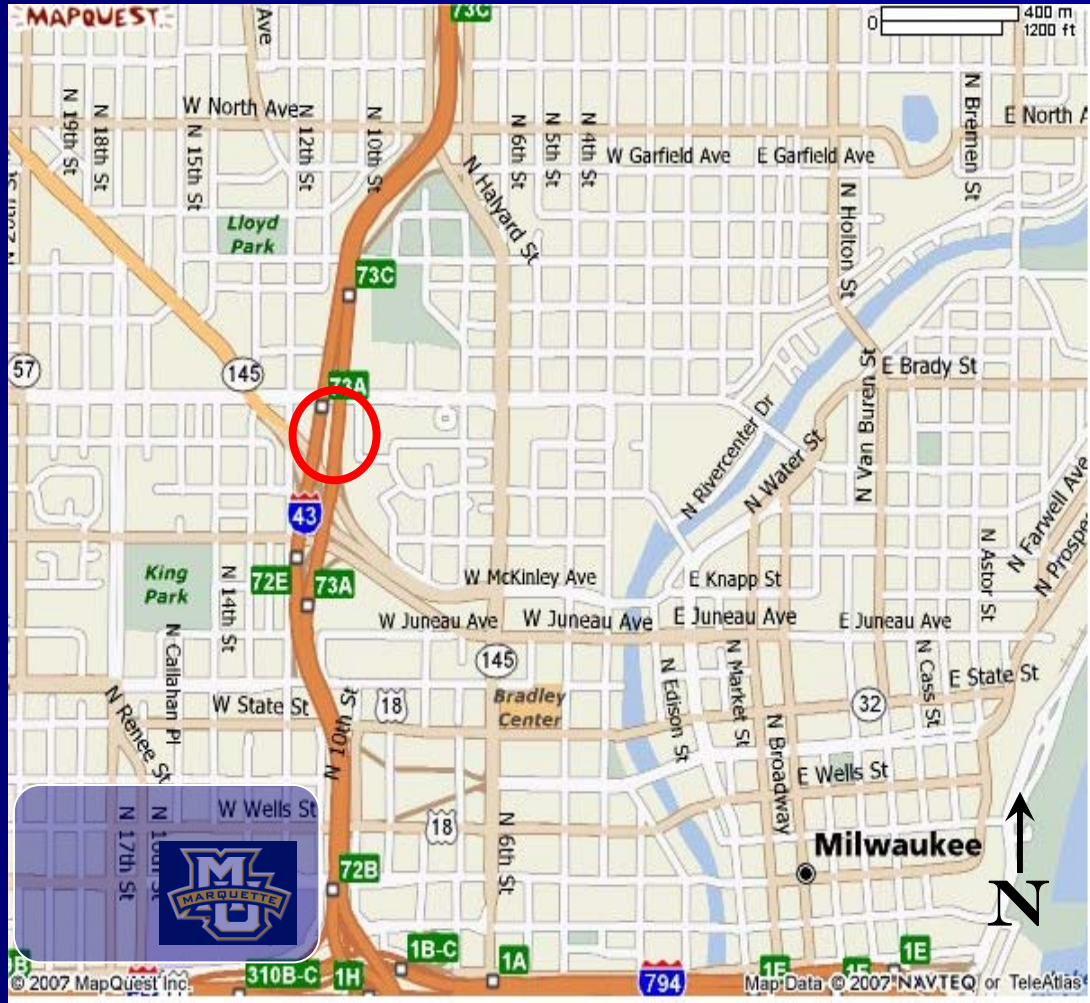


Extended Life Pavements in Wisconsin

Judie Ryan – WisDOT BTS

James Crovetti - Marquette University

Instrumentation Project I-43 NB



Marquette Interchange





North Leg Section Wells St to North Ave

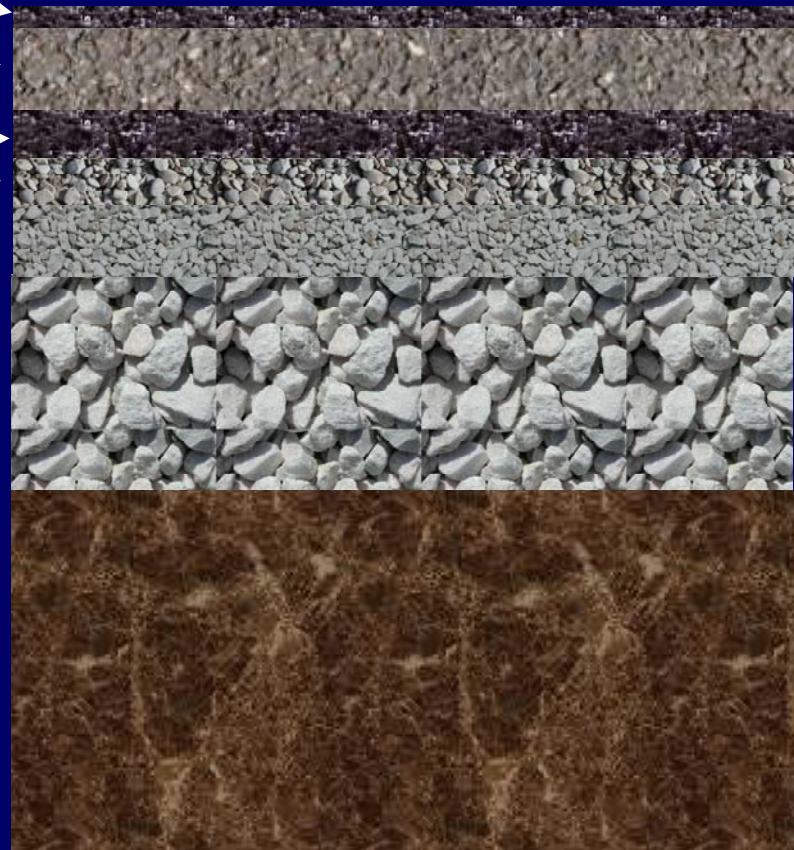


North Leg HMA Pavement Design Details

- 1999 ADT = 138,800
- 2025 ADT = 152,700
- 11% Heavy Trucks
- 37.1 Million ESALs (WisDOT)

North Leg Perpetual HMA Pavement Structure

- 2" SMA Wearing Surface (70-28)
- 7" E30 Middle Layers (64-22)
- 4" C2 Bottom Layer (64-22)
- 4" Open Graded Aggregate #2
- 6" Dense Graded Aggregate
- 18" Select Crushed Material
- Sandy-Silty-Clayey Soils



Project Goals

- Select/Procure/Install sensors into section of pavement
- Provide data to evaluate fatigue life of the pavement structure
- Compare experimental data against M-E outputs
- Calibrate local design inputs

Installed Sensor Types

- Asphalt Strain Sensors (25)
- Earth Pressure Cells (4)
- Moisture Probes (6)
- Soil Temperature Probes (6)
- HMA Temperature Gradient Probe (1)
- PK Piezo Wheel Wander Grid (3)
- Quartz Piezo WIM Strips (2)
- IR Surface Temperature Sensor (1)
- Wind Speed (1)
- Solar Radiation (2)
- Air Temperature (1)

