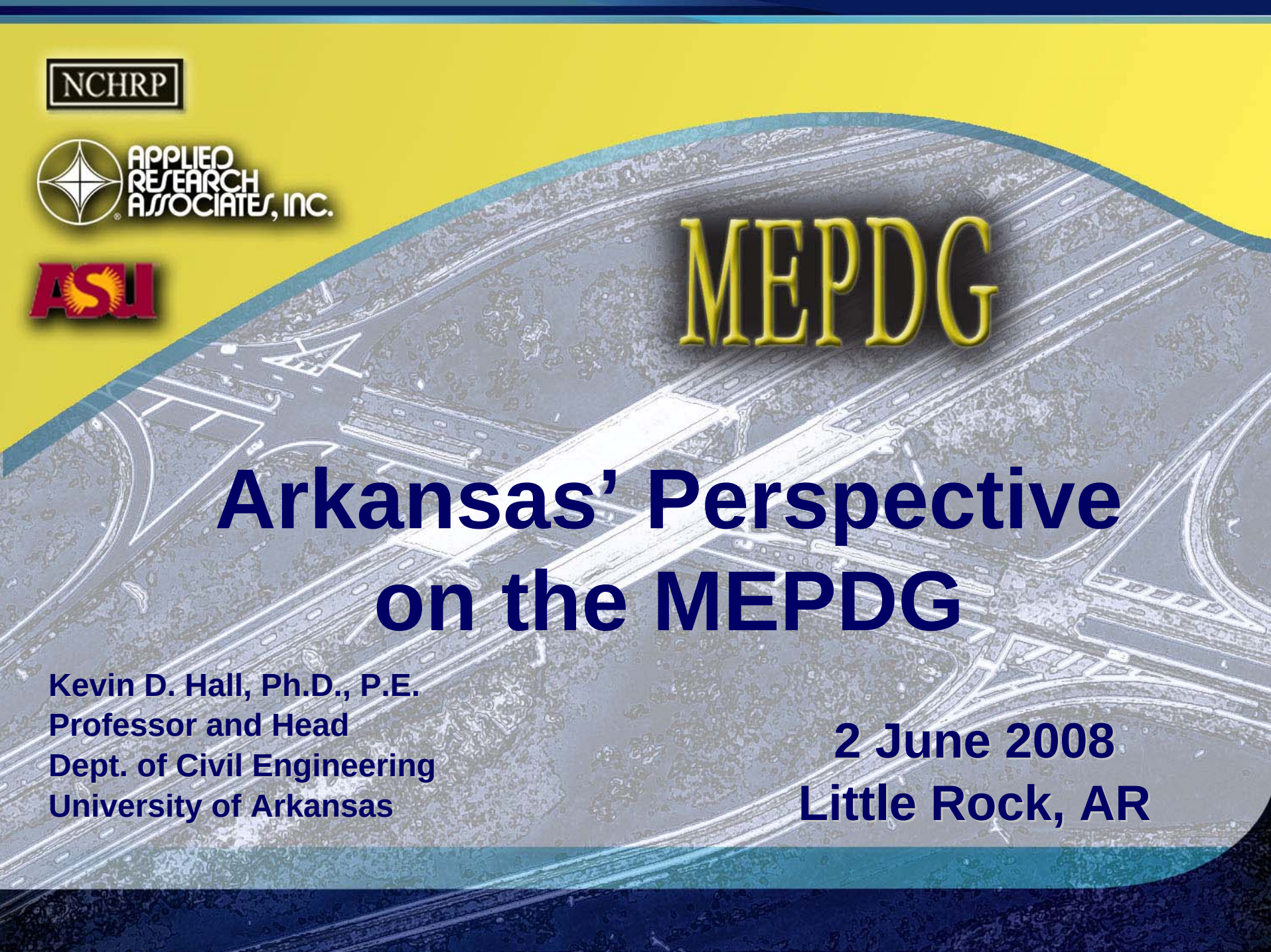

Arkansas' Perspective on the MEPDG

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