

QA Checking of PMS Condition Database

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Checking Data Quality

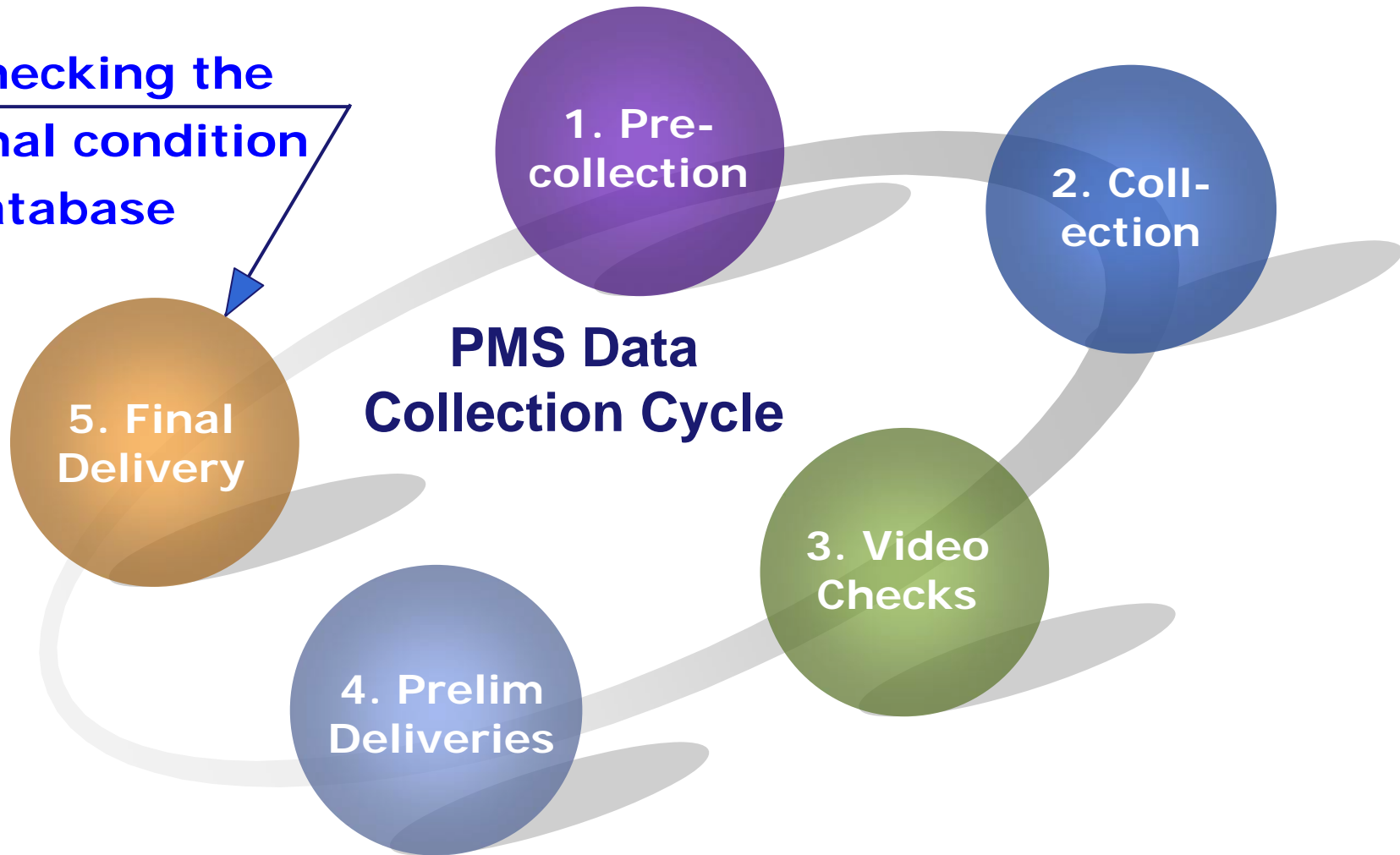
1. Why?