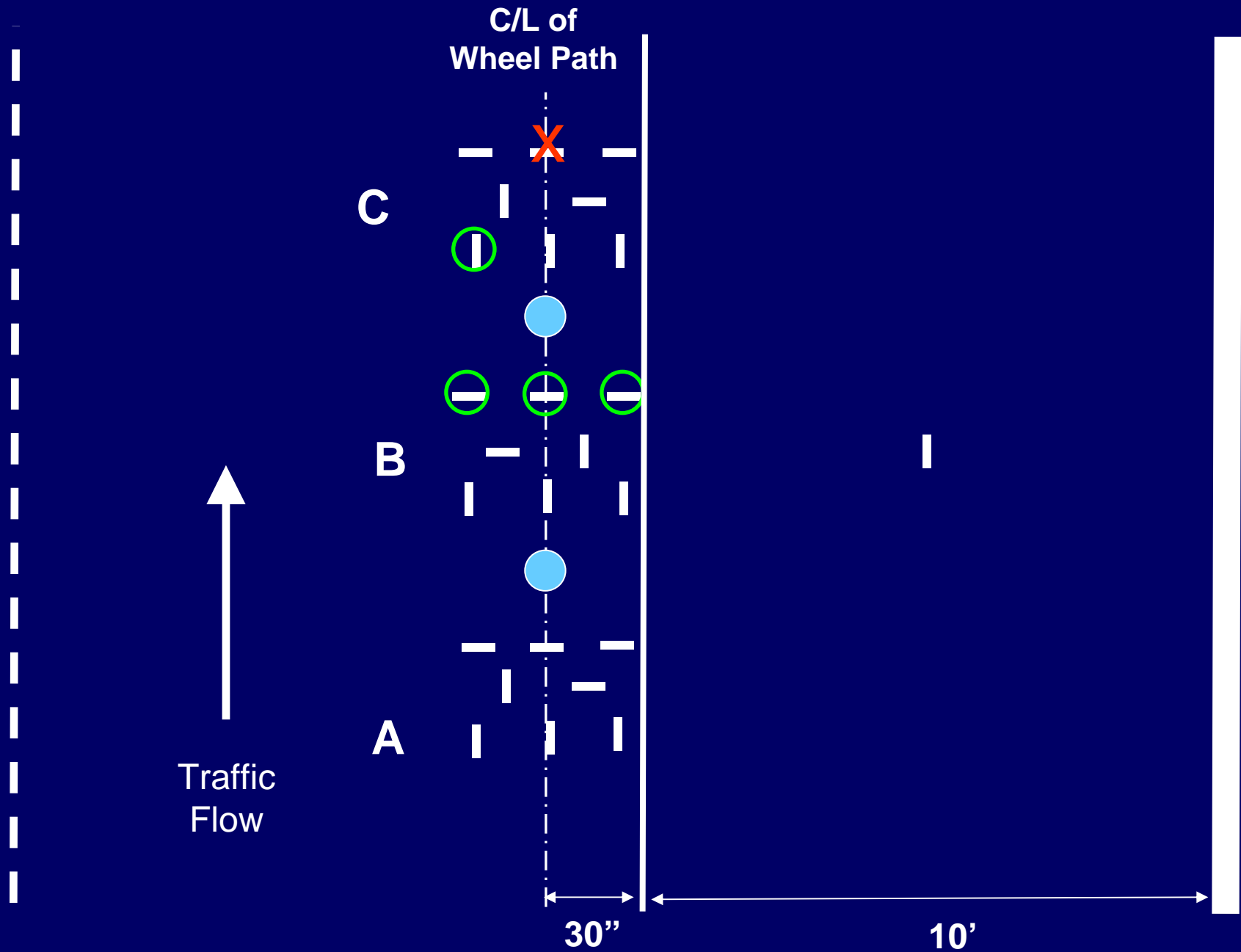
Instrumentation Location Looking South

Equipment
Cabinet

Strain/Pressure
Sensors

WIM/Wander







Maintaining System Integrity

- Replaced malfunctioning equipment:
 - Pavement temperature gradient probe
 - (2) Pyranometers
 - Infrared pavement surface temperature probe
- Added a back-up server to mirror the primary database

Data Processing

- Developed an algorithm for selecting peak values from strain and pressure signals
- Method for matching peak tensile strains/pressures with each associated wheel event is nearing completion

File

wheel_id	load_time_a0	load_time_a1	load_time_a2
1117256	0.082	0.077	0.072
1117257	0.235	0.136	0.023
1117258	0.235	0.136	0
1117259	0.111	0.016	0.016
1117260	0.111	0.067	0.023

wheel_id	area_a0	area_a1	area_a2
1117256	0.330961999999...	0.103679999999...	0.023436000000...
1117257	0.408877500000...	0.086855000000...	0.002893999999...
1117258	0.408877500000...	0.086855000000...	1.61005
1117259	0.150692000000...	0.005758000000...	0.002010000000...
1117260	0.150692000000...	0.025890999999...	0.002442500000...

Current Records

Record Start: label2 Cluster Size: 5
 Record End: label3 Cluster Spacing: 3

Vehicle Class: 9

Start Analysis Export Resultset Match Maker 0733

profile0733 1117256
 0

64.4 8/19/2007 5:20:55 PM 174

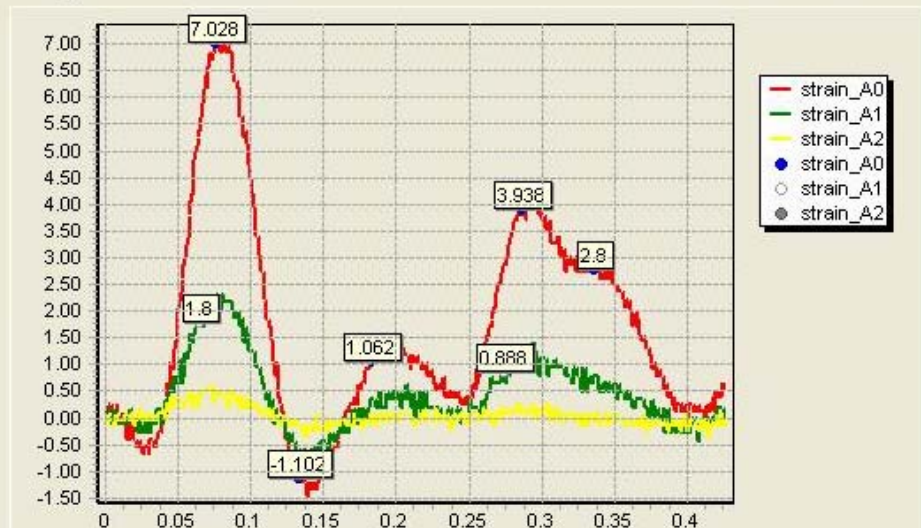
- wheel_id
- strain_A0
- strain_A1
- strain_A2
- strain_A3
- strain_A4
- strain_A5
- strain_A6
- strain_A7
- strain_B0
- strain_B1
- strain_B2
- strain_B3
- strain_B4
- strain_B5
- strain_B6
- strain_B7



