Checking Data Quality

1. Why?

2. What?

3. How?
Part of Overall QC/QA Process

Checking the final condition database

PMS Data Collection Cycle

1. Pre-collection
2. Collection
3. Video Checks
4. Prelim Deliveries
5. Final Delivery

Okla. Dept. of Transportation
Bringing it All Together

- Pre-Collection Discussion
- Use Condition Database
- Review/Discuss
- Control & Verification Sites
- Monitor During Collection
- QA Tool
How Did Process Evolve?

- Started out with individual queries
- Contract with APTech
  - Checked distress ratings
  - Document process
  - Combine into one process/interface
- Evolved into QA Tool
Why Use A Tool?

- **Lots of data**
  - 8,000 miles collected every 0.01-miles or **800,000 records annually**

- **65 data fields**
  - 10 supplied by ODOT in shell
  - 55 collected by contractor

- **800,000 x 65 = 52 million pieces of data annually!**
The QA Tool - What is It?

1. **QA Tool**
   - An interface/program

2. **Condition Database**
   - Shell filled in by the contractor

3. **QA Database**
   - ODOT-info tables
   - Tables for tracking results
How it Does it Work?

1. QA Tool

2. PMS
   Condition Database

3. QA Database
   ODOT-Info Tables
   Utilities Tables
   Tracking Tables

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QA Tool – The Interface

Oklahoma Department of Transportation

PMS Data Quality Assurance (QA) Investigator

This tool provides the Oklahoma Department of Transportation (ODOT) with a systematic approach for the conduct of their quality assurance (QA) procedures to check automated data collection results.

Step 1. Establish Database Link
Prior to conducting QA checks, the database (DB) manager must format the condition DB on the server. Once complete, each user must first link to the database using the "Establish QA Database Link" button.

QA Database Link: C:\usr2\Planning\PMS\APTech\QADatabase.mdb

Step 2. Select Division
Select the division on which to run distress checks.
Division: 1

Step 3. Preliminary Checks
Conduct Preliminary Checks

Step 4. Sensor Data Checks
Conduct Sensor Data Checks

Step 5. Distress Checks

- Distress Check Type
  - AC or COMP Distress Data
  - JCP Distress Data
  - CRCP Distress Data
  - Special Checks

- AC/Composite Pavement Distress Category
  - ALL AC/COMP DISTRESS GROUPS
    - Transverse Cracking
    - Alligator Cracking
    - Miscellaneous Cracking
    - Raveling
    - Patching

Check: Hide Ignored Values
Status: Idle
Generate Category Report

Compact Database
It is recommended that the database be compacted often to control database size. Please be patient during this process.
QA Database

ODOOT Tables

- All_Sections
  - Section lengths
  - Section IDs
- BegSectionGPS
  - Coordinates of each beginning point
- Misc_QCData
  - Number of bridges in each section
- Rail_Crossings
  - Location of each RR crossing
Utilities Tables

- Data Types Table
  - What is the field supposed to be?
- GlobalDatabaseInfo
  - Stores links to the QA Tool
- RangeInputs
  - Expected highs and lows for sensor and distress data
We investigated and want to ignore an error.

- **Summary Table**
  - What has passed the checks and what hasn’t

- **Ignored Values**
  - We investigated and want to ignore an error
1. Divide up database
   - By field divisions
   - More manageable size
   - Easier to keep track

2. Set up the QA Tool (link the tables)

3. Do the Checks
QA Tool Detail Process

- Setup
  - Create Ignored
- Check
  - Preliminary Checks
  - Sensor Checks
  - Distress Checks
  - Misc Checks
- Summarize
  - Resolve Data Problems
  - Summarize Results in QC/QA Report
QA Tool – Getting Started

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Select the division on which to run distress checks.

Division: 1

Step 3. Preliminary Checks

Conduct Preliminary Checks

Step 4. Sensor Data Checks

Conduct Sensor Data Checks

Step 5. Distress Checks

Distress Check Type

- AC or COMP Distress Data
- JCP Distress Data
- CRCP Distress Data
- Special Checks

AC/Composite Pavement Distress Category

- ALL AC/COMP DISTRESS GROUPS
  - Transverse Cracking
  - Alligator Cracking
  - Miscellaneous Cracking
  - Raveling
  - Patching

Hide Ignored Values

Status: Idle

Generate Category Report

Compact Database

It is recommended that the database be compacted often to control database size. Please be patient during this process.
Set Up Database Links

**Database Utilities**

- **Step 1:** Establish the link to the "QA database"
  - QA Database Path: `C:\usr2\Planning\PMS\APTech\QADatabase.mdb`
  - 'All Sections' table: `2005_All_Sections`
  - 'MiscQCData' table: `tblMisc_QCData`
  - 'RailCrossings' table: `tblRail_Crossings`
  - 'BegSectionGPS' table: `tblBegSectionGPS`
  - 'RangeInputs' table: `RangeInputs`
  - Status: Complete