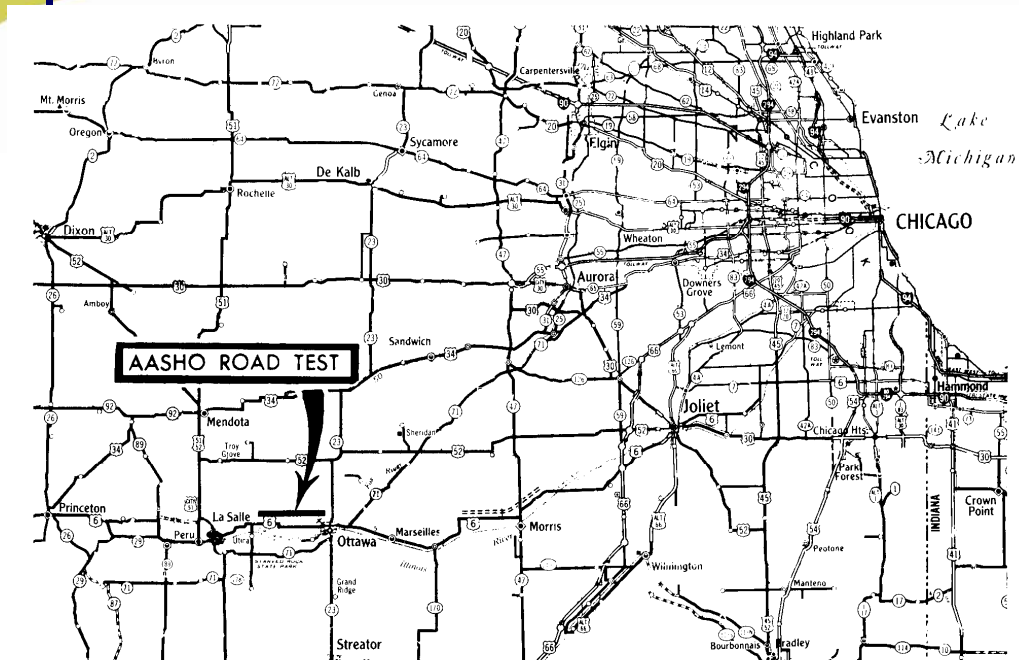
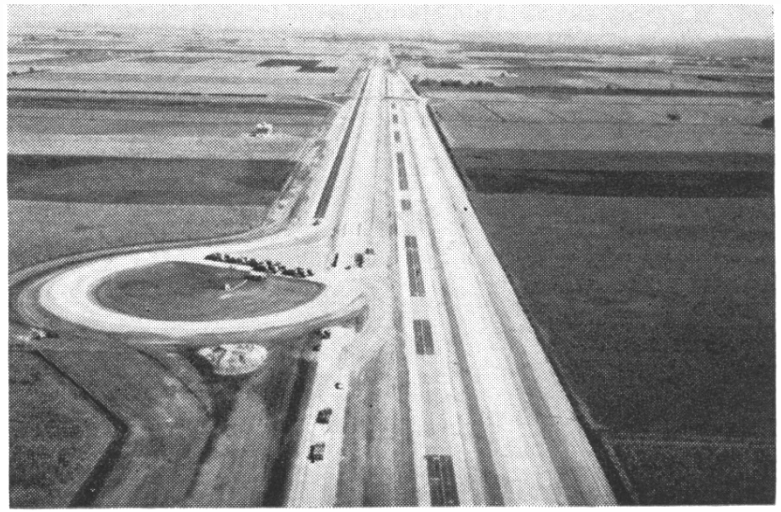
2 June 2008
Little Rock, AR

