Comparing Manual and Automated Distress Data

Scott George, P. E.
Pavement Management Engineer
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Research Project ST-1977

- "A Pavement Rating Procedure," conducted by University of Alabama, published 1985
- Consisted of Delphi study using experienced District & Maintenance Engineers
- Correlated physical distress measurements with engineers' opinions of road condition
- Established pavement condition rating (PCR) number

PCR Equation

PCR = 95.5727 - 5.5085 (5.0 - PSI) - 1.5964 (ln (ALL1 + 1)) - 1.9629 (ln (ALL2 + 1)) - 2.9795 (ln (ALL3 + 1)) - .01630 (PATF + PATP) - .07262 (BLK1 + BLK2 + BLK3 + BLK4) - .2220 (ORUT) - 3.4948 (RVLL) - 7.5269 (RVLW) - 11.2297 (RVLE) - .03032 (LNG1 + LNG2) - .05484 (LNG3 + LNG4) - .53050 (TRN1 + TRN2) - .69736 (TRN3 + TRN4)

Automated Data Collection

- **Manual surveys took too long to complete**
- **Increased traffic on roads put raters in greater jeopardy.**
- **1990—Several firms considered for pilot study**
  - PCES/Roadman
  - PAVEDEX
  - IMS
  - PAVETECH

PAVETECH

- Survey completed for half of state
- Results deemed unacceptable
- Remainder of survey completed manually (last manual rating completed in 1992)

Roadware

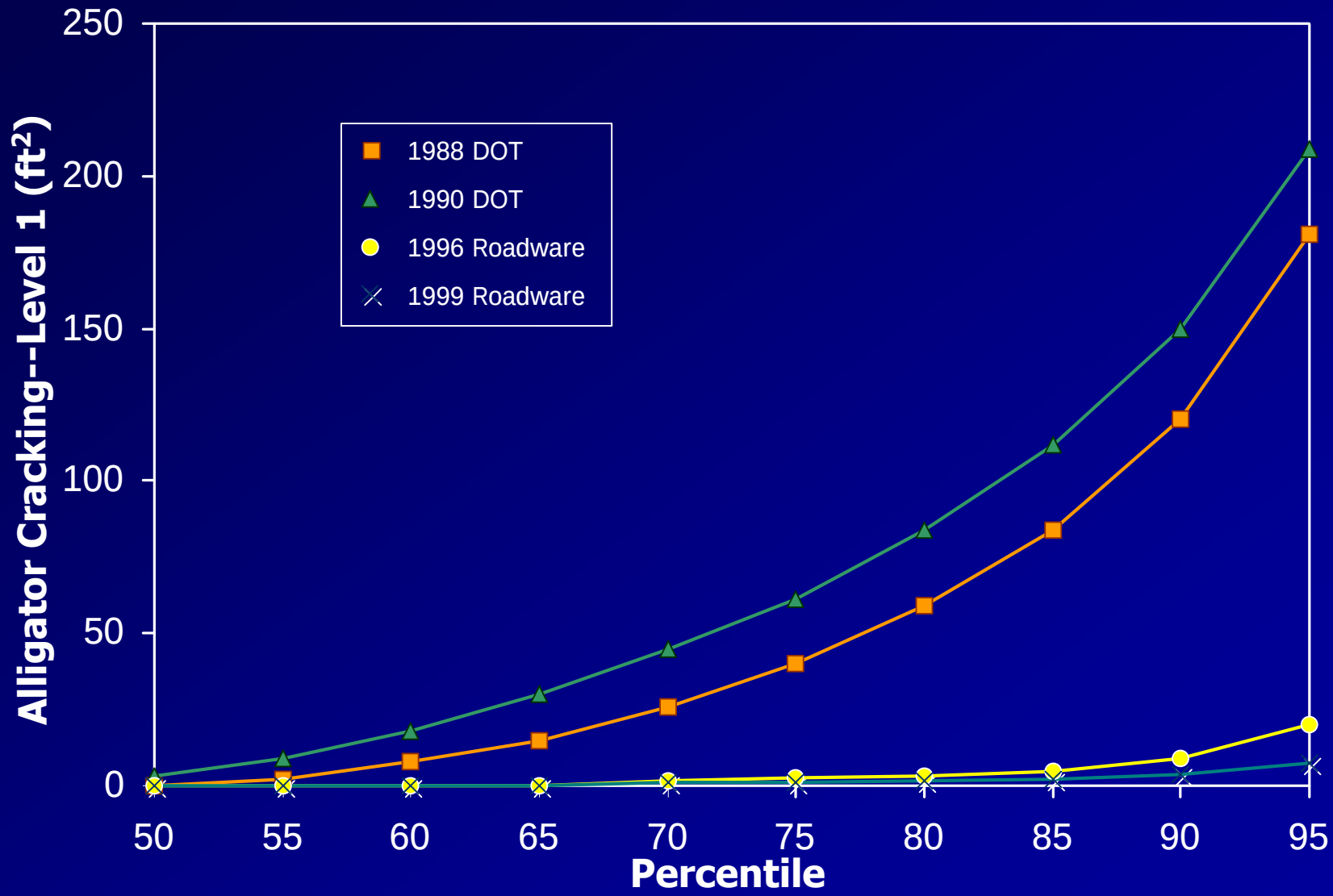
- First contract for 1996-1997 cycle
- Video collected continuously, data reported for first 50M segment per km
- Data first used in 1998 PCR report
- Second cycle began in 1999, completed in 2001
- Data collected continuously, reported in 50M segments

Roadware

- Third cycle began April 2002
- Video collected continuously, data reported very 0.01 mi
- IM Review Committee questioned data accuracy from previous cycles
- Reviewed data from previous cycles
- No documented quality assurance plan