- **Step 2:** Establish the link to the condition database
  - Condition Database Path: `C:\usr2\Planning\PMS\APTech\2005_Div8.mdb`
  - 'Condition' table: `Div_8`
  - Status: Complete

- **Step 3:** Create the 'IgnoredValues' and 'SummaryTables' in the QA Database
  - Create and Link 'IgnoredValues' and 'SummaryTable' Tables
  - Status: Complete

**Database Manager Tools**

- Database Manager Password Setup
  - Use these controls to change the database manager password.
  - Current password: "odoc"
  - New password: [Input]
  - Re-enter new password: [Input]
  - Save Password

- Set Valid Variable Data Ranges
  - Set Valid Variable Data Ranges
QA Tool – Start the Checks

Oklahoma Department of Transportation

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Step 2. Select Division

Select the division on which to run distress checks.

Division: 1

Step 3. Preliminary Checks

Conduct Preliminary Checks

Step 4. Sensor Data Checks

Conduct Sensor Data Checks

Step 5. Distress Checks

AC or COMP Distress Data
JCP Distress Data
CRCP Distress Data
Special Checks

AC/Composite Pavement Distress Category

ALL AC/COMP DISTRESS GROUPS

- Transverse Cracking
- Alligator Cracking
- Miscellaneous Cracking
- Raveling
- Patching

- Hide Ignored Values

Status: Idle

Generate Category Report

Compact Database

It is recommended that the database be compacted often to control database size. Please be patient during this process.
Preliminary Checks

Preliminary Checks

Preliminary Checks check general pavement section information. The summary table below provides information regarding which checks have been conducted for each division. Using the Export GPS Information button at the bottom of the screen, the user can create a spreadsheet summary of the GPS failed information.

<table>
<thead>
<tr>
<th>Initial Checks for All Divisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check that 'Division' values in the distress table are valid.</td>
</tr>
<tr>
<td>Checks the data types of the fields in the distress table.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Division Check</th>
<th>Status: Passed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Types Check</td>
<td>Status: Passed</td>
</tr>
</tbody>
</table>

Preliminary Checks By Division

Current Division: **8**

<table>
<thead>
<tr>
<th>Check Type</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODOT Supplied Fields</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Passed</td>
</tr>
</tbody>
</table>

Note: Checks of 'ODOT Supplied Fields' must be completed before continuing with the additional checks below.

<table>
<thead>
<tr>
<th>GPS Blanks</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Long/Lat Difference</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPS Duplicates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pavetype/Surface</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Events</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geometric Values</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CtlSect Grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visidata Fields</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Export GPS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Okla. Dept. of Transportation
## Preliminary Checks of ODOT Supplied Fields

Click on each of the buttons below to run preliminary checks on the different ODOT supplied fields. Please be patient as many of these checks may take 5 to 10 minutes to complete for large condition databases.

### Current Division: 8

<table>
<thead>
<tr>
<th>Check Type</th>
<th>Status of Check By Division</th>
</tr>
</thead>
<tbody>
<tr>
<td>NLF_ID Check</td>
<td>Passed</td>
</tr>
<tr>
<td>CtlSect Check</td>
<td>Passed</td>
</tr>
<tr>
<td>Direction Check</td>
<td>Passed</td>
</tr>
<tr>
<td>Chainage Check</td>
<td>Passed</td>
</tr>
<tr>
<td>GRP Check</td>
<td>Passed</td>
</tr>
</tbody>
</table>

Checks 'NLF_ID' values in the distress table against the acceptable list of 'NLF_ID' values in the 'tblAll_Sections' table.

Checks 'CtlSect' values in the distress table against the acceptable list of 'CtlSect' values in the 'tblBegSectionGPS' table.

Checks that the 'Direction' values in the distress table are equal to 'S' or 'S'.

Checks that 'Chainage' values in the distress table are > '0' and less than the maximum chainage value for the 'CtlSect'.

Checks that the 'GRP' values in the distress table are equal to 'I', 'N', 'O', 'TI', or 'TN'.
Preliminary Checks

PDO Tool: Preliminary Checks

Preliminary Checks

'Preliminary Checks' check general pavement section information. The summary table below provides information regarding which checks have been conducted for each division. Using the Export GPS Information button at the bottom of the screen, the user can create a spreadsheet summary of the GPS failed information.

Initial Checks for All Divisions
- Check that 'Division' values in the distress table are valid.
- Checks the data types of the fields in the distress table.

<table>
<thead>
<tr>
<th>Division Check</th>
<th>Status: Passed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Types Check</td>
<td>Status: Passed</td>
</tr>
</tbody>
</table>

Preliminary Checks By Division

Current Division: 8

<table>
<thead>
<tr>
<th>Check Type</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDO Supplied Fields</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Passed</td>
</tr>
</tbody>
</table>

Note: Checks of 'PDO Supplied Fields' must be completed before continuing with the additional checks below.