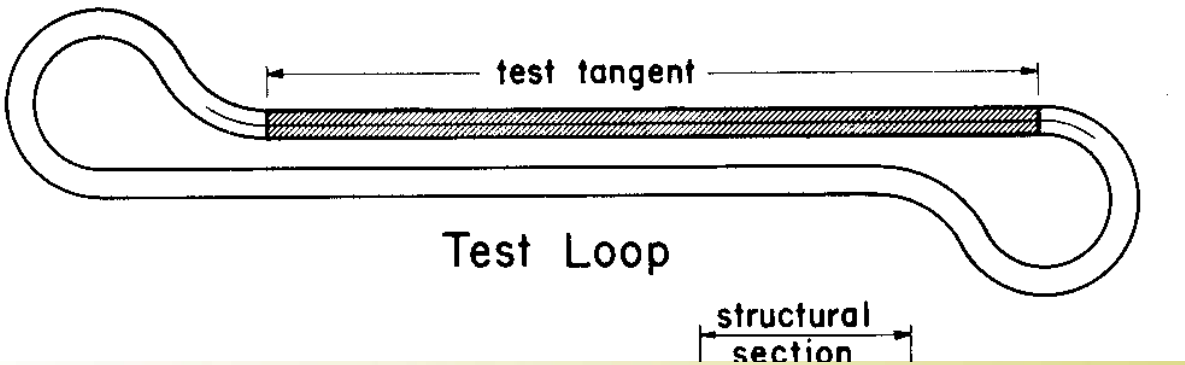
The Agenda…

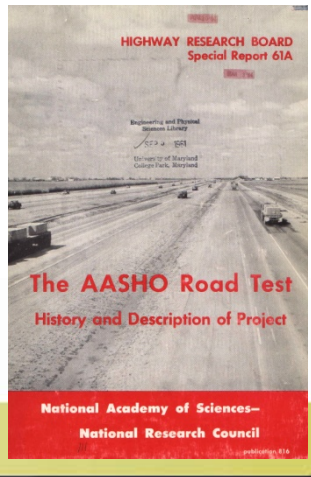
- A Little History
- Overview of the MEPDG
- Arkansas' Approach
- Status / Direction
- Future Work
- LUNCH!

A Little Trip Down Memory Lane

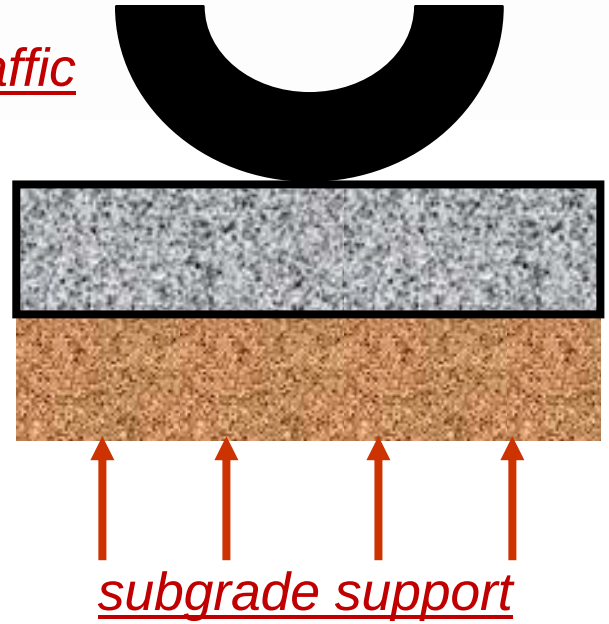








1993 AASHTO Flexible "Design"



materials

environment

$$SN_{HMA} = a_{HMA} * d_{HMA}$$

$$SN_{base} = a_{base} * d_{base} * m_{base}$$

$$SN_{total} \leq SN_{req'd}$$

performance

$$\log_{10} W_{18} = Z_R * S_o + 9.36 * \log_{10}(SN + 1) - 0.20 + \frac{\log_{10}\left[\frac{\Delta PSI}{4.2 - 1.5}\right]}{0.40 + \frac{1094}{(SN + 1)^{5.19}}} + 2.32 * \log_{10} M_R - 8.07$$

1993 AASHTO Design Inputs

Flexible

- Reliability
- Std. Deviation
- ΔPSI
- Traffic (ESAL)
- Subgrade Resilient Modulus

MEPDG:
50-100 inputs !