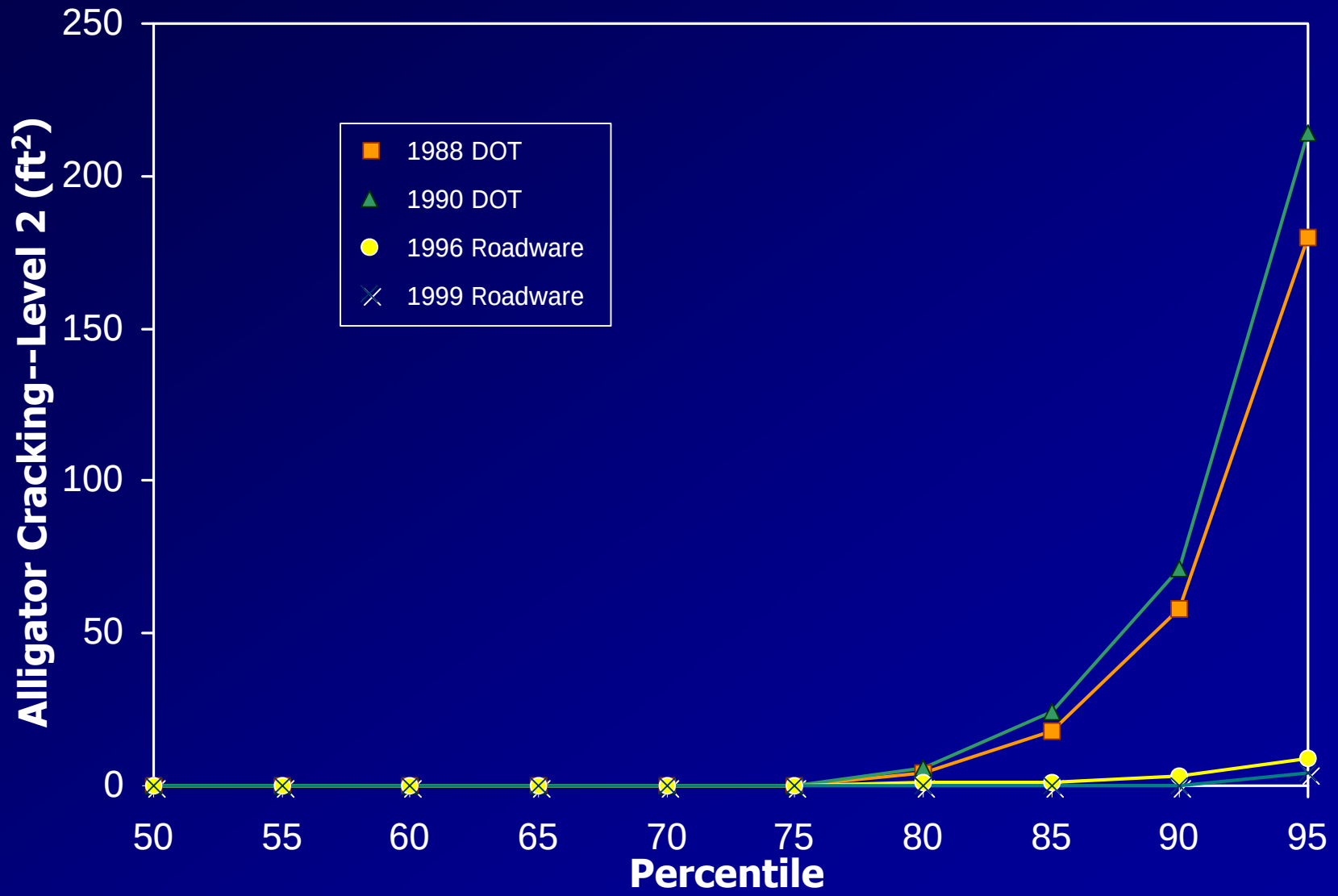
Historical Percentile Values

Level 1 Alligator Cracking



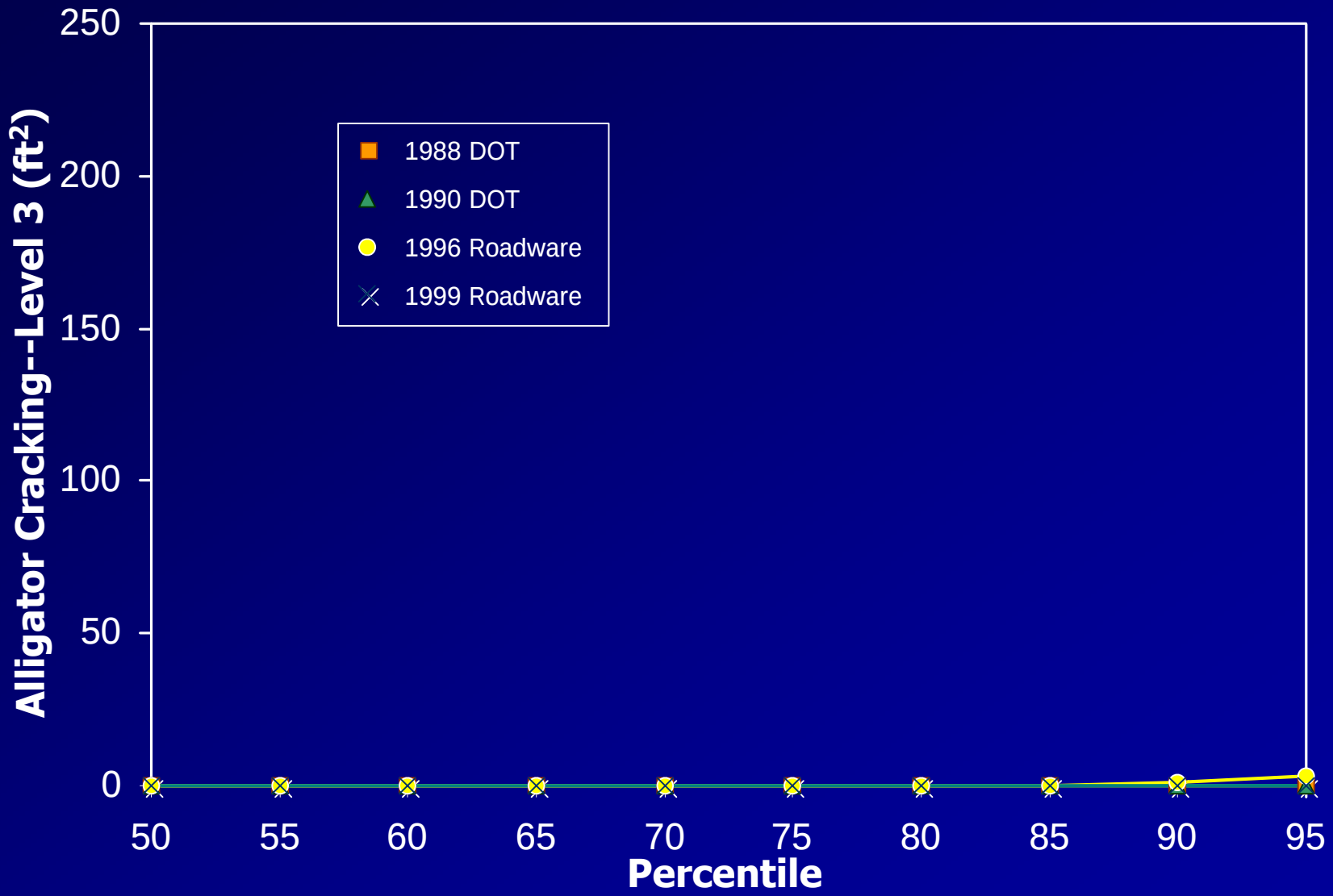
Historical Percentile Values

Level 2 Alligator Cracking