Plot

Find Peaks

Find Pressure Peaks

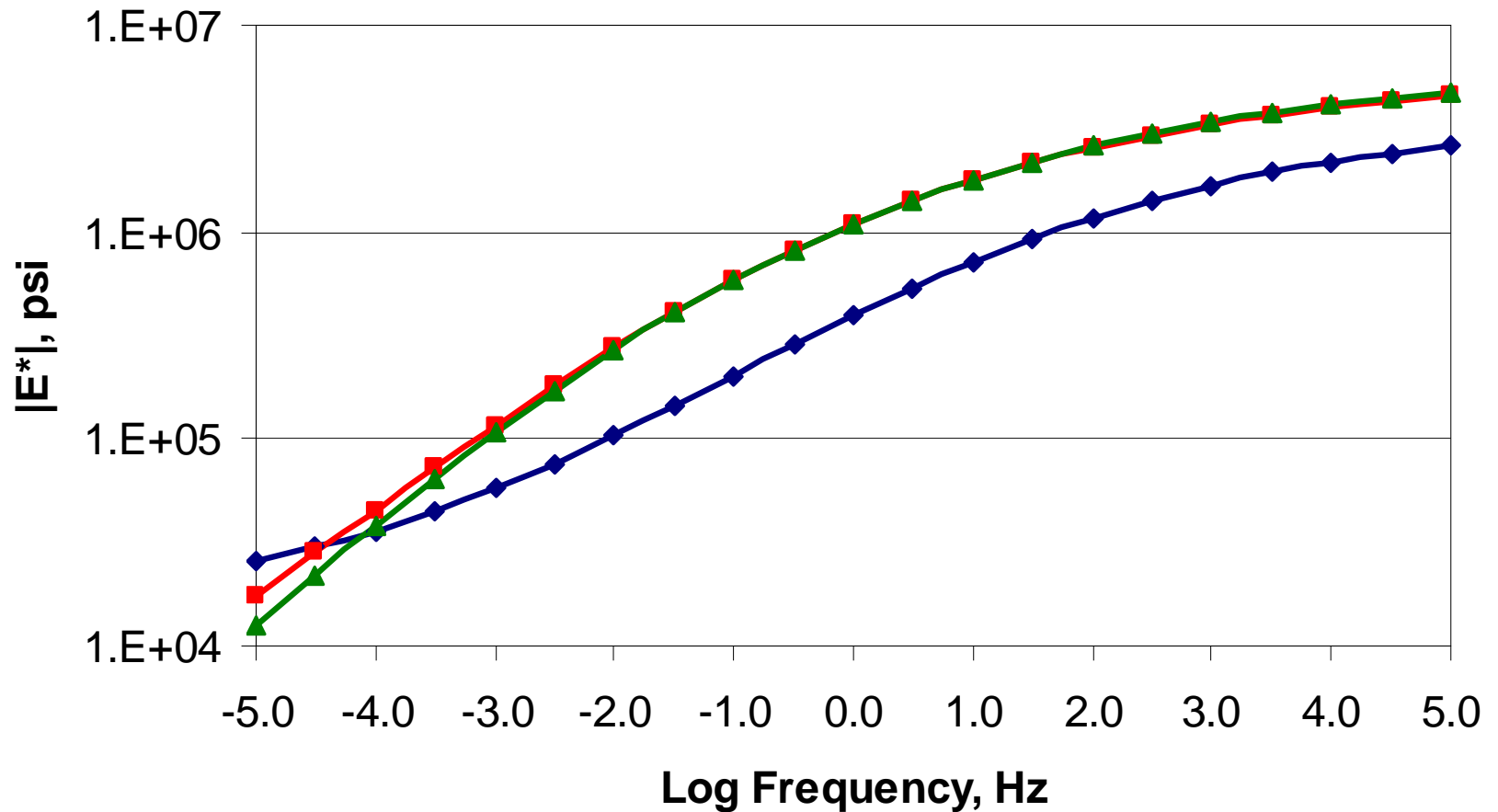


wheel_id	time_average	strain_a0	strain_a1	strain_a2	strain_a3	strain_a4	strain_a5
1117256	0.075663002016...	7.028499999999...	1.800000000000...		4.884999999999...	-2.421500000000...	17.078500000000...
1117257	0.281608668010...	3.938499999999...	0.887999999999...		2.060999999999...	-1.717500000000...	8.170500000000...
1117258	0.335413002016...	2.800499999999...			1.402999999999...	-1.307500000000...	8.170500000000...
1117259	0.112413575695...	1.876000000000...			1.395499999999...	-0.807999999999...	5.438499999999...