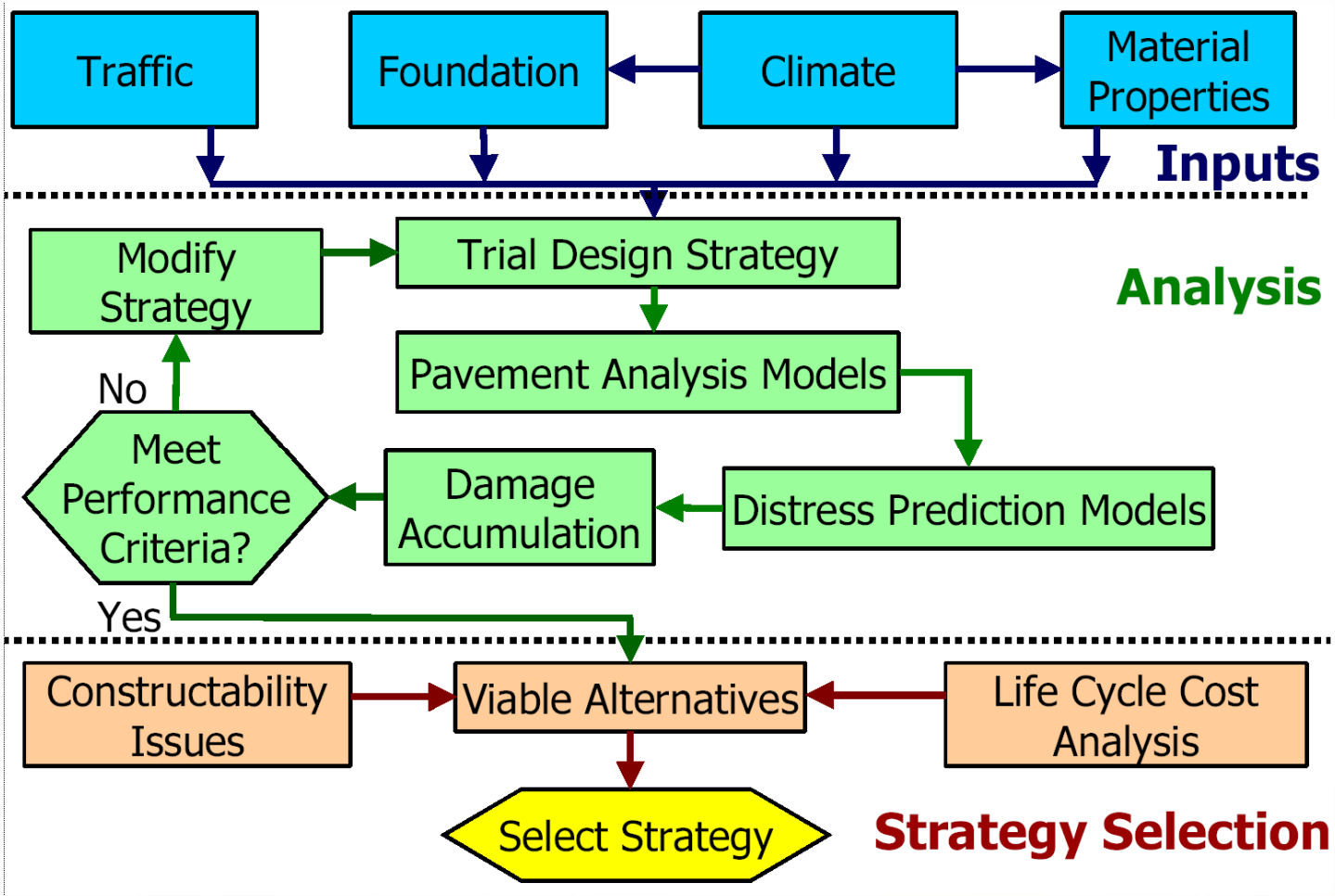
Rigid

- Reliability
- Std. Deviation
- ΔPSI
- Terminal PSI
- Traffic (ESAL)
- Subgrade “k” value
- PCC Elastic Modulus
- PCC Flexural Strength
- Load Xfer Coefficient (J)
- Drainage Coefficient (C_d)

Oh, By the way…about those inputs

- Some of the 50+ inputs not currently measured or tracked
- Each input has a "level"
  - Level 1: I know *everything* about this input…
  - Level 2: I know *something* about this input…
  - Level 3: I know *just a little bit* about this input…

MEPDG: The 'nickle tour'