2. What?

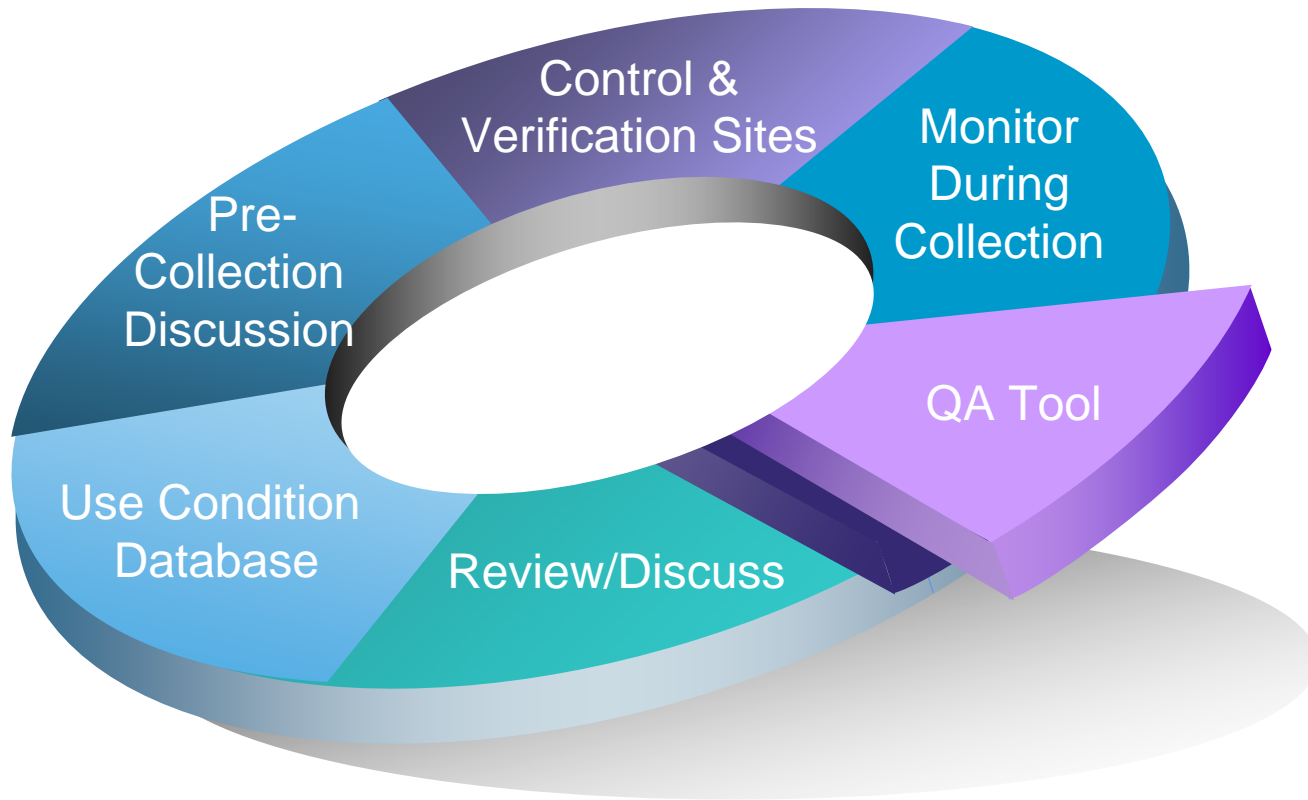
3. How?

Part of Overall QC/QA Process

Checking the
final condition
database



Bringing it All Together





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

❖ $800,000 \times 65 = \underline{\mathbf{52\ million}}$ pieces of data annually!



The QA Tool - What is It?