Historical Percentile Values

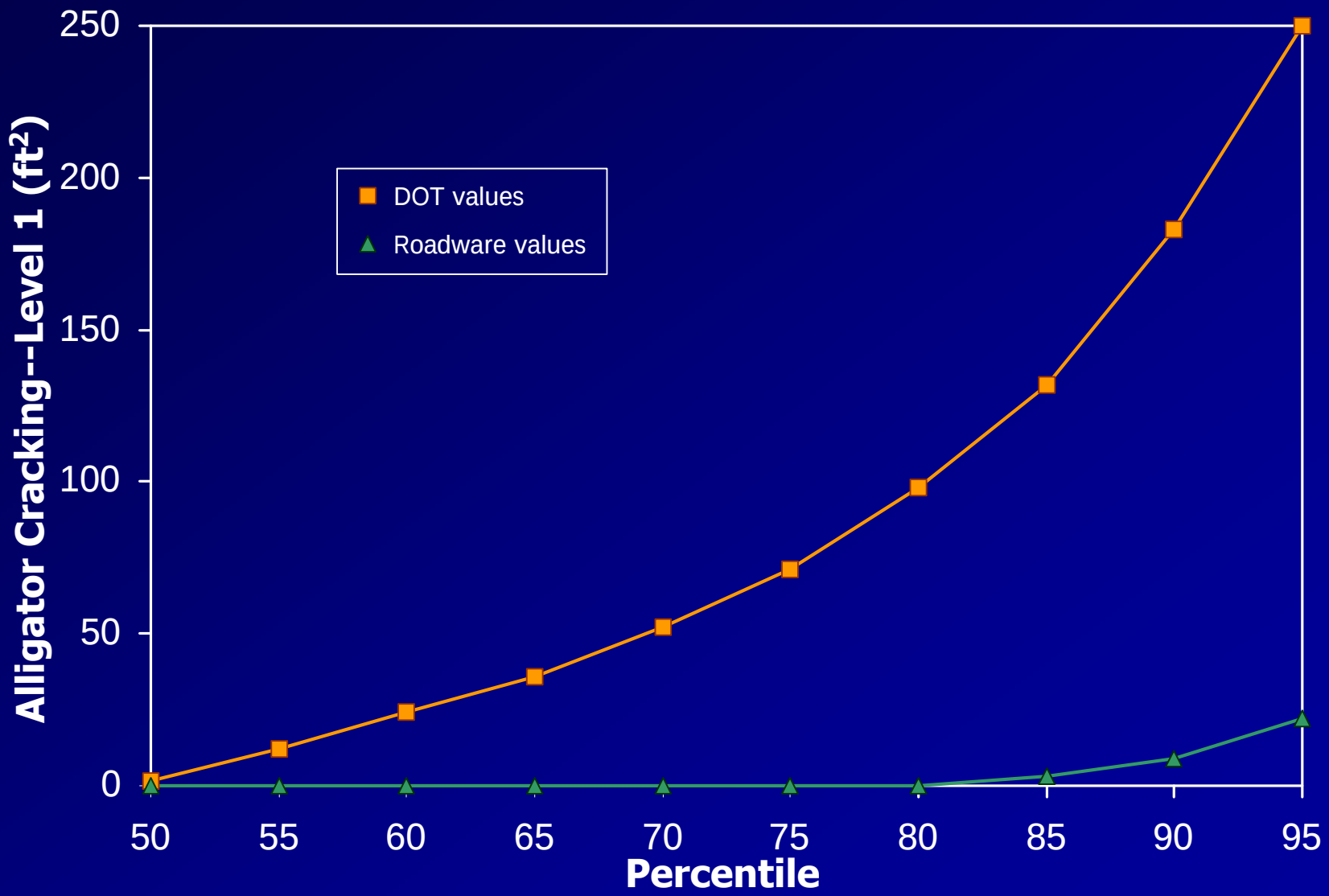
Level 3 Alligator Cracking



2002 ALDOT QA Process

- 200 ft manual ratings completed every 10 lane miles in rural areas by raters with 8+ years of experience