<table>
<thead>
<tr>
<th>GPS Blanks</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Long/Lat Difference</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPS Duplicates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pavement/Surface</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Events</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geometric Values</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ctsfct Grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visidata Fields</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Export GPS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Most Critical

Where are we?

What kind of pavement is it?
Start with location
- Check their beginning GPS vs. ours
- Flag if off by more than 0.05 mi
What Type of Pavement?

- Check Surface (theirs) vs. Pavetype (ours)
  - Resolve discrepancies with video
Sensor Data Checks

The 'Sensor Checks' allow you to check the sensor-related data on a division-by-division basis. The summary table below provides information regarding which checks have been conducted for each division.

<table>
<thead>
<tr>
<th>Current Division: 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control of Ignored IRI Values</td>
</tr>
<tr>
<td>Click the included check box if you want the -1 IRI values to be excluded from the 'Data Range Checks' below.</td>
</tr>
<tr>
<td>□ Ignore -1 IRI Values</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sensor Data Checks</th>
<th>Status of Check By Division</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRI Triplicate Check</td>
<td>1</td>
</tr>
<tr>
<td>Data Range Checks</td>
<td>Errors</td>
</tr>
</tbody>
</table>
Distress Data Checks

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Step 2. Select Division
Select the division on which to run distress checks.
Division: 3

Step 3. Preliminary Checks
Conduct Preliminary Checks

Step 4. Sensor Data Checks
Conduct Sensor Data Checks

Step 5. Distress Checks
Distress Check Type
- AC or COMP Distress Data
- JCP Distress Data
- CRC Distress Data
- Special Checks

AC/Composite Pavement Distress Category
- ALL AC/COMP DISTRESS GROUPS
- Transverse Cracking
- Alligator Cracking
- Miscellaneous Cracking
- Raveling
- Patching

Hide Ignored Values
Status: Idle
Generate Category Report

Compact Database
It is recommended that the database be compacted often to control database size. Please be patient during this process.
### Distress Data Checks

#### Category Check - AC and Composite Pavement Distress

**Transverse Cracking**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Valid Range</th>
<th>Status</th>
<th>Ignore?</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRANSV_1</td>
<td>9</td>
<td>0 to 8</td>
<td>Out of Range</td>
<td></td>
</tr>
<tr>
<td>TRANSV_2</td>
<td>0</td>
<td>0 to 8</td>
<td>Passed</td>
<td></td>
</tr>
<tr>
<td>TRANSV_3</td>
<td>0</td>
<td>0 to 6</td>
<td>Passed</td>
<td></td>
</tr>
<tr>
<td>TRANSV_4</td>
<td>0</td>
<td>0 to 3</td>
<td>Passed</td>
<td></td>
</tr>
</tbody>
</table>

**Miscellaneous Cracking**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Valid Range</th>
<th>Status</th>
<th>Ignore?</th>
</tr>
</thead>
<tbody>
<tr>
<td>MISC_1</td>
<td>52</td>
<td>0 to 53</td>
<td>Passed</td>
<td></td>
</tr>
<tr>
<td>MISC_2</td>
<td>0</td>
<td>0 to 53</td>
<td>Passed</td>
<td></td>
</tr>
<tr>
<td>MISC_3</td>
<td>0</td>
<td>0 to 53</td>
<td>Passed</td>
<td></td>
</tr>
<tr>
<td>Total MISC</td>
<td>52</td>
<td>0 to 53</td>
<td>Passed</td>
<td></td>
</tr>
</tbody>
</table>

**Alligator Cracking**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Valid Range</th>
<th>Status</th>
<th>Ignore?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALLIG_1</td>
<td>0</td>
<td>0 to 53</td>
<td>Passed</td>
<td></td>
</tr>
<tr>
<td>ALLIG_2</td>
<td>53</td>
<td>0 to 53</td>
<td>Passed</td>
<td></td>
</tr>
<tr>
<td>ALLIG_3</td>
<td>0</td>
<td>0 to 53</td>
<td>Passed</td>
<td></td>
</tr>
<tr>
<td>Total ALLIG</td>
<td>53</td>
<td>0 to 53</td>
<td>Passed</td>
<td></td>
</tr>
</tbody>
</table>

**AC Patching**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Valid Range</th>
<th>Status</th>
<th>Ignore?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACPATCH</td>
<td>0</td>
<td>0 to 536</td>
<td>Passed</td>
<td></td>
</tr>
</tbody>
</table>

**Raveling**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Valid Range</th>
<th>Status</th>
<th>Ignore?</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAVEL</td>
<td>0</td>
<td>0</td>
<td>Passed</td>
<td></td>
</tr>
</tbody>
</table>

Note: The "Total ALLIG" will be blank if one of the corresponding individual values (e.g., ALLIG_1) is blank. This is also the case for the "Total MISC" value.
What’s for the Future?

Based on aggregated data
Sum/average to PMS sections

Logic Checks
e.g., If IRI>120, should see some type of cracking

Year to Year Comparison
What is expected change in values for two years

Check one side against the other on divided