1. QA Tool

- An interface/program

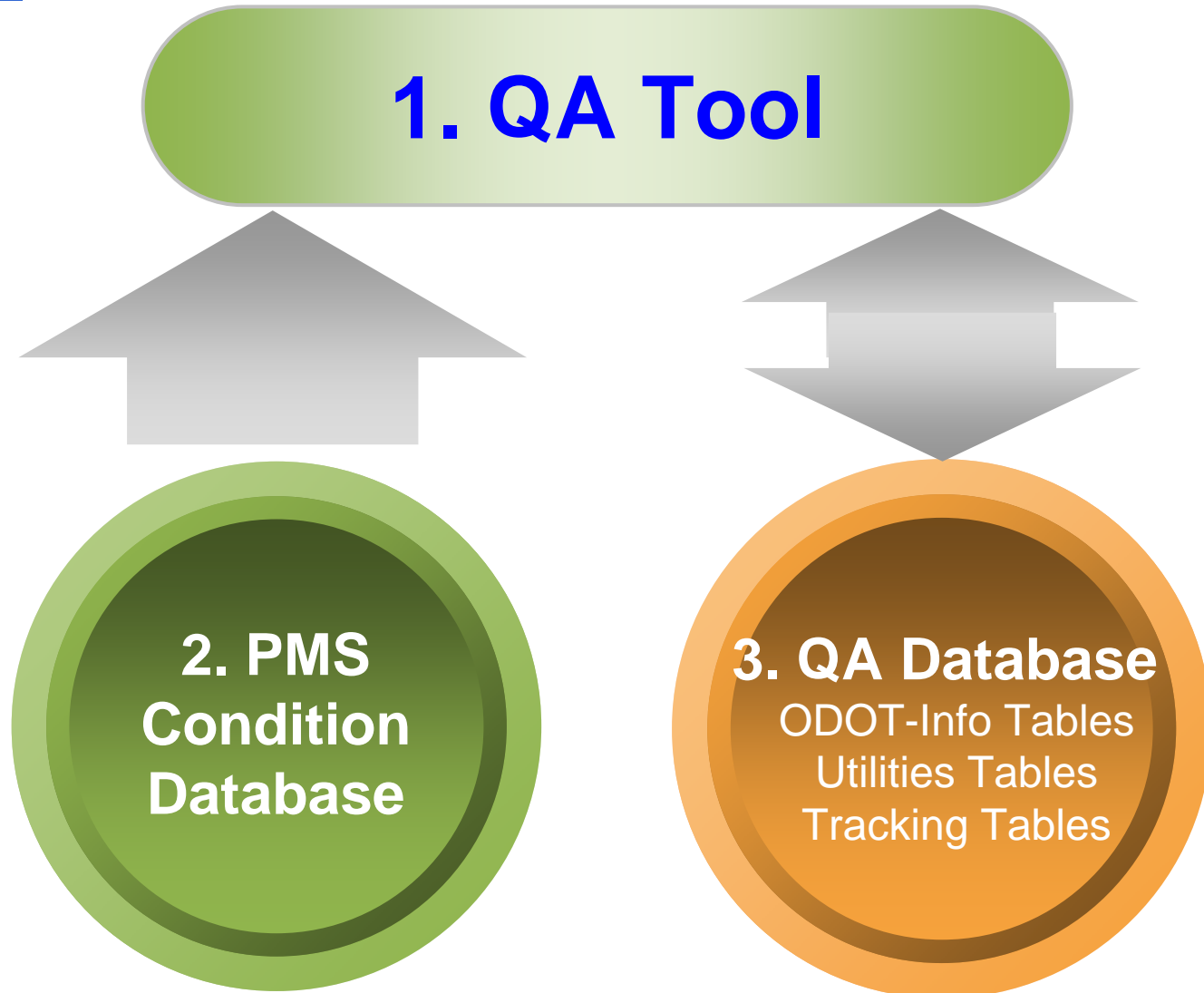
2. Condition Database

- Shell filled in by the contractor

3. QA Database

- ODOT-info tables
- Tables for tracking results

How it Does it Work?