Pavement Life Projections

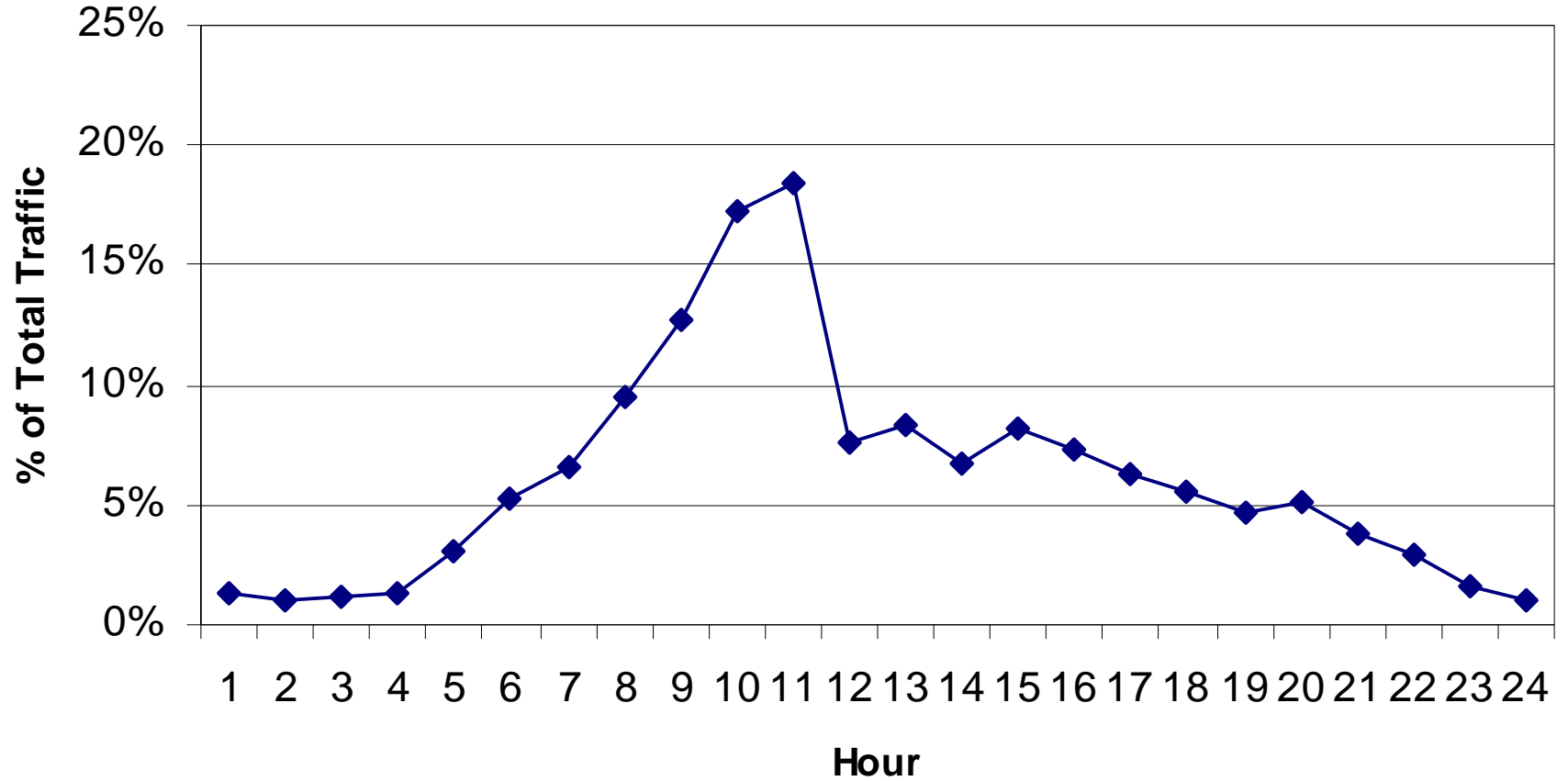
- Characterization of material properties to be completed soon (M_r , E^* , etc.)
- Environmental data used to develop seasonal variations in material properties
- Strain readings used for peak tracking and loading times
- Comparisons of predicted versus measured strains (ILLI-PAVE, EVERSTRESS, etc)
- MEPDG analysis and stand-alone predictions