QA Sample Percentile Values
First Division 2002



QA Sample Percentile Values
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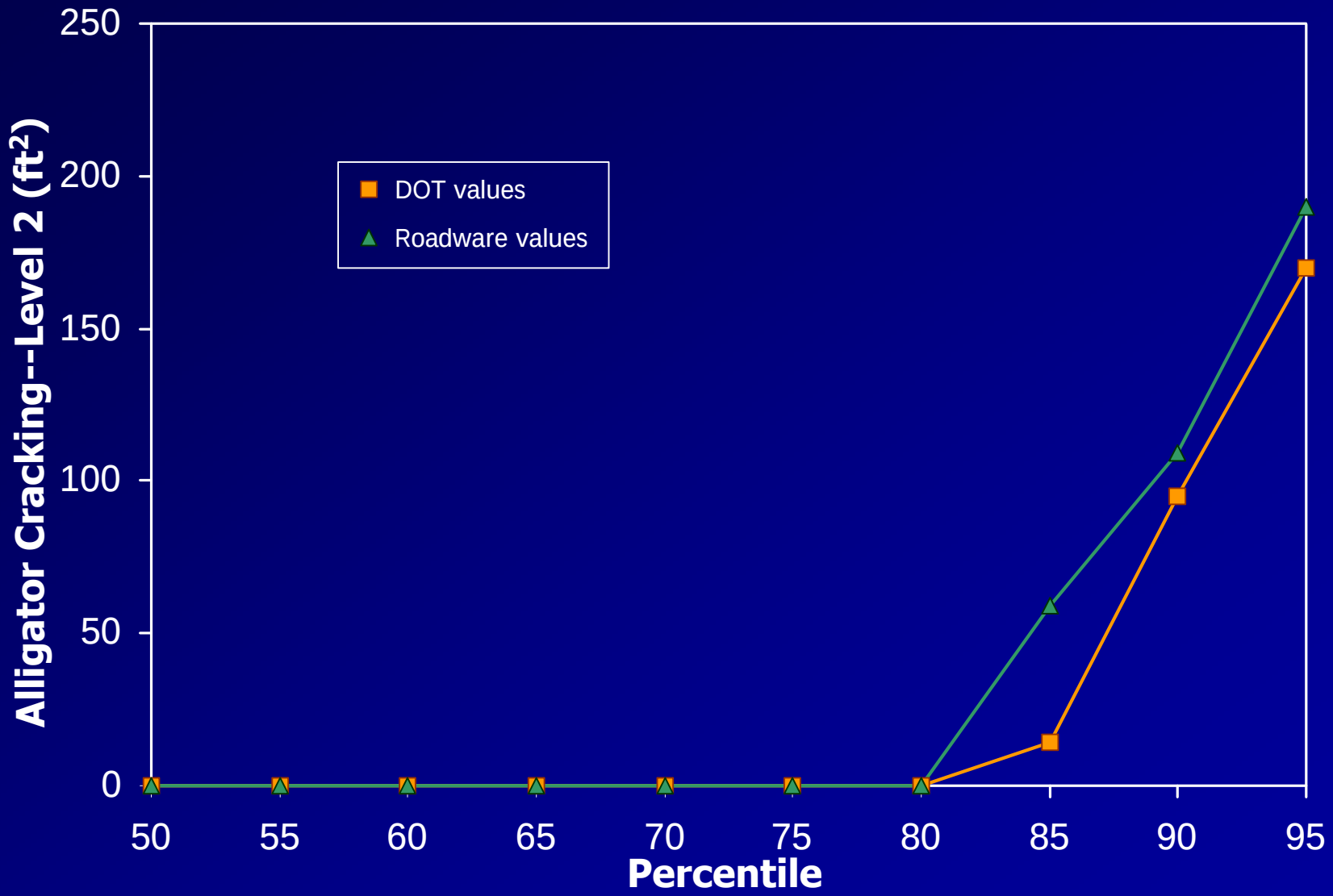

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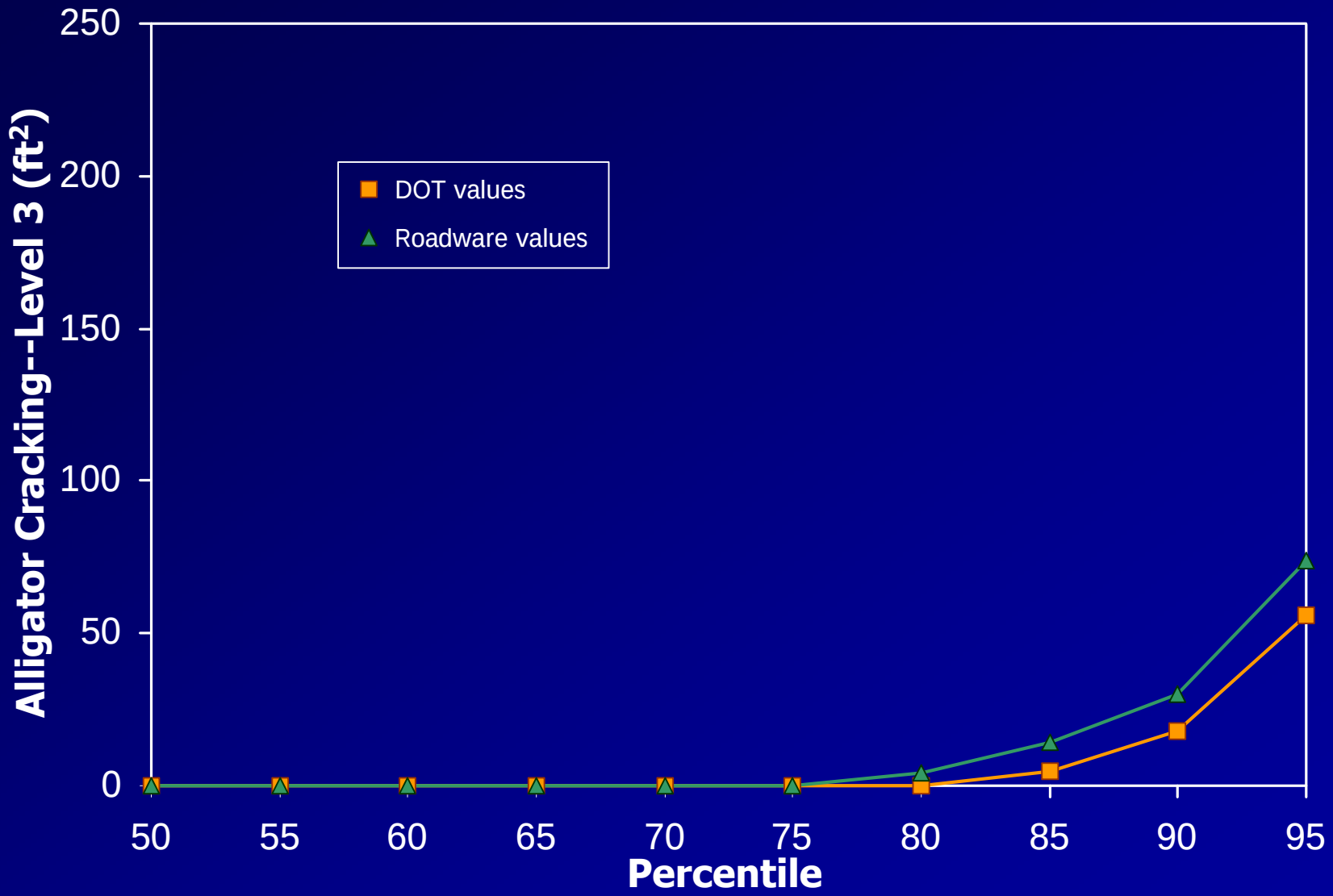


Auburn University
HRC Report IR-04-01

"A Study of Manual vs. Automated Pavement Condition Surveys"

David H. Timm, Ph. D. & Jason M. McQueen

- A summary of distress collection history and state of the practice
- Survey of other States' use of automated distress collection
- Review of ALDOT's QA process and PCR equation

2002 ALDOT QA Process

- Regression analysis – None of the variables showed good correlation
- Best Correlation was IRI at R^2 = 0.65

2002 ALDOT QA Process

- Weakness: Location
  - Recommended using GPS to locate QA sites
- Weakness: Agreement between ALDOT raters
- Phase II of QA Program
  - Used one rater; surveyed 200 ft very 20 miles

2002 ALDOT QA Process

No systematic error between vendor and ALDOT

Three general trends observed

- Vendor reported greater OWP rutting
- Vendor underreported alligator level 1
- Vendor over reported alligator level 3

ALDOT PCR Equation

- Monte Carlo simulation to determine sensitivity of the PCR equation
- Accurate cracking data has greatest impact on PCR

Research Project 930-598
July 2003

"Pavement Management System Review"

David P. Hale, Ph. D.

