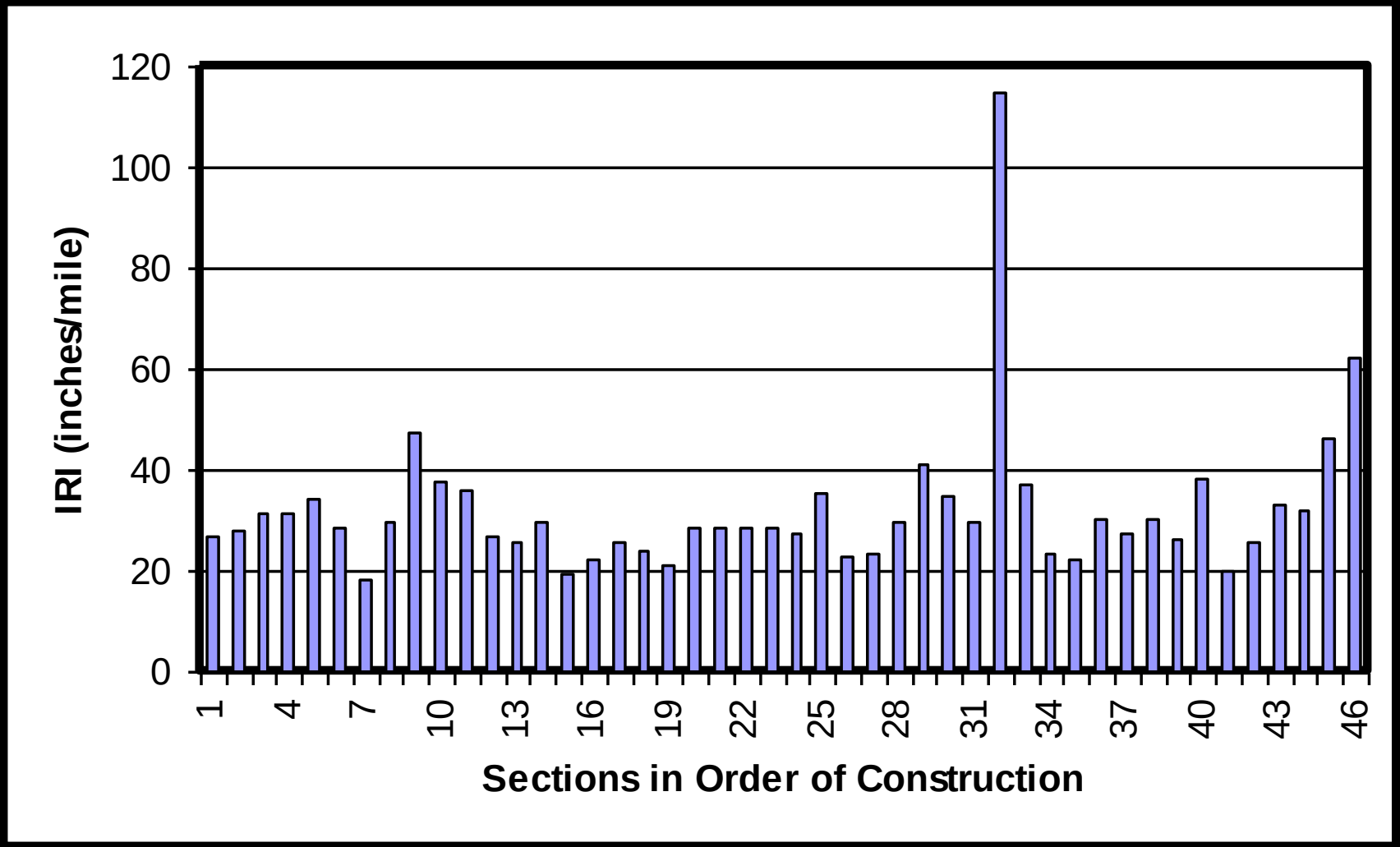
NCAT Pavement Test Track

TIRE NOISE



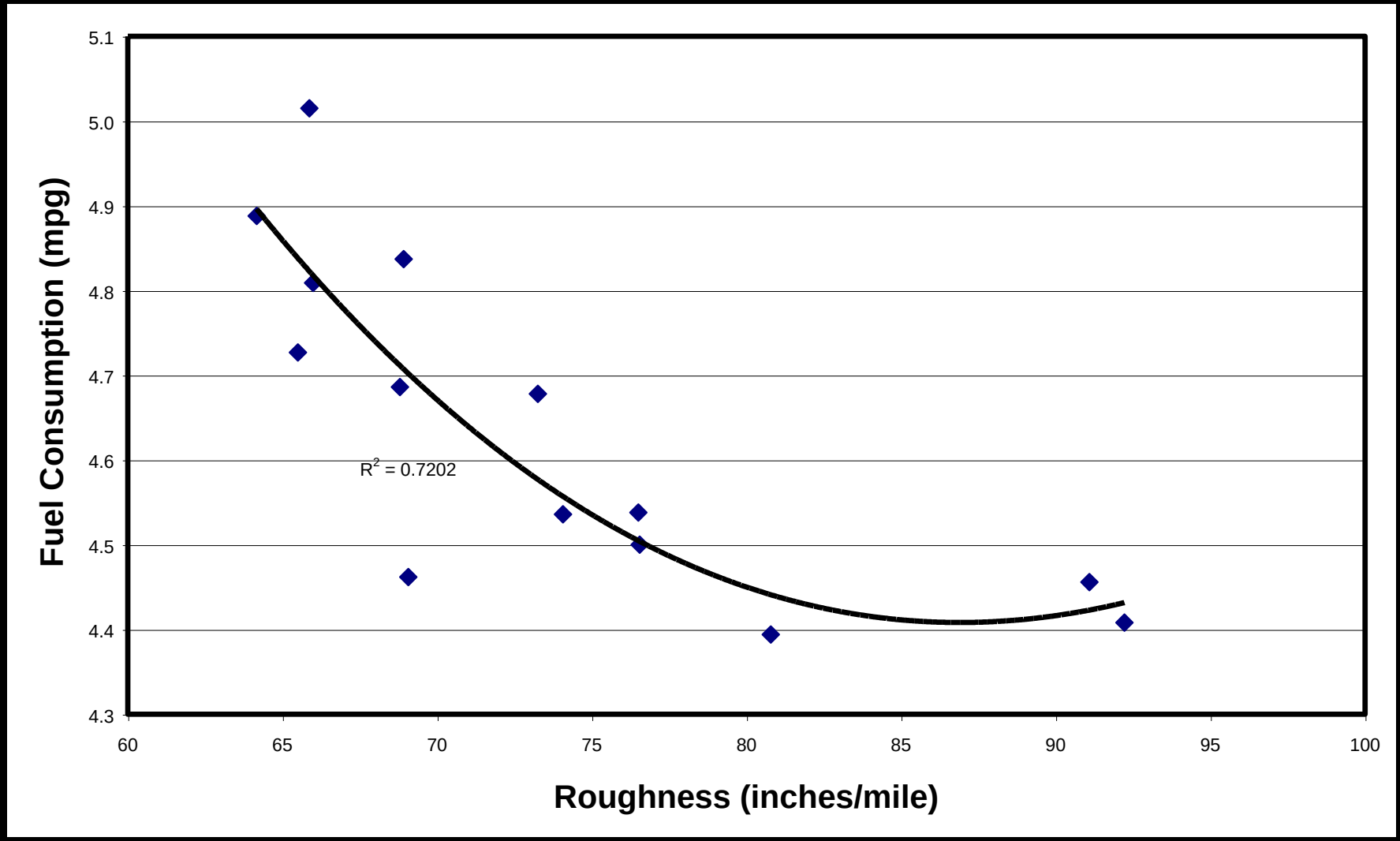
NCAT Pavement Test Track

ROUGHNESS DISTRIBUTION



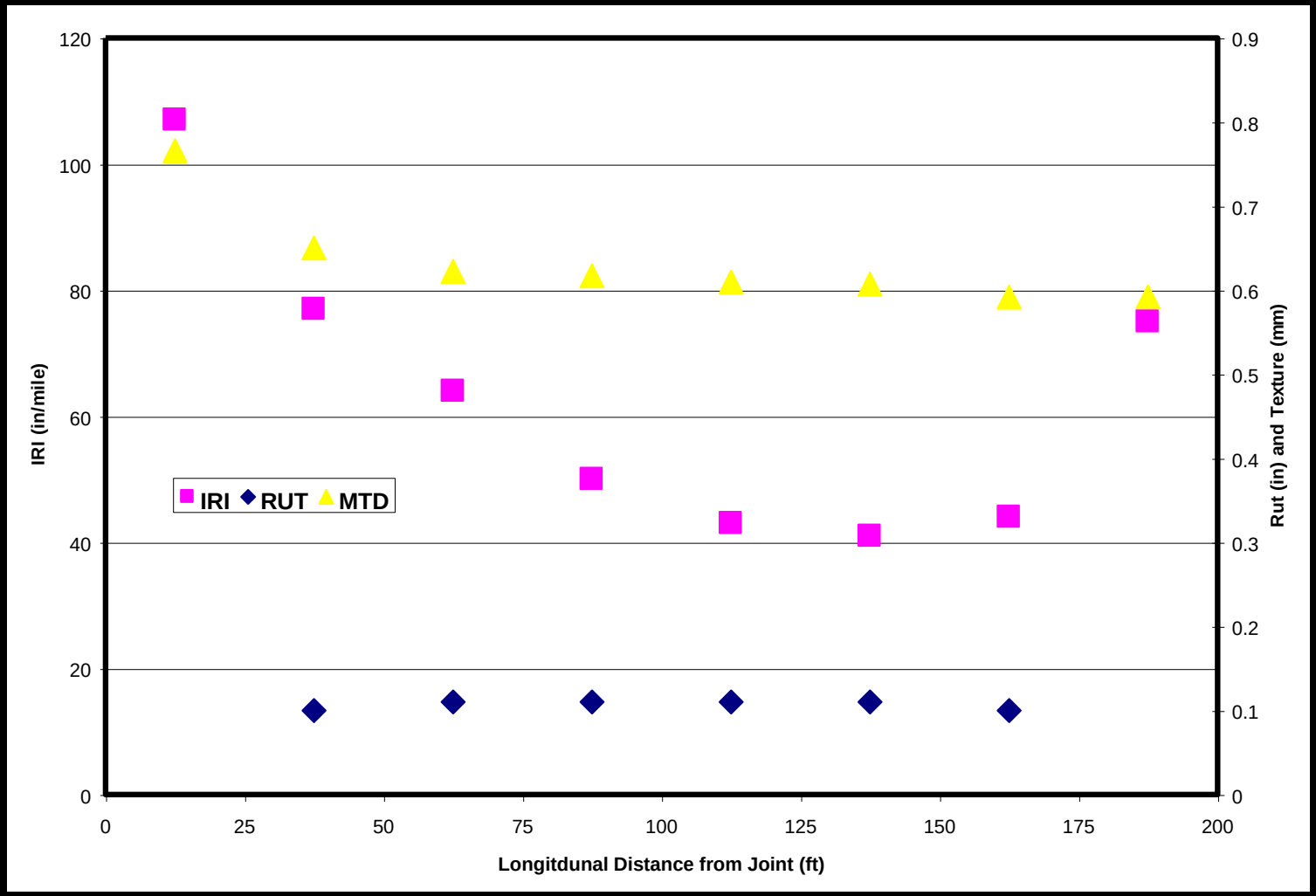
NCAT Pavement Test Track

EFFECT OF ROUGHNESS ON FUEL ECONOMY