HMA Master Curves



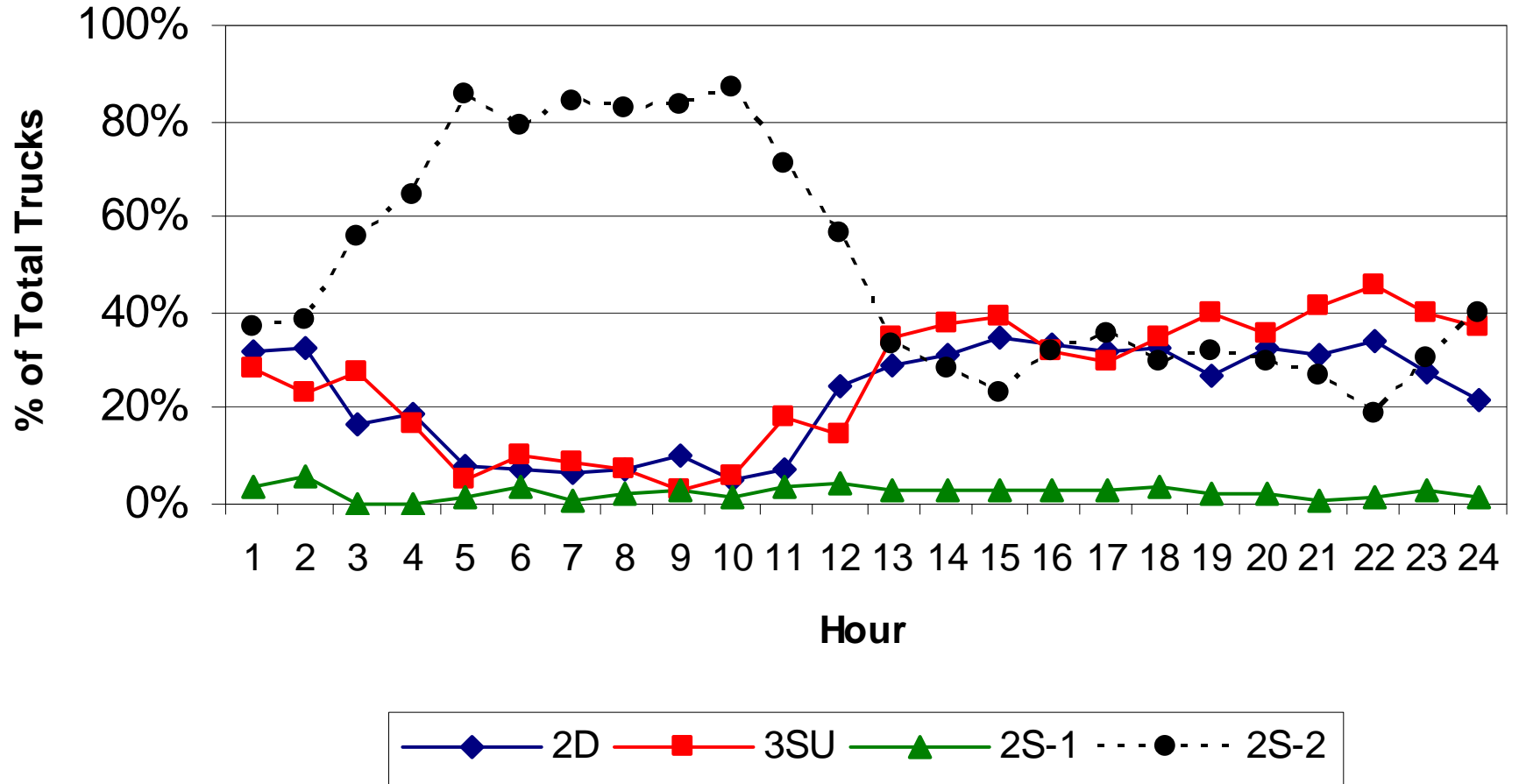
Average Hourly Truck Distribution

Nov 10-16, 2007

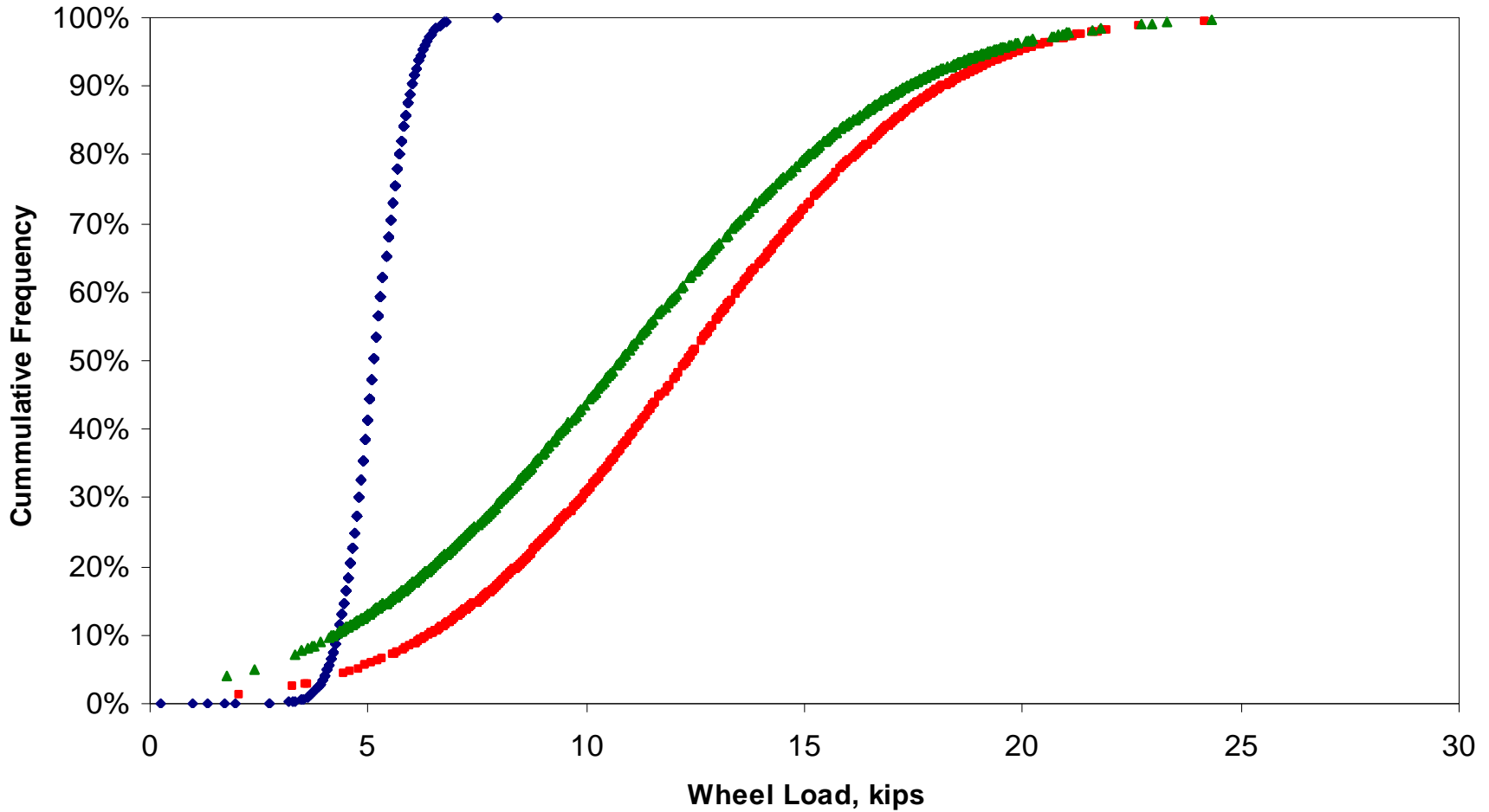