Daniel S. Turner, Ph. D., P. E.

Jay K. Lindly, Ph. D., P. E.

Shane Sharpe, Ph. D.

Research Project 930-598

- Notice-of-need document
- Pavement distress questionnaire
- New ALDOT pavement distress rating procedure ALDOT-414

Pavement Distress Questionnaire

- What would you like to know from the PMS?
- Do you perform significant amounts of maintenance on the driving lanes other than resurfacing?
- What minimum crack width is significant to you?
- What type of distresses trigger in your mind a need for maintenance?
- If you have OGFC or SMA surfaces how do you determine the need for maintenance?

ALDOT 414 Severity Levels

Severity Level 1: Cracks having widths > 1/25" and ≤ ⅛"

Severity Level 2: Cracks having widths > ⅛" and ≤ ¼"

Severity Level 3: Cracks having widths > ¼"

ALDOT 414 Data Quality Requirements

- IRI: ± 5% compared to Dipstick control section
- Cross slope and grade data: ±0.20%
- Load associated cracking: ± 10%
- Non-Load associated cracking: ± 10%
- Transverse cracking: ± 10%
- Rut depth: ±0.1 in.
- Transverse joint faulting: ±0.1 in.

ALDOT 414 QC/QA Requirements

Senor verification bi-weekly

ALDOT sample 3% images and rate

More Field Verification

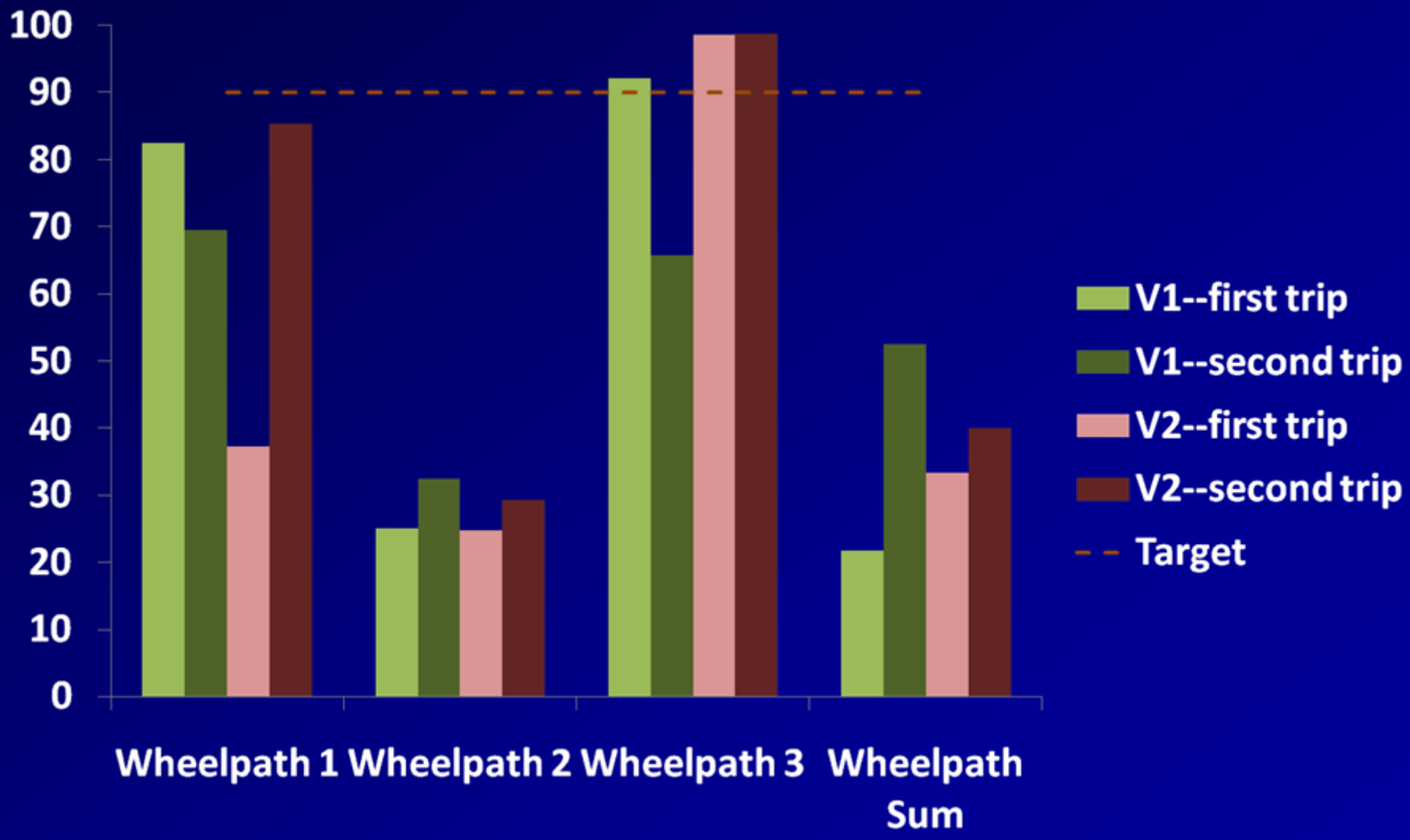
- Chose twelve sites in northwest Alabama
- October 2007 ALDOT rater rated 0.3 miles at each site in the office then rated in the field
- March 2008 ALDOT performed field survey again

More Field Verification

- University of Alabama research team asked Roadware to run the twelve sites
- Pathway re-ran the twelve sites earlier this year
- Each vendor was given the field ratings from 1/3 of the sites to calibrate their process

