Quality Management Plan for Pavement Condition Data

2019 Complete Streets and Tech Conference

APWA Southern California Chapter
American Public Works Association
Carson, CA

April 10, 2019
“The act of overseeing all activities and tasks needed to maintain a desired level of excellence.”

(www.Investopedia.com)
...and why should you care?

Data quality influences

Condition assessment

Performance prediction

Treatment timing and selection

Budget estimating

Pavement Management Credibility

NCE
Key Components

- Condition Assessment
- Equipment Calibration & Method Acceptance
- Data Quality Standards
- Data Inspection
- Responsibilities
- Corrective Action
- Training
- Reporting
## Pavement Condition Survey

<table>
<thead>
<tr>
<th>Referencing System</th>
<th>Survey Types</th>
<th>Analysis Types</th>
<th>Distress Protocols</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Route-mile</td>
<td>• Manual</td>
<td>• Semi</td>
<td>• LTPP <em>Distress Identification Manual</em></td>
</tr>
<tr>
<td>• Route post</td>
<td>• Automated</td>
<td>• Images viewed</td>
<td>• ASTM D6433, <em>Pavement Condition Index Surveys</em></td>
</tr>
<tr>
<td>• Link-node</td>
<td>- Walking or slow speed</td>
<td>- Sensor data processed</td>
<td>• Agency manuals</td>
</tr>
<tr>
<td>• Route-street reference</td>
<td>- Posted speed</td>
<td>• Full</td>
<td></td>
</tr>
<tr>
<td>• Spatial reference</td>
<td>- Specialized equipment</td>
<td>- Software analysis of images</td>
<td></td>
</tr>
<tr>
<td>• Multilevel reference</td>
<td>- 2D/3D images</td>
<td>- Sensor data processed</td>
<td></td>
</tr>
<tr>
<td><strong>Return to same spot each time</strong></td>
<td>- Measures profile</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Equipment & Personnel

Profile Equipment
- Transverse (IRI & rutting)
- Longitudinal (faulting)

Rating / Raters
- Automated vehicles
- Quantifying distress

System Checks
- Sensors
- Video
- DMI & GPS
Checking Data Quality

- Control sites
- Verification Sites
- Blind Sites
Control Sites

• Centrally located
• 0.5–1.0 mile long
• Before data collection
  – Ground truth
  – Rater training
  – Equipment calibration
• During data collection
  – Repeatability & reproducibility
  – Check equipment accuracy & precision
Verification and Blind Sites

- **Verification**
  - Geographically located
  - Range in length
  - During production
    - Check rating method
    - Check equipment calibration
  - Location **known** to the rating team

- **Blind**
  - Geographically located
  - Range in length
  - During production
    - Check rating method
    - Check equipment calibration
  - Location **unknown** to the rating team

Actual measurement or from distress survey; AGENCY or RATING TEAM
Checks

Distress Rating
- Random sample audits
- Rater reproducibility
- Repeat test checks
- Logic tests
- Range of values

Database
- Segmentation
- Format
- Missing data
- Errors

Video
- Image clarity
- Lighting
- Aim & focus
- Image stitching
- Location reference
Corrective Action

Discuss issues with rating team

Recalibrate, repair, replace equipment; retrain rating staff

Re-evaluate data & review images

Re-collect data & images

Stop data collection

NCE
## Data Collection Process

<table>
<thead>
<tr>
<th>Prior to</th>
<th>During</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Training</td>
<td>• Quality Control</td>
<td>• Data checks</td>
</tr>
<tr>
<td>− Raters</td>
<td>− Data checks</td>
<td>− Field review</td>
</tr>
<tr>
<td>− Equipment</td>
<td>− Rater consistency</td>
<td>− Database</td>
</tr>
<tr>
<td>• Equipment</td>
<td>− Validate equipment</td>
<td>− Time series</td>
</tr>
<tr>
<td>− Calibration</td>
<td>− Corrective action</td>
<td></td>
</tr>
<tr>
<td>− Rut &amp; Ride</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Control Sites</td>
<td>• Acceptance</td>
<td>• Deliverables</td>
</tr>
<tr>
<td>− Testing</td>
<td>− Data checks</td>
<td>− Data</td>
</tr>
<tr>
<td>− Evaluation</td>
<td>− Control, verification, blind sites meet criteria?</td>
<td>− Images</td>
</tr>
<tr>
<td></td>
<td></td>
<td>− Reports</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Database links to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>− Pavement &amp; asset management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>− Video</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Corrective action</td>
</tr>
</tbody>
</table>

- Data checks
- Field review
- Database
- Time series
- Deliverables
- Data
- Images
- Reports
- Database links to
- Pavement & asset management
- Video
- Corrective action
Local Agency Example

San Francisco Bay Area Metropolitan Transportation Commission (MTC)

MTC Process

Consultant Pre-Qualification

Quality Control Plan

Data Acceptance
Consultant Pre-Qualification

Site Evaluation

- Standard distress types @ 3 severity levels
- Walking survey (100 ft)
  Semi-automated survey (200 ft)
- Photos and distress maps
- Results established as “ground truth”

Up to 24 sections

PCI > 75
20 ≥ PCI ≤ 75
PCI < 20
Pre-Qual (continued)

Acceptance Criteria

- PCI calculated by Agency
- \( \geq 50\% \) of PCI \( \pm 8 \) points of “ground truth” PCI value
- \( \leq 12\% \) of PCI \( \geq \pm 18 \) points of “ground truth” PCI value
- If successfully passed, certified for 2-year period
Quality Control Plan

Acceptance Criteria

- Describe rater qualifications
- Describe data verification process
- PCI ± 15 points
  - Re-survey control sites > once every 2 weeks
  - Re-survey > 5% of sections ± 1 month of initial survey
  - Re-survey > 5% of sections by a supervisor
Data Quality Plan

Criteria

• Describe remedial actions if data checks are not acceptable
• When, what format, and how often results will be submitted
• When results will be entered, PCI calculated, and available
Rater Certification Program

• Pavement distress manual survey exam
• Online written exam
• Certificate
  – 2 years + renew 2 additional years w/refresher course

https://www.streetsaver.com/academy/academy-rater-certification
Quality Management Guide

- Assist agencies in developing and implementing a quality management plan
Questions?

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