Average Hourly Truck Distribution

Nov 10-16, 2007



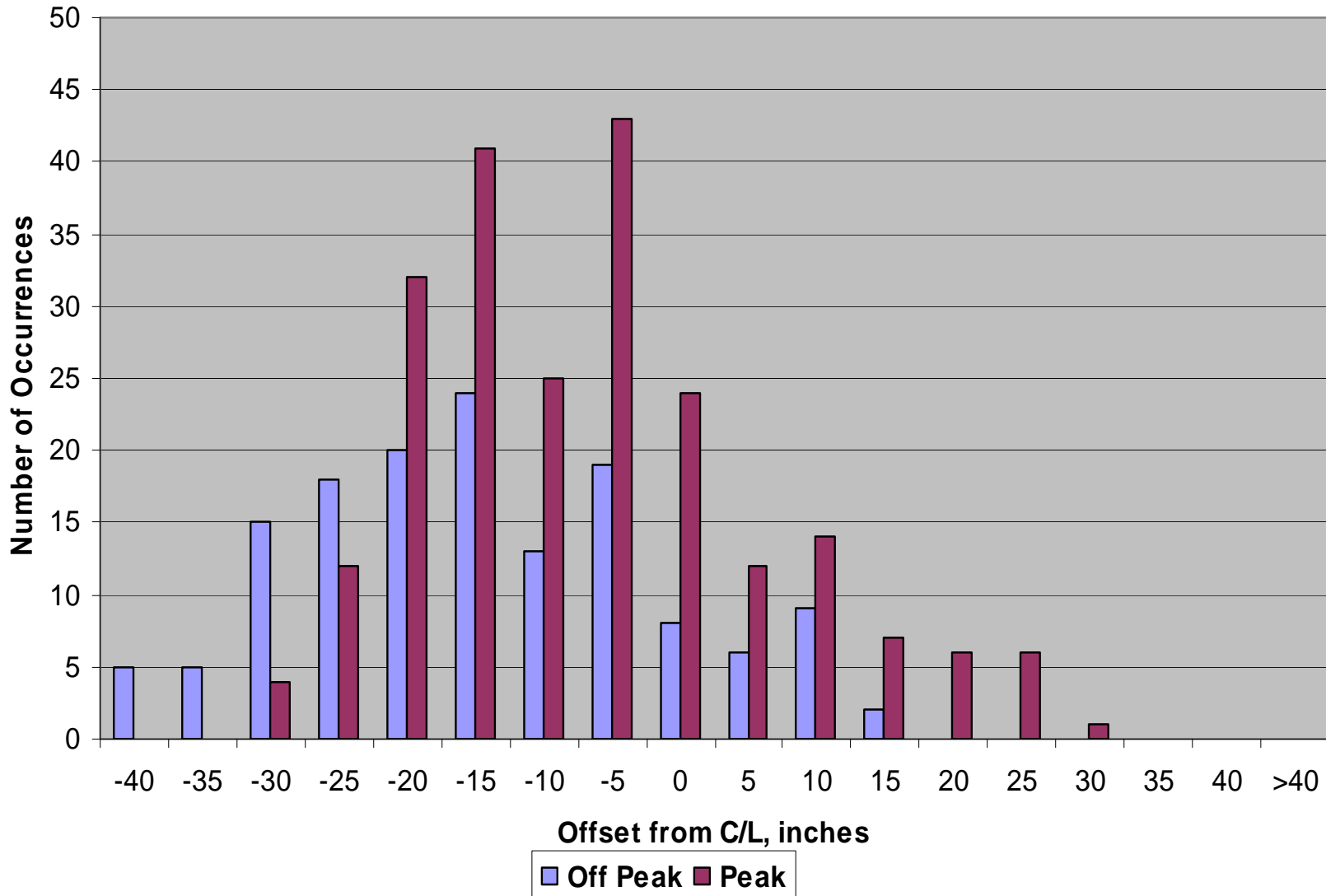
Cumulative Distribution of Wheel Loads From Class 9 Vehicles October 19-27, 2007