Percent Within Limits—10%

zeros included



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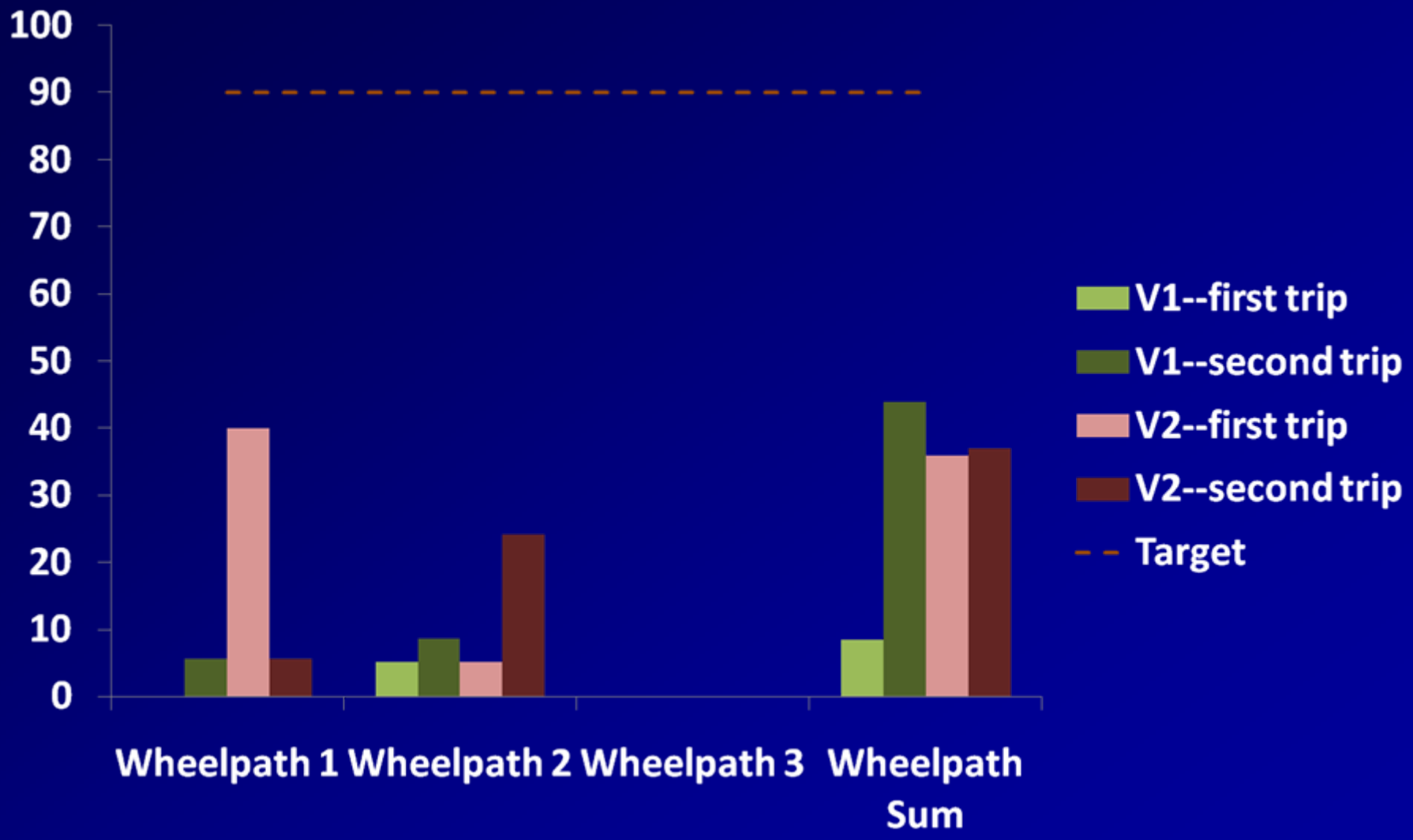

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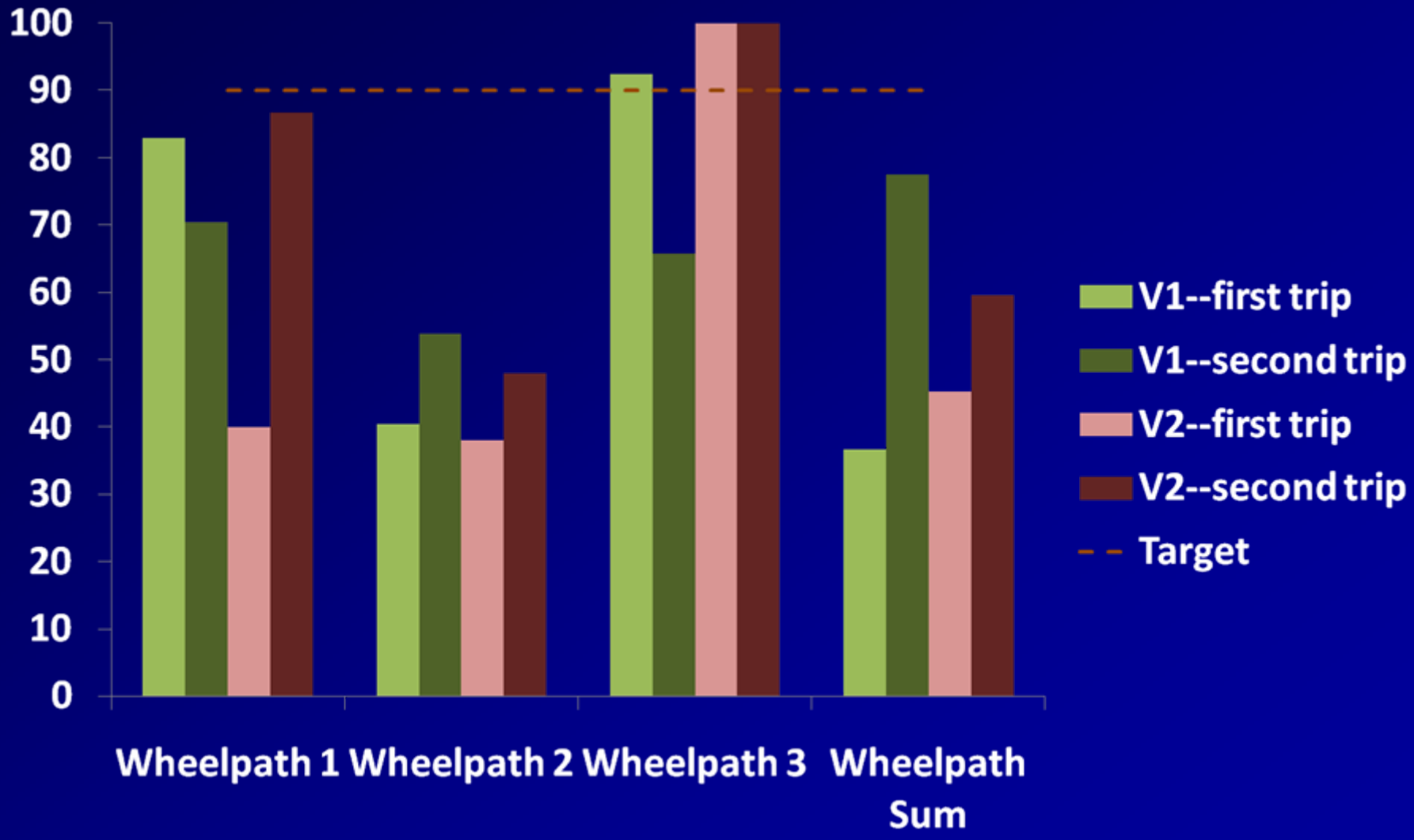