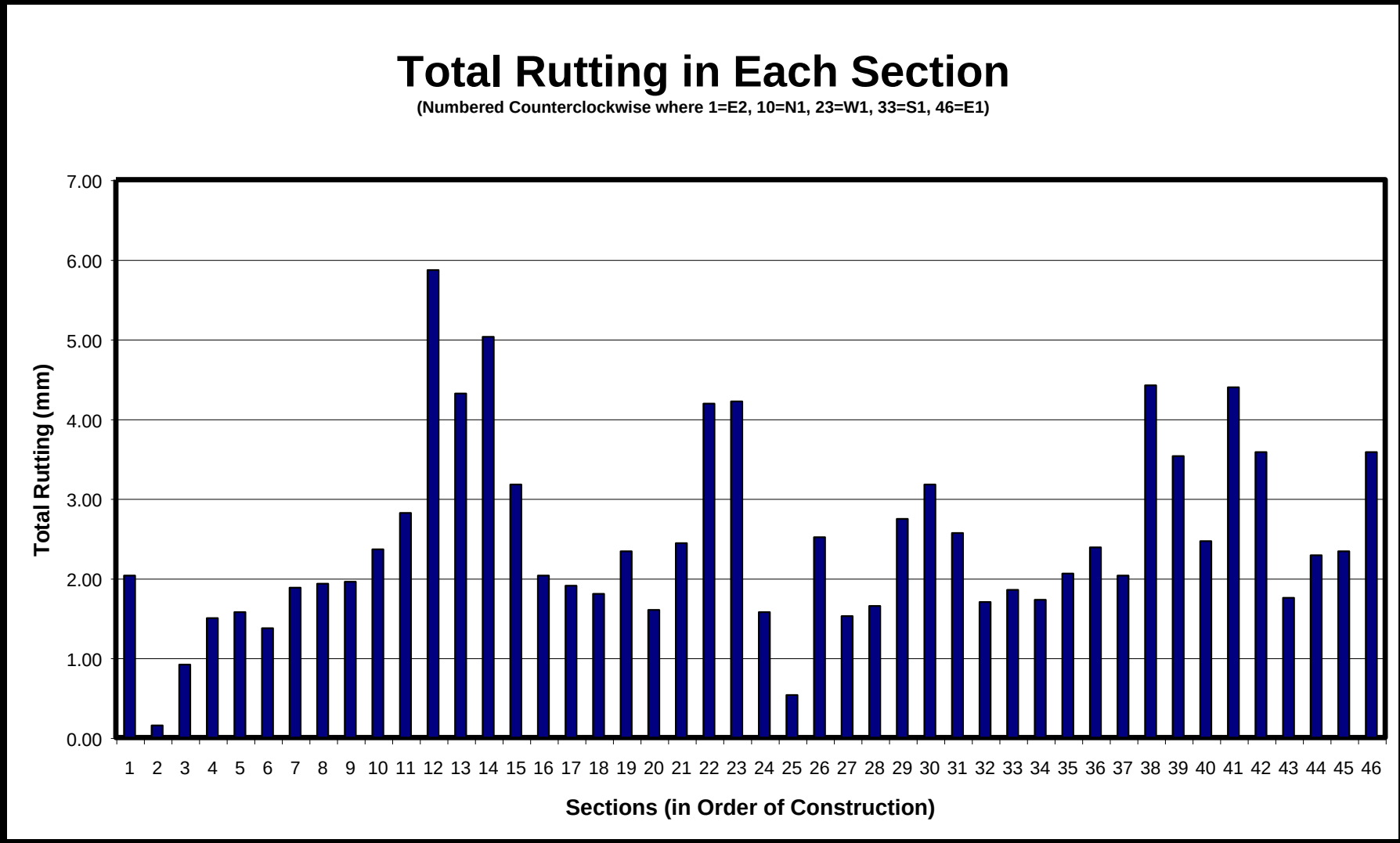
NCAT Pavement Test Track

ARAN GENERATED DATA



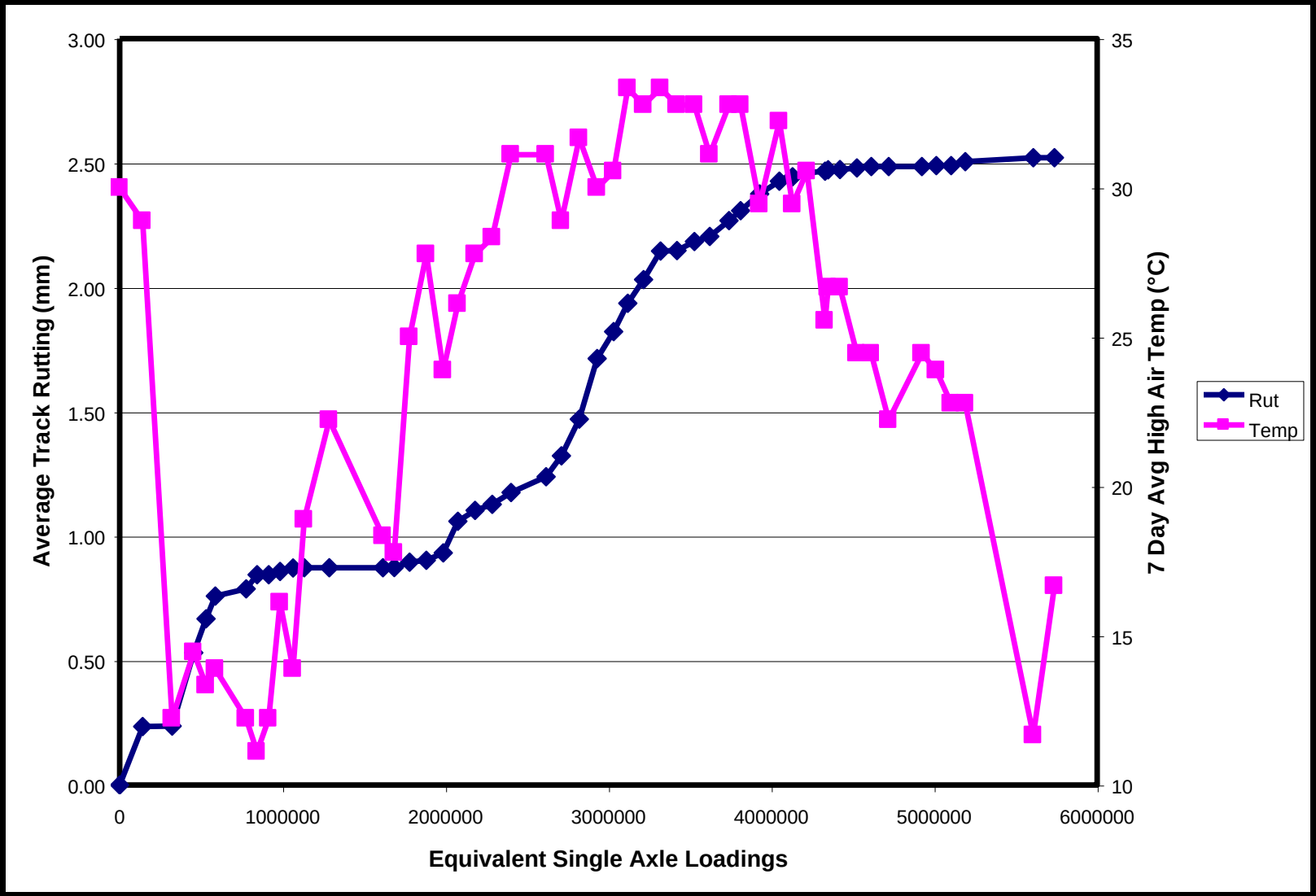
NCAT Pavement Test Track

RUTTING DISTRIBUTION



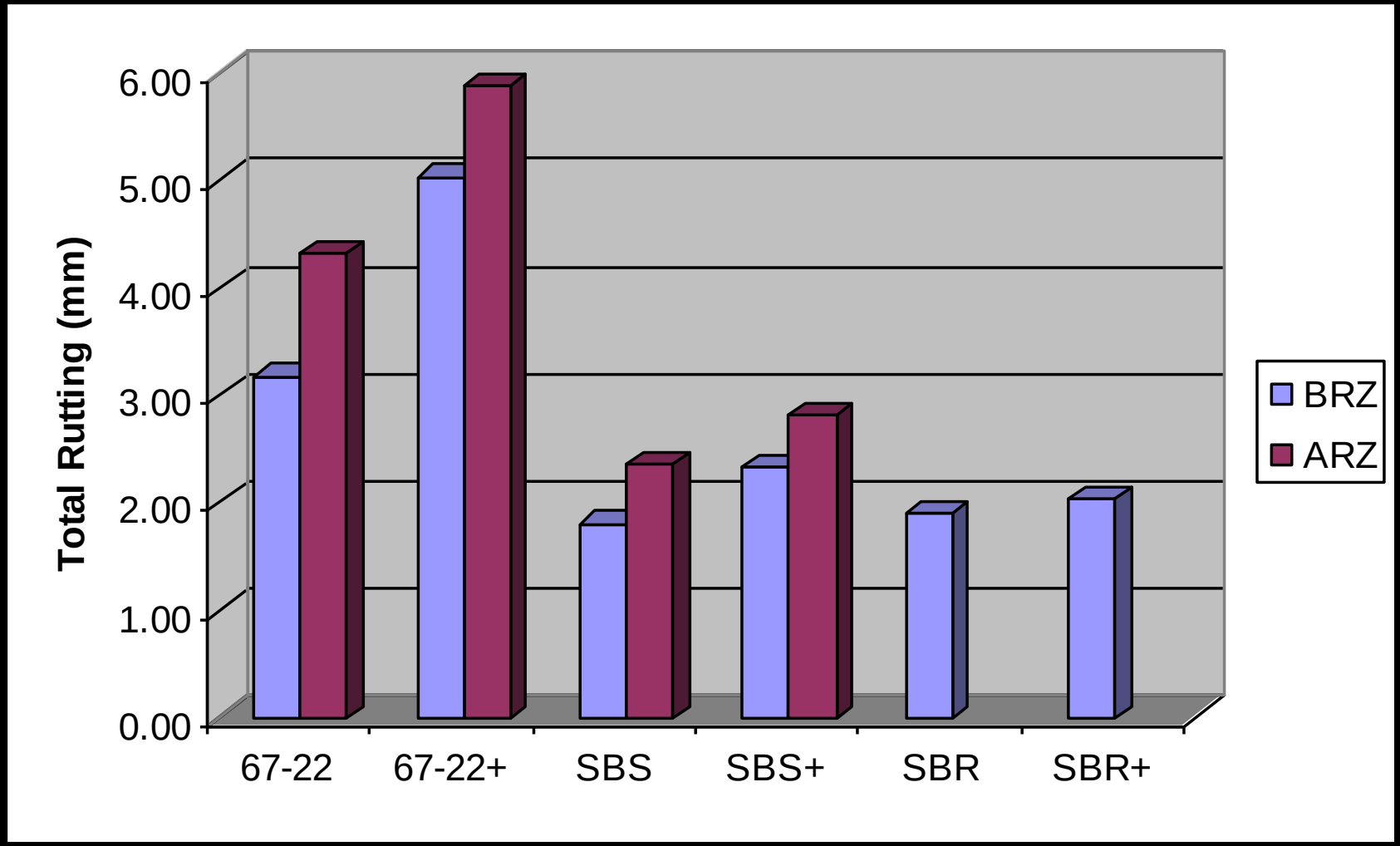
NCAT Pavement Test Track

AVG RUTTING OVER TIME