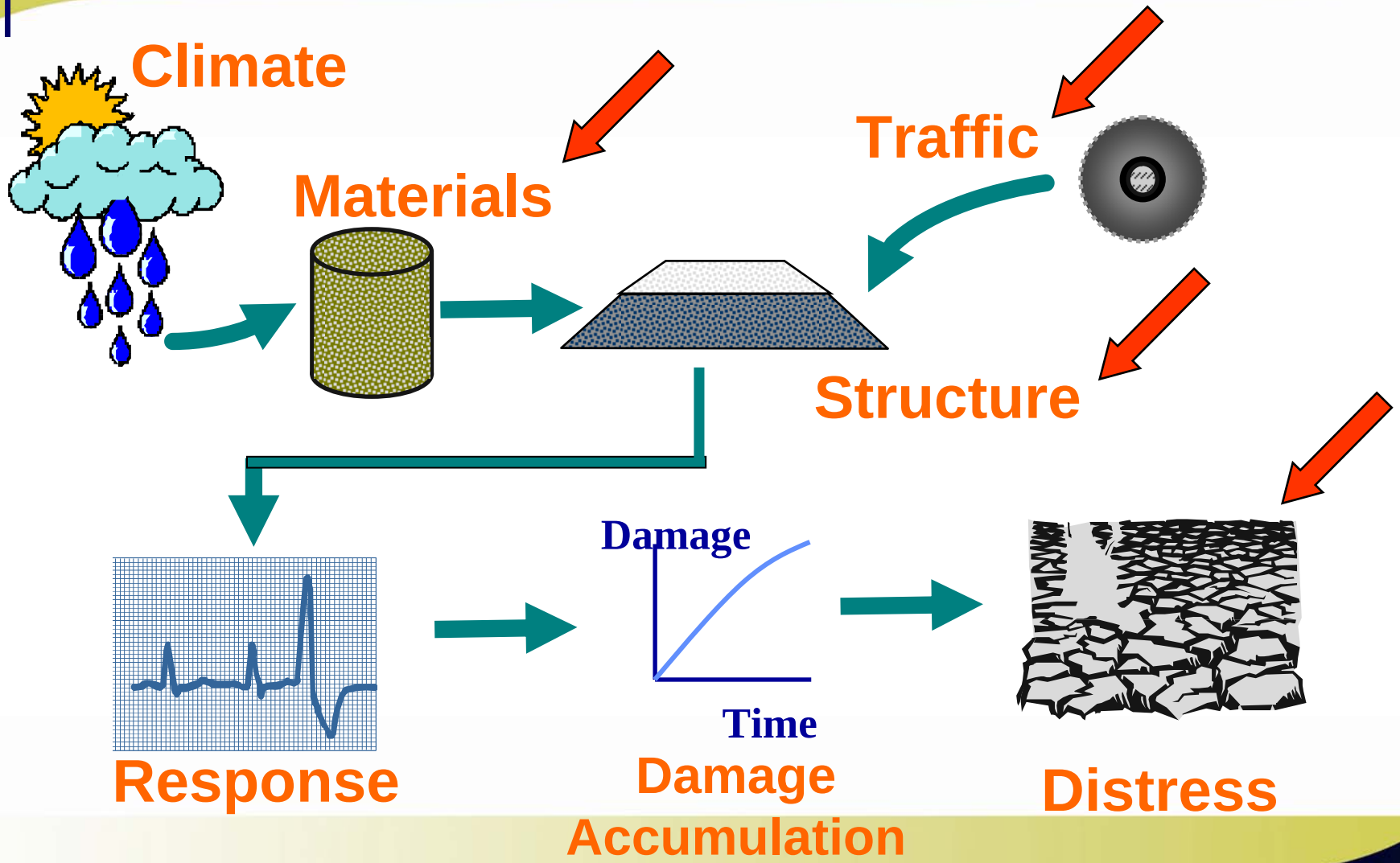
Flexible Distress Models

- Fatigue
- Rutting
- Thermal Cracking
- Ride (IRI)

Rigid Distress Models (JPCP)

- Faulting
- Cracking
- Ride (IRI)

Where do you attack the Beast?



Arkansas' MEPDG Activities

- "First Look"
  - Sensitivity Analyses
- Materials Characterization
  - Hot-mix asphalt
  - Portland cement concrete
  - Unbound materials
- Traffic Characterization
- Design Studies
- Local Calibration Research

Sensitivity Analyses

- Identify those inputs most critical in distress predictions
  - Provided a ‘head start’ to material characterization studies
- Numerous studies completed around the U.S. to date

Materials: Hot-Mix Asphalt

- Dynamic Modulus (E*)
  - 3 NMAS
  - 3 Binder Grades
  - 4 Agg Types
  - 2 Gradations

- Created catalog of E* data for “Level 1” design
- Assessed suitability of Level 3 predictive equation

Materials: PCC

- Coefficient of Thermal Expansion (CTE)
- Poisson's Ratio
- Modulus of Elasticity
  - 5 Agg types
  - Time Series Values
- Effect of Paste
- Catalog of Values
- Assessment of Predictive Relationships

Materials: Unbound

- Granular Base
  - 10 Agg types
  - Shear properties
  - Elastic & Resilient Modulus
  - Poisson's Ratio

- Subgrade Soils
  - Resilient Modulus
  - "Relationship"(?) between modulus & R-value