◆ Steering ■ First Tandems ▲ Second Tandems

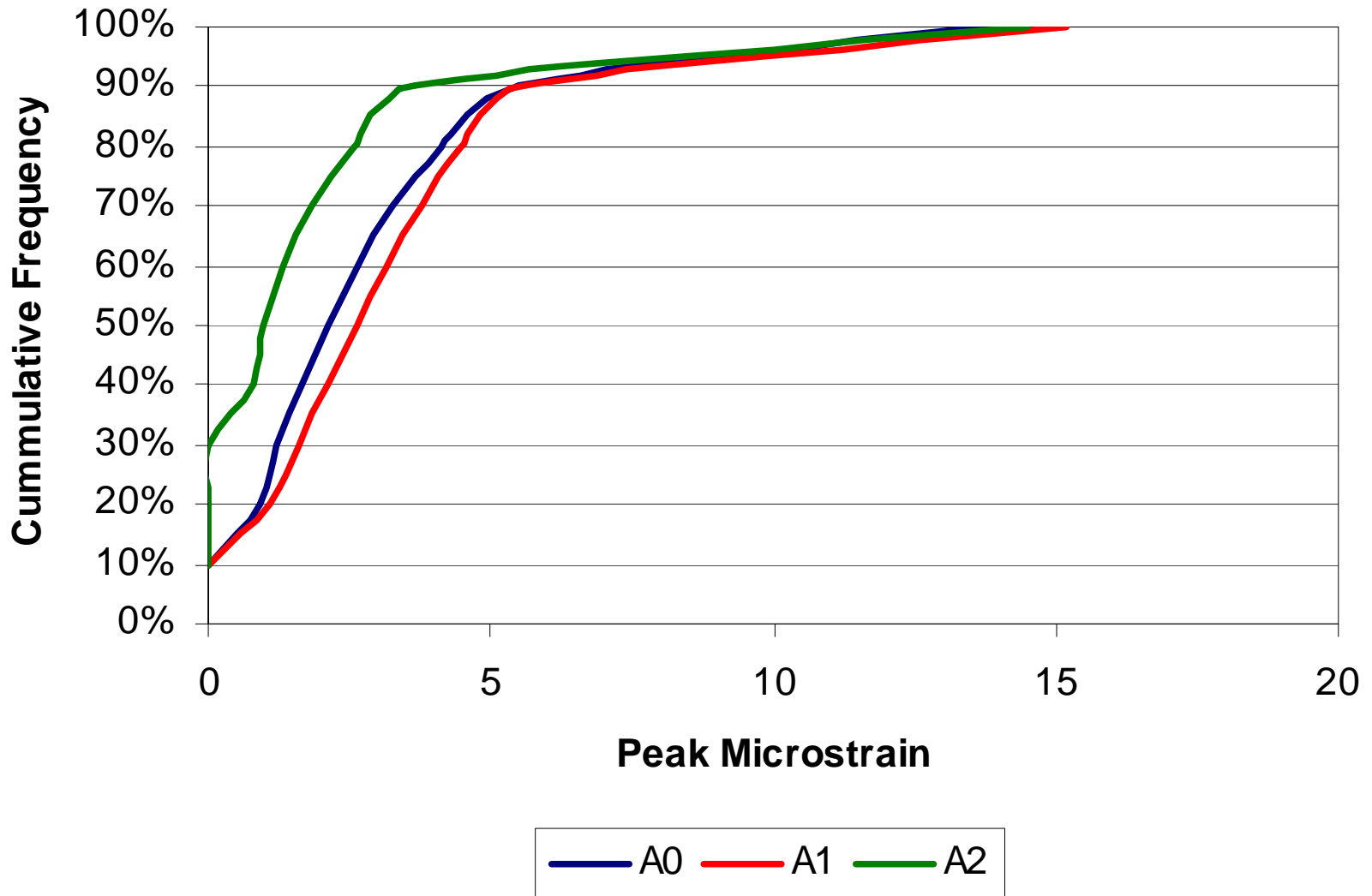
Peak and Off-Peak Wheel Wander

(+) Offset is right of C/L of Wheel-path



Peak Strain Readings

August 19-25, 2007



Data Packaging

- Project website in development
- Web portal created to display data
 - www.MChange-Strain.com
- Pre-packaged data will be available for download as a compressed file.
- Additional content can be accessed via a read-only account on MySQL server.

**Thanks
for your attention!**

www.MChange-Strain.com