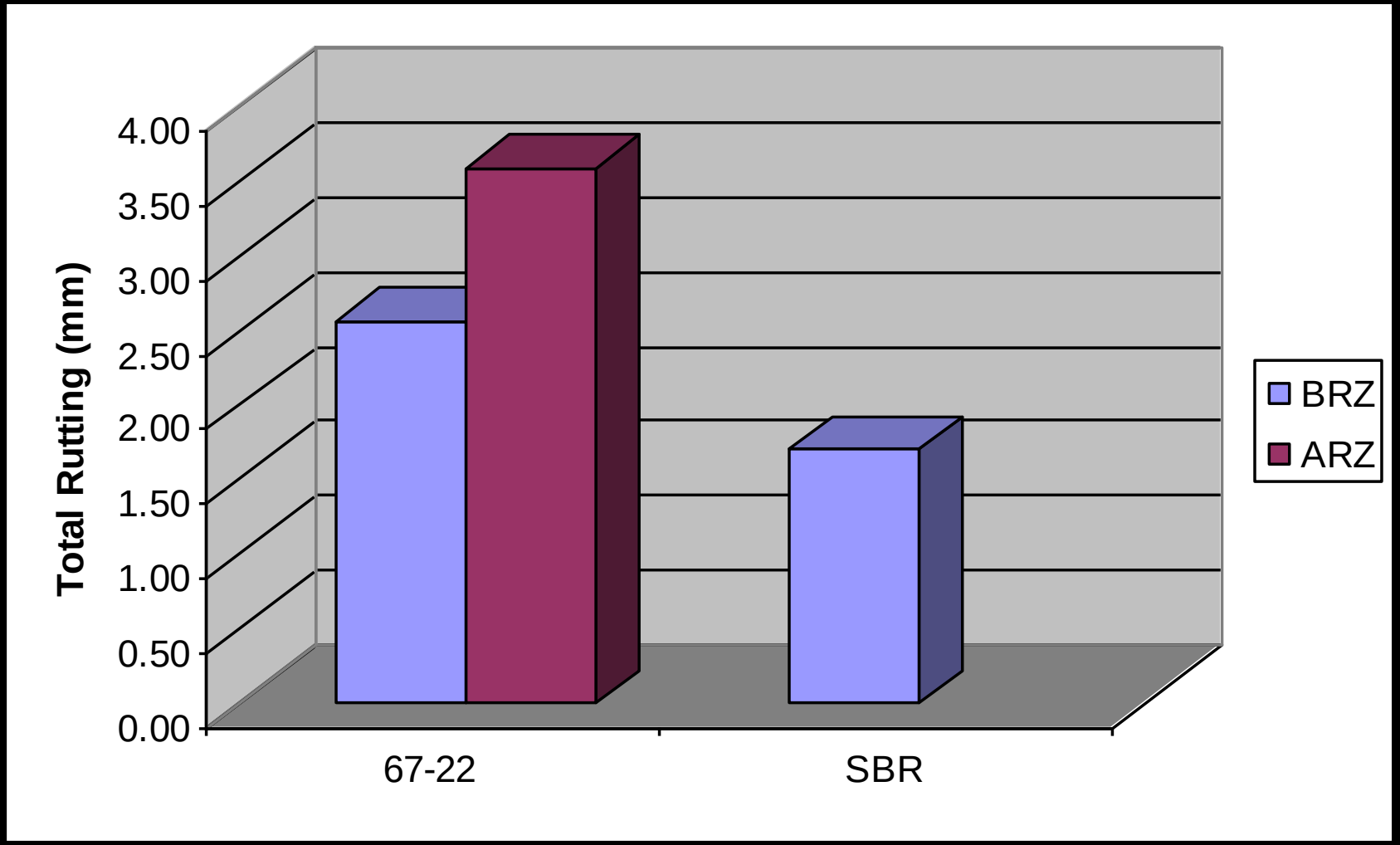
NCAT Pavement Test Track

NORTH TANGENT SLAG/LMS



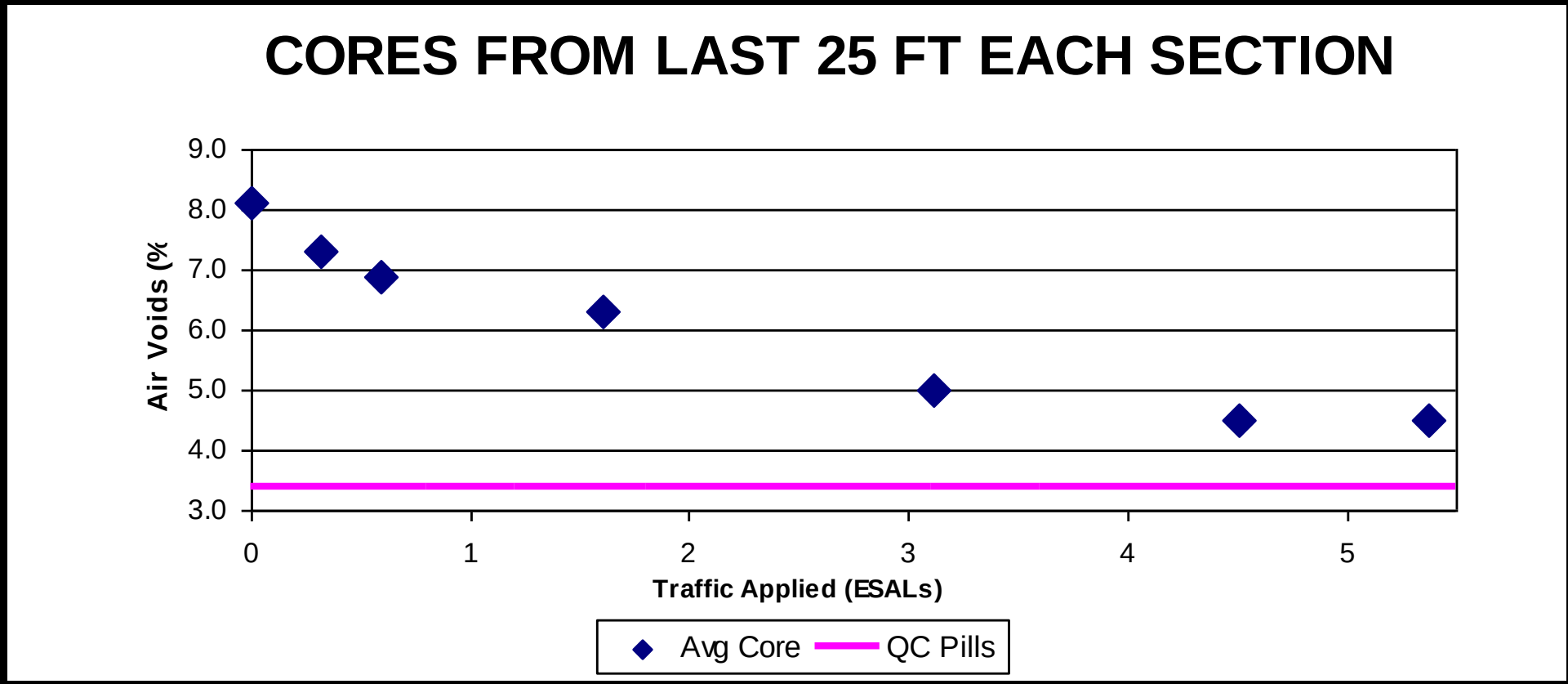
NCAT Pavement Test Track

CURVE GRAVEL STUDY



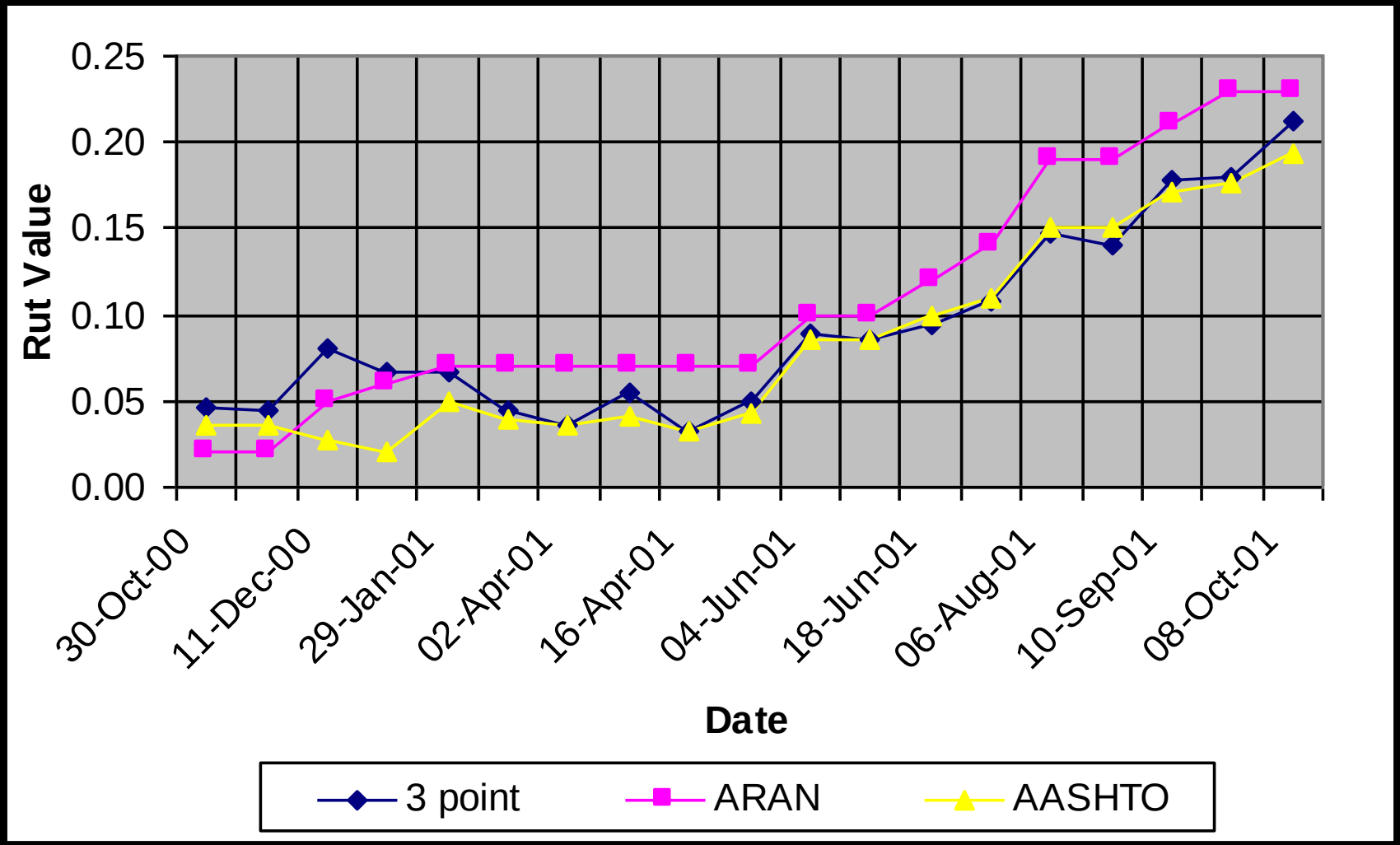
NCAT Pavement Test Track

MAT DENSIFICATION