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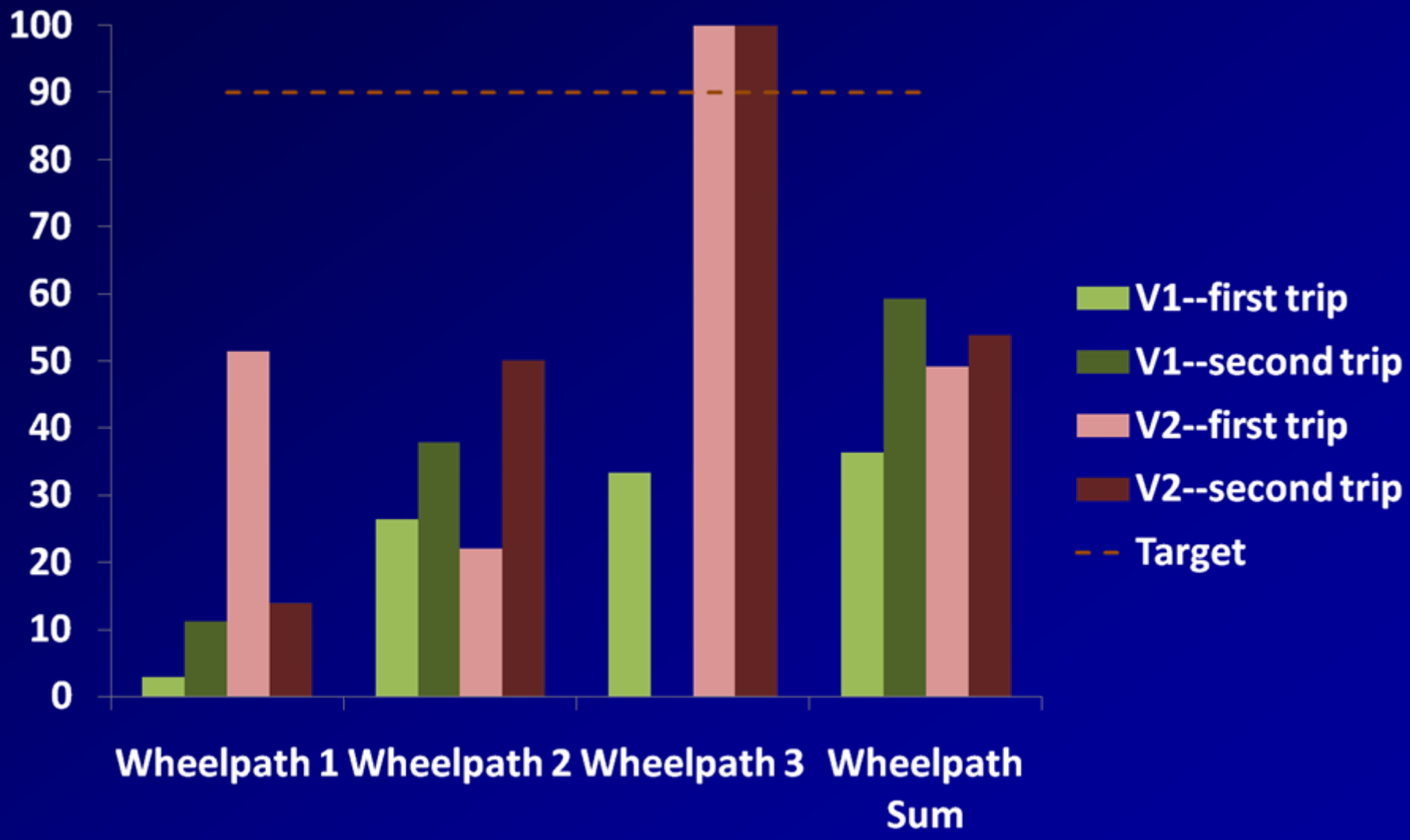

