Pavement Data Collection

Gaylord Cumberledge, P.E.
Some Things Learned
PAVEMENT DISTRESS DATA COLLECTION

- Pilots
- Location
- Quality
Pilots

- Pilots are costly
- Usually not well defined
- No training involved
- No Specifications
- Procedures are vague
- Few people use the results
- No data collection vendor wants to look bad
Location - A Credibility Issue
Location Referencing System

- Link node (Segments)
- Continuous (Milepost)
Physical Inventory Files

- Permanent physical features
- Accuracy
- Current
- Links to all data systems
PMS Database

- Segment lengths
- Terminal points
- Linked to Physical Inventory Data
- Linked to GIS
- Database integration
- Field Data Locations match Database
Accuracy of Location Data

- Must be accurate
- Must be kept current
- Signs must match database
Testing Aids for Location Accuracy

- DMI Calibration
- Use of GPS
- Driving skills
- Direction of testing
- Physical Events
- Accurate GIS
Quality

- Training
- Manual Field vs. Images
- Level of Quality
- Specifications
REVIEW OF THE VARIABILITY AND ACCURACY OF PAVEMENT DISTRESS DATA
VARIABILITY OF DATA

- Type
- Severity
- Extent
- Data Collection Method
Manual
- Windshield
- Shoulder
- Walking Detailed

Automated
- Sensors
- Video
- Film
OFFICE VS. FIELD MANUAL SURVEYS

- Fatigue
- Miscellaneous
- Edge Deterioration
- Bit. Trans. Crk. No. and Length
- Patch Count and Area
FATIGUE

MEAN

TEST SECTION

Field Raters
Pasco Office
PennDOT Office

BF1  BF5  BF6  BF4  BF7  BF9  BF8  BF3  BF10  BF2
FATIGUE

STD. DEV.

TEST SECTIONS

Field Raters
Pasco Office
PennDOT Office

BF1  BF5  BF6  BF4  BF7  BF9  BF8  BF3  BF10  BF2
Training

- Training Materials
- Employee Turnover
- Quality Control
DISTRESS DEFINITIONS

- SHRP
- FHWA/AASHTO Protocols
- Others
There are three basic types of pavements in use:

- Asphalt Concrete Surfaced Pavement (ACP)
- Jointed (Plain and Reinforced) Portland Cement Concrete (JCP)
- Continuously Reinforced Portland Cement Concrete (CRC)

Each type of pavement has a unique set of distresses which are evaluated. The tutor contains a section for each pavement type.

Select the type of pavement you would like to explore from the options above.
Distress Type

Fatigue Cracking

Severity Level

High Severity

Moderate to High

Moderate Severity

Low to Moderate

Low Severity

Select Another Distress

Example 1 of 2

← →

Main Menu | Select Another Category | Help | Quit

Distress Description:

Fatigue cracking occurs in areas subjected to repeated traffic loadings (wheel paths.)

Can be a series of interconnected cracks in early stages of development. Develops into many-

Severity Description:

HIGH

An area of moderately or severely spalled interconnected cracks forming a complete pattern; pieces may move when subjected to traffic; cracks may be sealed; pumping may be evident.
Practice Exercise

What distress is this?

Exercise Score
You have answered 2 questions correctly out of 4 questions asked.
There are 84 questions remaining in the exercise.
What Quality of Data is Required?

- Research
- Pavement Performance Model
- Maintenance Fund Allocation
- Long-Term Trends
- General Health of System
- Just Collect Numbers
HOW DO WE MEASURE QUALITY?

- Gut Feeling
- Random Manual Checks
- Precision and Bias?
WHAT VARIABLE(S) DO WE EVALUATE TO MEASURE QUALITY?

- Distresses?
- Weighting Factors?
- Composite Index?
- Treatment Cost?
Cost

- No Specifications
- Descriptive Specification
- End Result Specification
Quality Monitoring Plan

- Pre-Survey Quality Control

- Data Collection Quality Control and Equipment Calibration

- Office Data Quality Control
Pre-Survey Quality Control

- Equipment Operator Training
- Pre-survey Equipment Calibration
- Survey VDOT Calibration Verification Sites
- Sensor Data Precision & Bias Statements
- Survey Routing Plan QC
- Distress Rater Training & Certification
- Distress Index Precision & Bias Statements
Data Collection Quality Control and Equipment Calibration

- Weekly Survey Equipment Calibration Verification
- Daily Survey Equipment Checks & Calibration Verification
- Periodic Equipment Calibration Verification
- Initial Data Checks of Field Data Received
- Post-Survey Calibration Verification
Resolution Board
Office Data Quality Control

- Training
- Processed Sensor Data & Digital Imagery QC
- Pavement Distress Data QC
- Processed Pavement Distress Data QC
- External QA Review of Distress Data
- Pre-Delivery QC
Suggested QA Process

- Choose variable(s) to be monitored
- Establish precision and bias for that variable(s) by best method available
- Write end result specification for the required quality of data
- Establish QA Plan
- Pilot sections to train & calibrate vendor
Asset Data Collection

- PMS Data Collection
- Collecting Digital Images of Assets
- Development of Asset Database
- Asset Identification Available from Images
- Asset Attribute Data
Prototype Pavement Management System
Data Flow

FIELD DATA

INVENTORY DATABASE

Additional Data

Maintenance

Financial

Analysis

Reports

4R -- $20,000,000
3R -- $ 9,000,000
MAINT -- $10,000,000
Additional Data Sets

- Current Data
  - Traffic Counts
- Additions for Prototypes
  - Construction / Rehab Costs
- Bridge Management
  - Bridge Inventory
- Safety Management
  - Accidents
- Miscellaneous Additions
  - Geotechnical Info
  - Environmental Info

ROAD DATABASE
Road Inventory Program GIS

- Contains Multiple Themes (Layers)
- One Theme for Various Fields in RIP Database
  - (Condition, Widths, Traffic, etc…)
- Images Used for Background
  - Digital Raster Graphics (DRG)
  - Digital Ortho Quads (DOQ)

Accidents

Cycle 3 Condition - 2002

Cycle 2 Condition - 1999

Traffic

Shapefile

Background
ARA’s Transportation Sector

- Formerly - ERES Consultants & CGH Pavement Engineering
- Depth of Professional Support - over 130 professional staff members.
- Coast to Coast Locations - 9 States & 1 Canadian Province.
Selected ARA Specialties

- Pavement Management
- Pavement Engineering & Research
- Pavement Evaluation & Testing
- Automated Data Collection
- Traffic Data Collection & Analysis
- Database & Software Development
Digital Survey Vehicles

- Longitudinal Profile
- Pavement Images
- Right-of-Way Images
- Sign Images
- Distance Measuring Instrument (DMI)
- Differential GPS (sub-meter)
- Inertial Navigation
ARA’s Newest Digital Survey Vehicle (DSV)