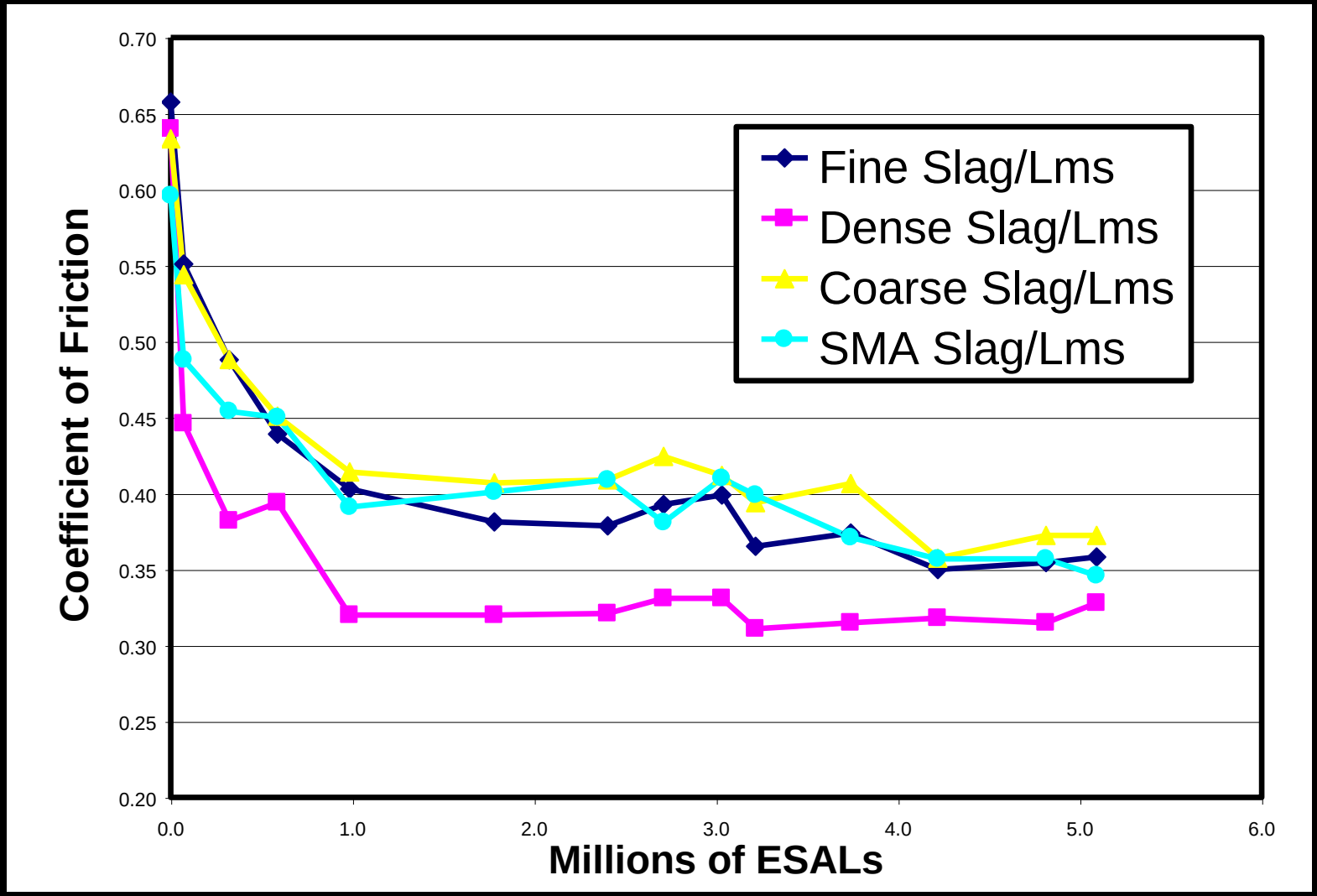
NCAT Pavement Test Track

AASHTO RUTDEPTH IMPLEMENTATION



NCAT Pavement Test Track

SURFACE FRICTION vs MIX TYPE



NCAT Pavement Test Track

SUPPLEMENTAL RESEARCH

NCAT Pavement Test Track

PRELIMINARY FIELD RESULTS