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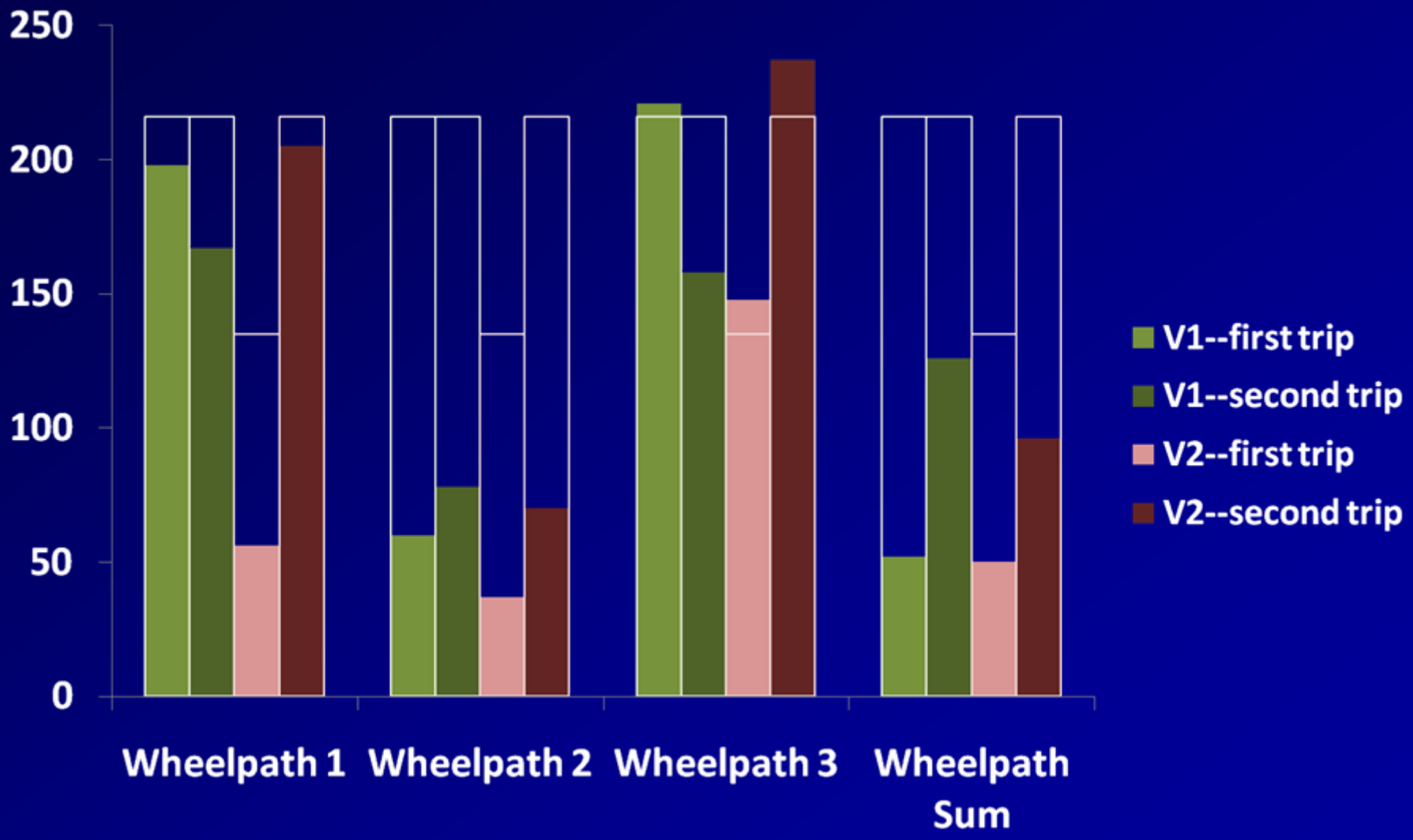

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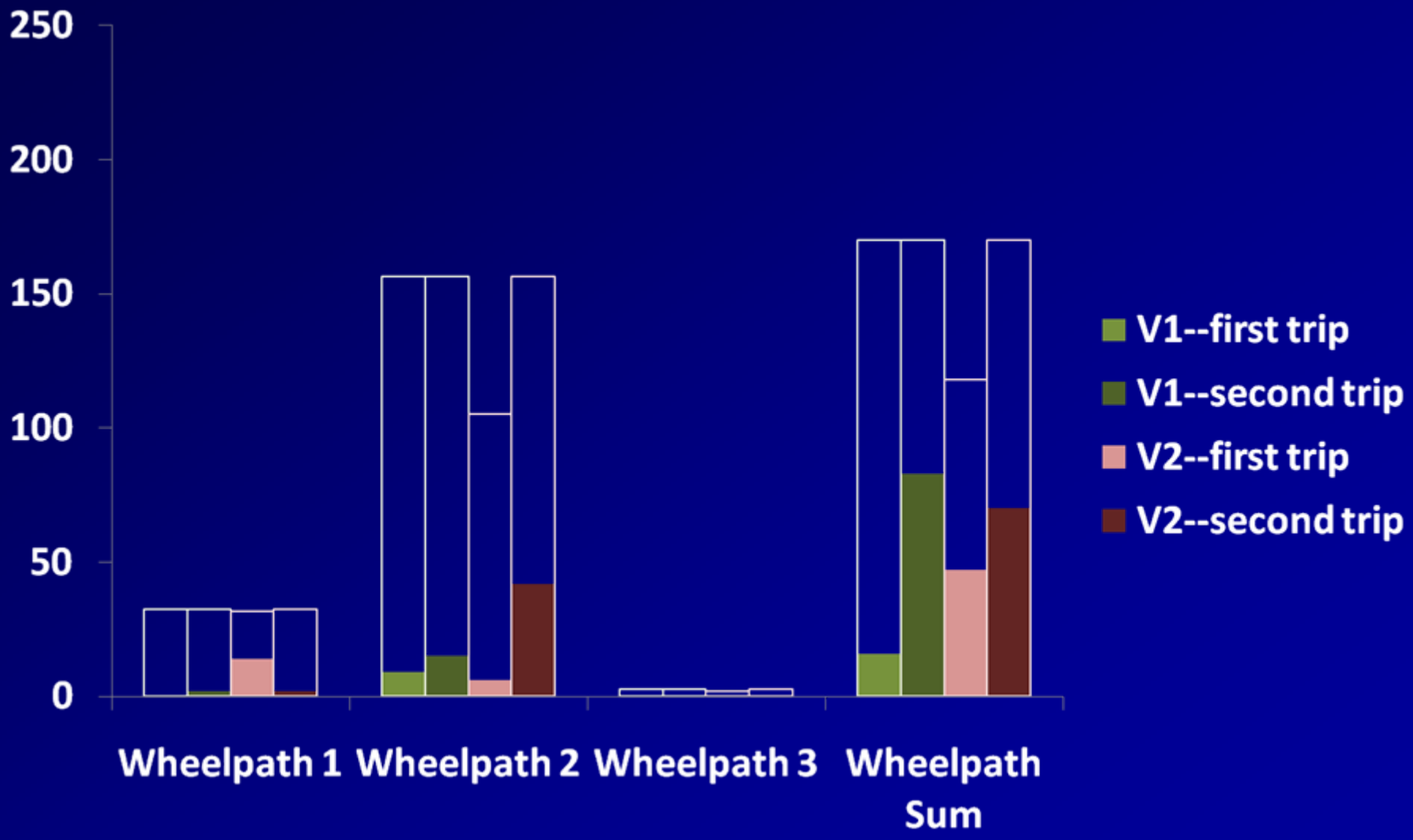

Next

- Research team will follow up with more detailed statistical analysis of the data
- Dr. Bugao Xu, University of Texas will look at the Pathway images
- ALODT will re-visit distress procedure and acceptance criteria