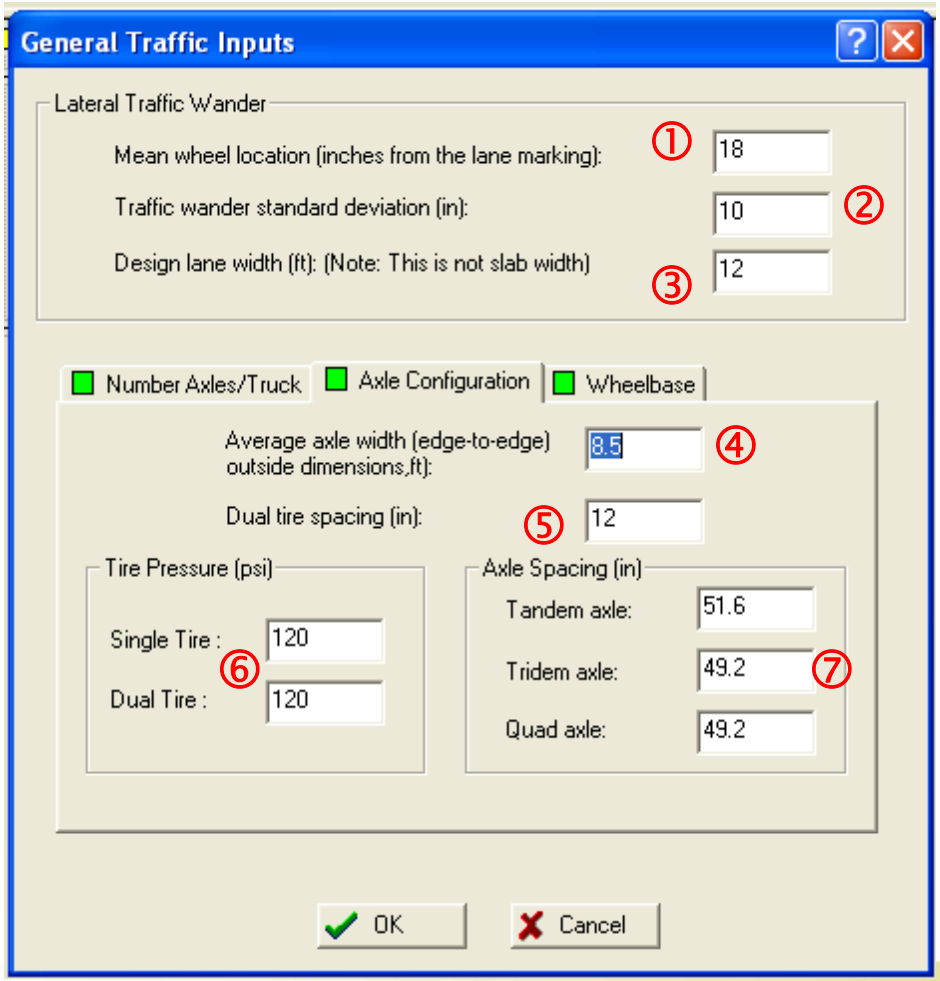
Traffic Studies

- The Good…
  - 7 TTCs identified statewide
  - Default monthly & hourly distribution factors suitable for use
  - Developed statewide vehicle class distribution factors
  - Developed statewide Axle Load Spectra
- The Bad…
  - TRAFLOAD could not be used; spreadsheets developed
- The Ugly…
  - Only 25 of 55 WIM sites suitable/comprehensive for traffic study
    - Classification data: 17 of 25 sites passed quality checks
    - Weight data: 10 of 25 sites passed quality checks

Design Studies

- Comparing designs with ‘current practice’
  - Aid in identifying initial performance criteria
- Developing comprehensive database structure to integrate design, construction, performance / PMS data
  - Much more on this tomorrow…
- Developing “Design Handbook”

Example: “Design Handbook”



General Traffic Inputs

① Mean wheel location
Use default value shown

② Traffic wander std. deviation
Use default value shown

③ **Design lane width**
Enter lane width in feet

④ Average axle width
Use default value shown

⑤ Dual tire spacing
Use default value shown

⑥ Tire pressure(s)
Use default value(s) shown

⑦ Axle spacing(s)
Use default value(s) shown

Local Calibration Efforts

- Potential ‘existing’ section identification
  - LTPP sites within Arkansas
  - ‘top 25’ Superpave sites
    - Primarily modified binders
- Guidelines for data collection: new construction
  - Design
  - Construction
  - Performance Monitoring

Arkansas' Research Activities

■ "First Look"		
• Sensitivity Analyses	complete	$176^k
■ Materials Characterization		
• Hot-mix asphalt	complete	$330^k
• Portland cement concrete	ongoing	$250^k
• Unbound materials	("complete")	????
■ Traffic Characterization	complete	$ 81^k
■ Design Studies	ongoing	$375^k
■ Local Calibration Research	(3 studies)	

Total Research Commitment (to date): $1212^k

Arkansas' Bottom Line…