- Temperatures in Summer 2001 were Very Mild, but…
- "Coarse" Superpave Mixes have Rutted About 20% Less than "Fine" Superpave Mixes
- Modified Binders have Rutted About 40% Less than Unmodified Binders
- Average Field Voids (Originally 6.4%) Will Equal Average Lab Voids (3.4% @ N_{des}) in the Second Half of the Service Life of Experimental Mixes

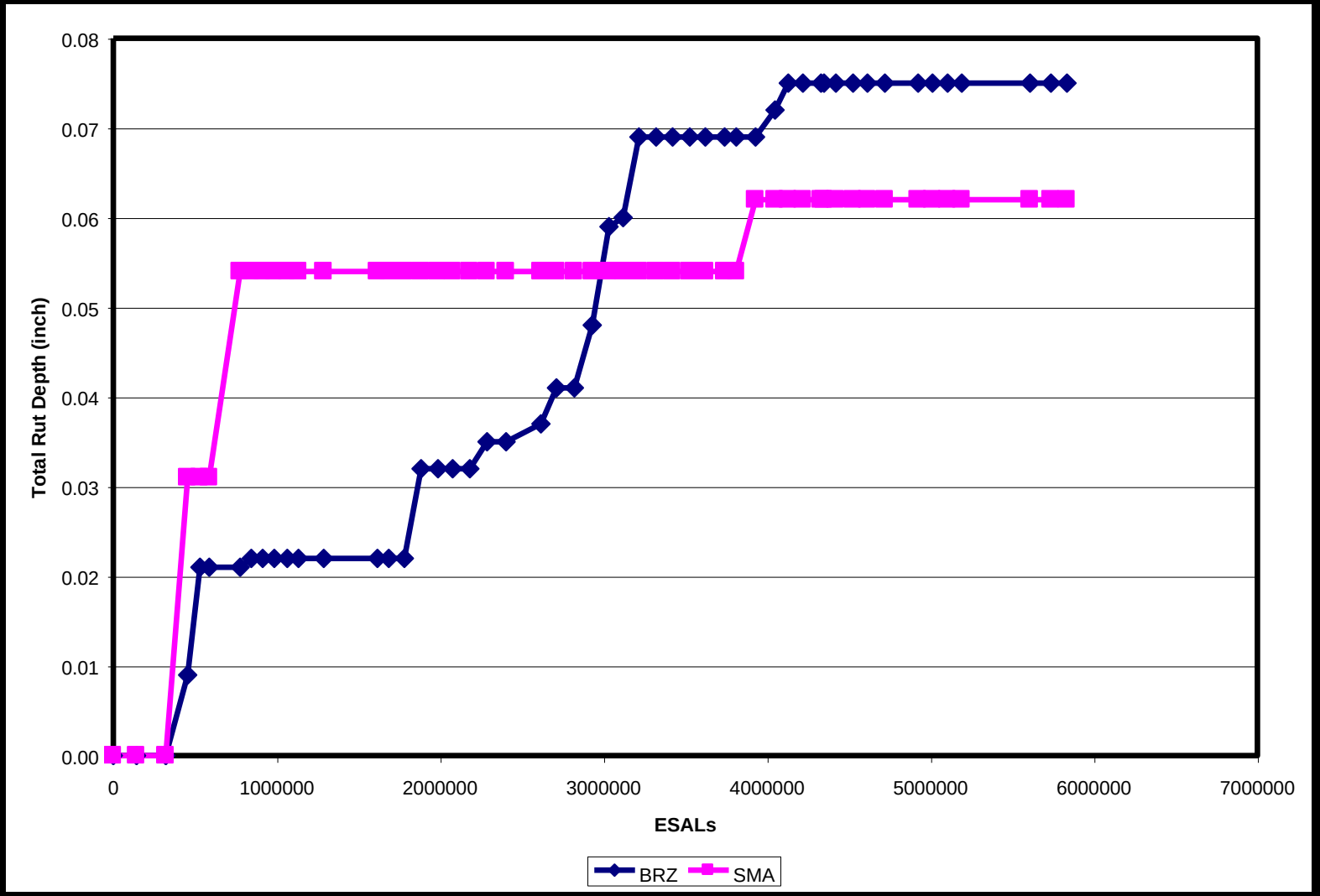
LAB PERFORMANCE

- Utilizes Specimens Made During Construction
- Target QC Air Voids Without Cutting or Coring
- What Test Can Predict Rutting Using QC-Type Pills ?

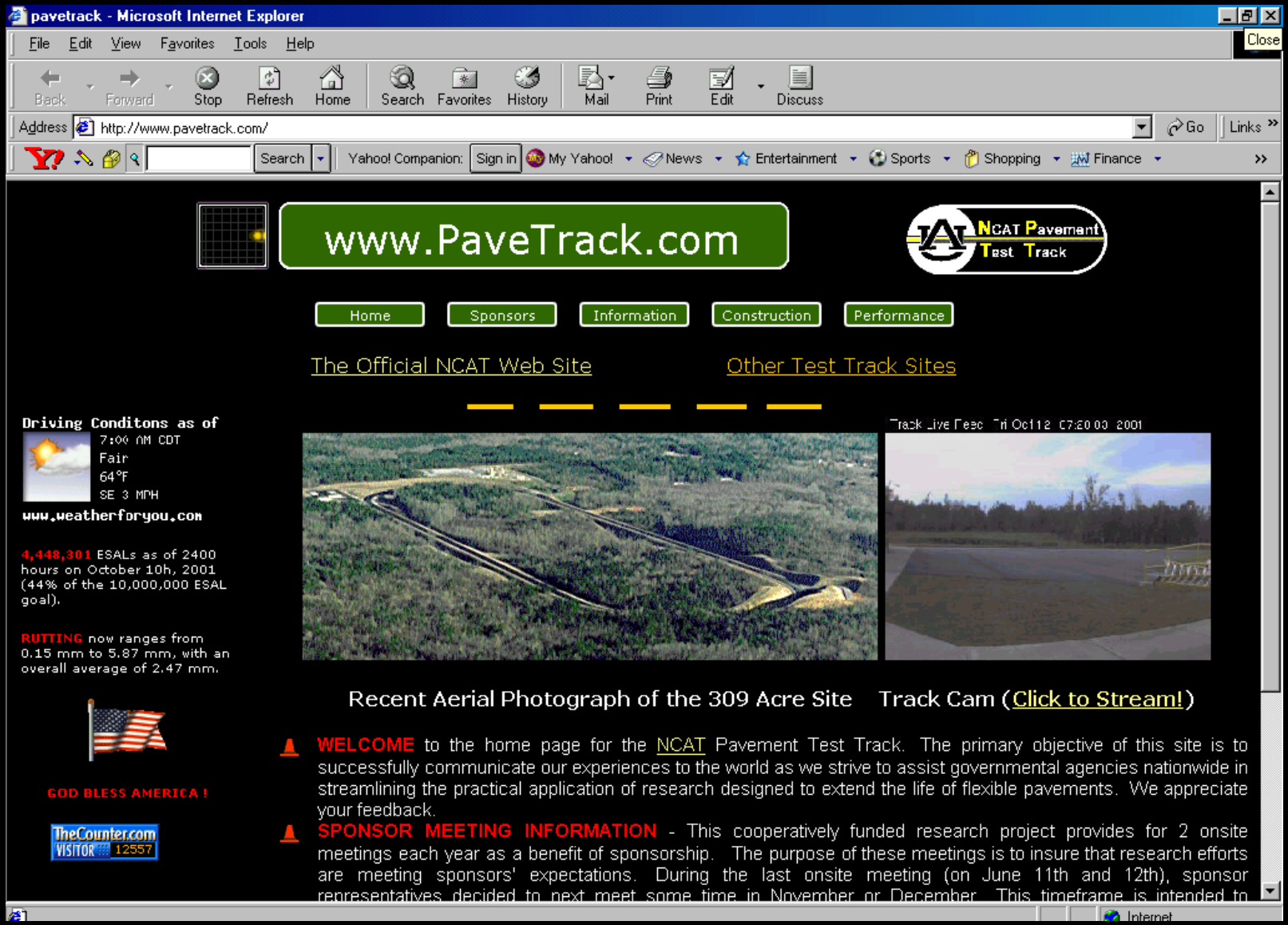
LAB vs *PRELIMINARY* FIELD

TEST METHOD	Super Slg/Lms	SMA Slg/Lms
Surface Friction	0.38	0.34
Field Roughness	23 inches/mile	24 inches/mile
Field Rutting	1.91 mm	1.57 mm
APA	1.51 mm	2.43 mm
Hamburg	2.50 mm	4.85 mm
Rotary	1.43 mm	1.68 mm
SGC Shear	0.71 GSR	0.57 GSR
COE Shear	0.97 GSI	1.03 GSI

SUPERPAVE vs SMA



NCAT Pavement Test Track



NCAT Pavement Test Track

WEB PRESENTATION

CONSTRUCTION

Section N3

Laboratory Diary

General Description of Mix and Materials

Design Method:	Superpave
Compactive Effort:	100 gyrations
Binder Performance Grade:	67-22
Modifier Type:	NA
Aggregate Type:	Lms/Slag
Gradation Type:	ARZ

Avg. Lab Properties of Plant Produced Mix

Sieve Size:	% Passing:
1"	100
3/4"	100
1/2"	98
3/8"	91
No. 4	68
No. 8	51
No. 16	33
No. 30	22
No. 50	15
No. 100	10
No. 200	6.0

Asphalt Binder Content:	7.6%
Compacted PW Bulk Gravity:	2.284
Theoretical Maximum Gravity:	2.389
Computed Air Voids:	3.2%

Construction Diary

Relevant Conditions for Construction

Completion Date:	Wednesday, April 26, 2000
24 Hour High Temperature (F.):	85
24 Hour Low Temperature (F.):	55
24 Hour Rainfall (in):	0.00
Lift Type:	dual
Design Thickness of Test Mix (in):	4.0

Plant Configuration and Placement Details

Component:		% Setting:
Liquid Binder Setting:		7.6%
Sieve	78	32.0%
Sieve	8910	28.0%
Limestone	Manufactured Sand	40.0%

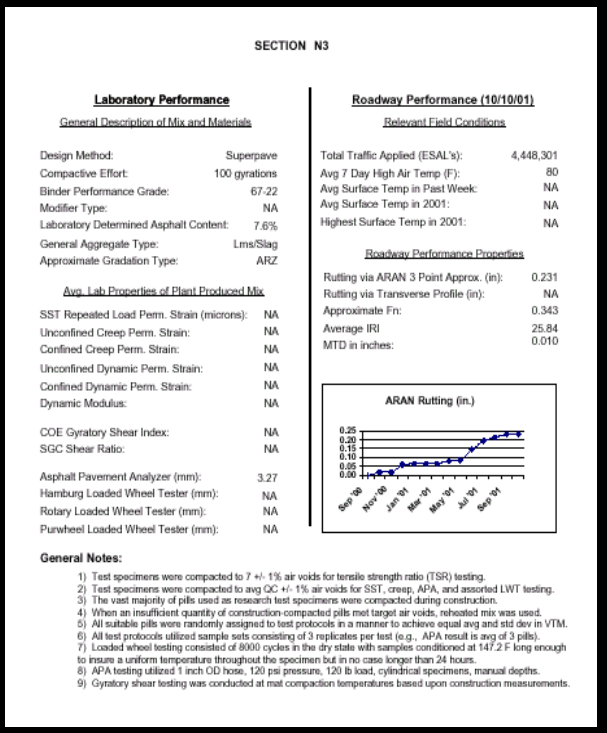
Approximate Length (ft):	200
Surveyed Thickness of Section (in):	4.2
Std Dev of Section Thickness (in):	0.1
Type of Tack Coat Utilized:	CQS-1h
Target Tack Application Rate:	0.03 gal / sy
Avg Mat Temperature Behind Paver (F.):	288
Average Section Compaction:	94.1%

General Notes:

1) Mixes are listed chronologically in order of completion date (i.e., construction began with E2 and ended with E1).
2) Sections are referenced by quadrant and sequence number, where "E2" refers to section 2 of the east quadrant.
3) "dual" lift type indicates that the lower and upper lifts were constructed with this same experimental mix.
4) The total thickness of all experimental sections is 4 inches by design, with the exception of S9, S10, S11, S12.
5) ARZ, THZ, and BRZ refer to gradations intended to pass above, through, and below the restricted zone.
6) NMA and OGFC refer to dense graded asphalt and open graded friction course, respectively.

INFORMATION

PERFORMANCE



SECTION N3

Laboratory Performance

General Description of Mix and Materials

Design Method:	Superpave
Compactive Effort:	100 gyrations
Binder Performance Grade:	67-22
Modifier Type:	NA
Laboratory Determined Asphalt Content:	7.6%
General Aggregate Type:	Lms/Slag
Approximate Gradation Type:	ARZ

Avg. Lab Properties of Plant Produced Mix

SST Repeated Load Perm. Strain (microns):	NA
Unconfined Creep Perm. Strain:	NA
Confined Creep Perm. Strain:	NA
Unconfined Dynamic Perm. Strain:	NA
Confined Dynamic Perm. Strain:	NA
Dynamic Modulus:	NA
COE Gyratory Shear Index:	NA
SGC Shear Ratio:	NA
Asphalt Pavement Analyzer (mm):	3.27
Hamburg Loaded Wheel Tester (mm):	NA
Rotary Loaded Wheel Tester (mm):	NA
Purwheel Loaded Wheel Tester (mm):	NA

Roadway Performance (10/10/01)

Relevant Field Conditions

Total Traffic Applied (ESAL's):	4,448,301
Avg 7 Day High Air Temp (F):	80
Avg Surface Temp in Past Week:	NA
Avg Surface Temp in 2001:	NA
Highest Surface Temp in 2001:	NA

Roadway Performance Properties

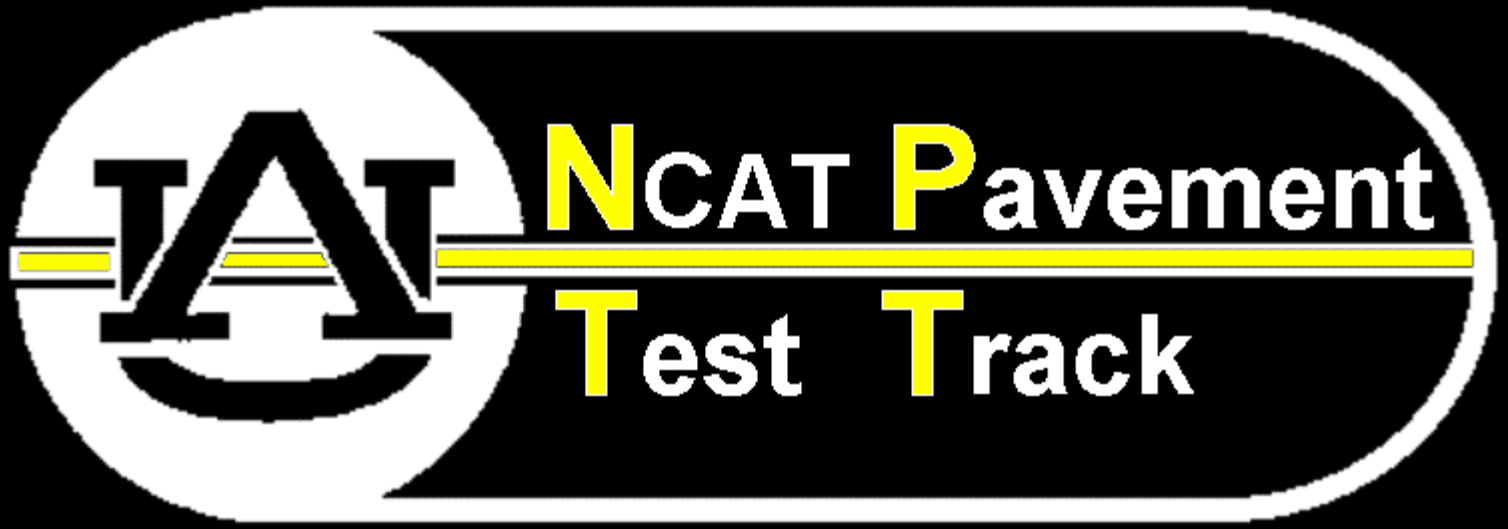
Rutting via ARAN 3 Point Approx. (in):	0.231
Rutting via Transverse Profile (in):	NA
Approximate Fn:	0.343
Average IRI	25.84
MTD in inches:	0.010

ARAN Rutting (in.)

General Notes:

1) Test specimens were compacted to 7 +/- 1% air voids for tensile strength ratio (TSR) testing.
2) Test specimens were compacted to avg QC +/- 1% air voids for SST, creep, APA, and assorted LWT testing.
3) The vast majority of pills used as research test specimens were compacted during construction.
4) When an insufficient quantity of construction-compacted pills met target air voids, reheated mix was used.
5) All suitable pills were randomly assigned to test protocols in a manner to achieve equal avg and std dev in VTM.
6) All test protocols utilized sample sets consisting of 3 replicates per test (e.g., APA result is avg of 3 pills).
7) Loaded wheel testing consisted of 8000 cycles in the dry state with samples conditioned at 147.2 F long enough to insure a uniform temperature throughout the specimen but in no case longer than 24 hours.
8) APA testing utilized 1 inch OD hose, 120 psi pressure, 120 lb load, cylindrical specimens, manual depths.
9) Gyratory shear testing was conducted at mat compaction temperatures based upon construction measurements.

NCAT Pavement Test Track



2003

- Traffic Only (Rutting & Top Down Cracking)
- Mill and Inlay (Another Rutting Comparison)
- Structural (2002 Design Guide Validation)