QA Tool – The Interface

ODOT QA Tool: Main Menu

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\PM5\APTech\QADatabase.mdb`

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

Step 3. Preliminary Checks

Step 4. Sensor Data Checks

Step 5. Distress Checks

Distress Check Type

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

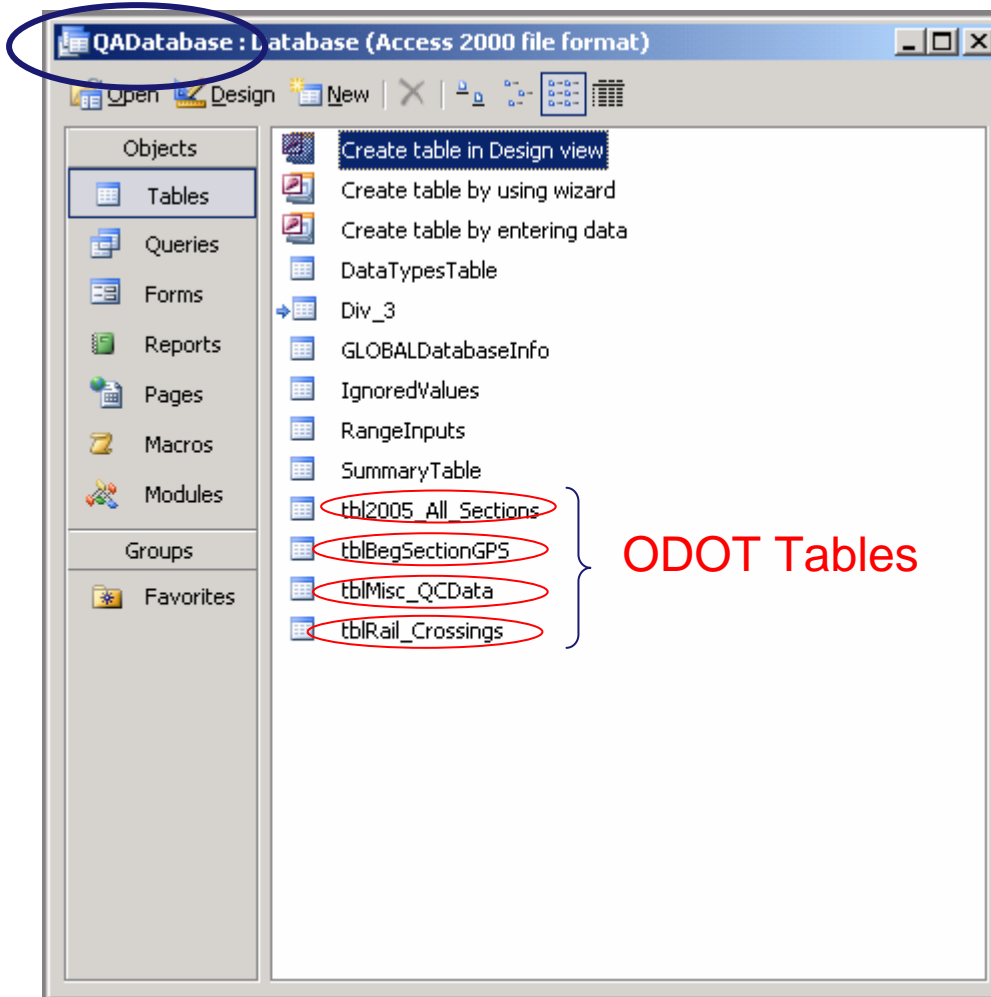
AC/Composite Pavement Distress Category

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

Hide Ignored Values Status:

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

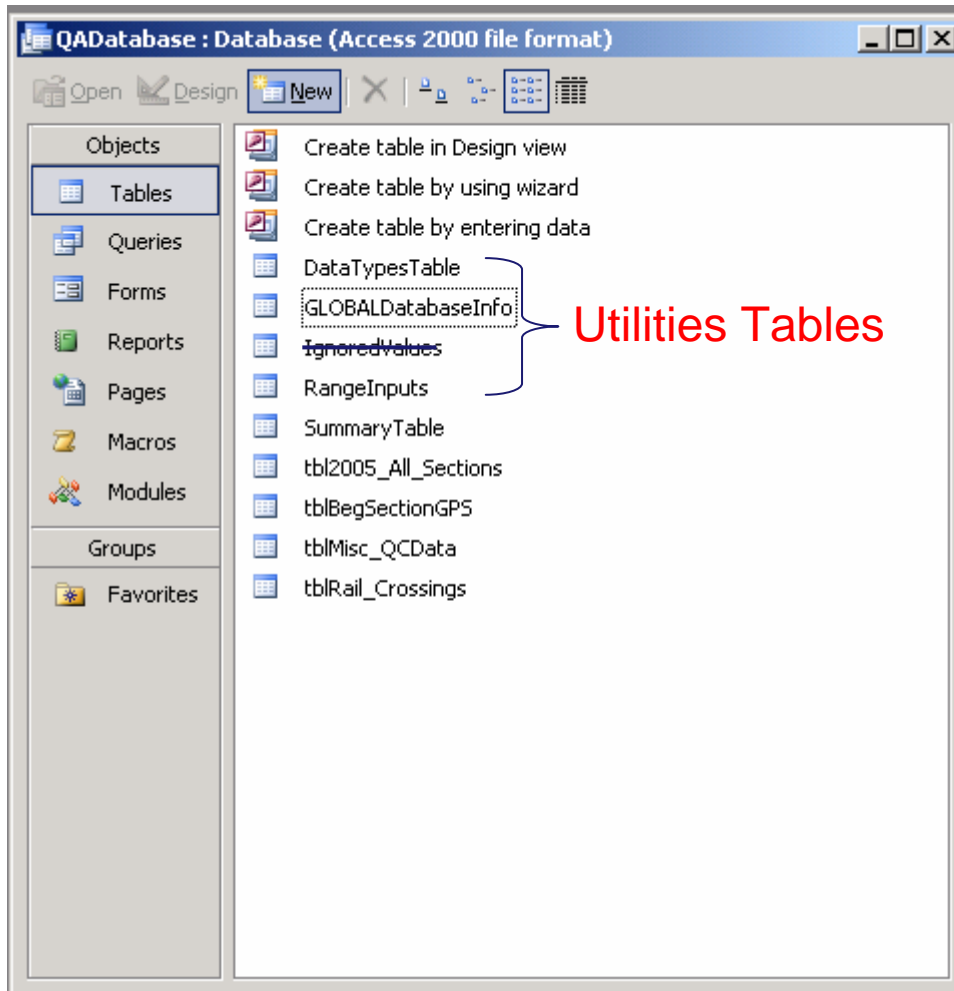
QA Database



ODOT 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

QA Database

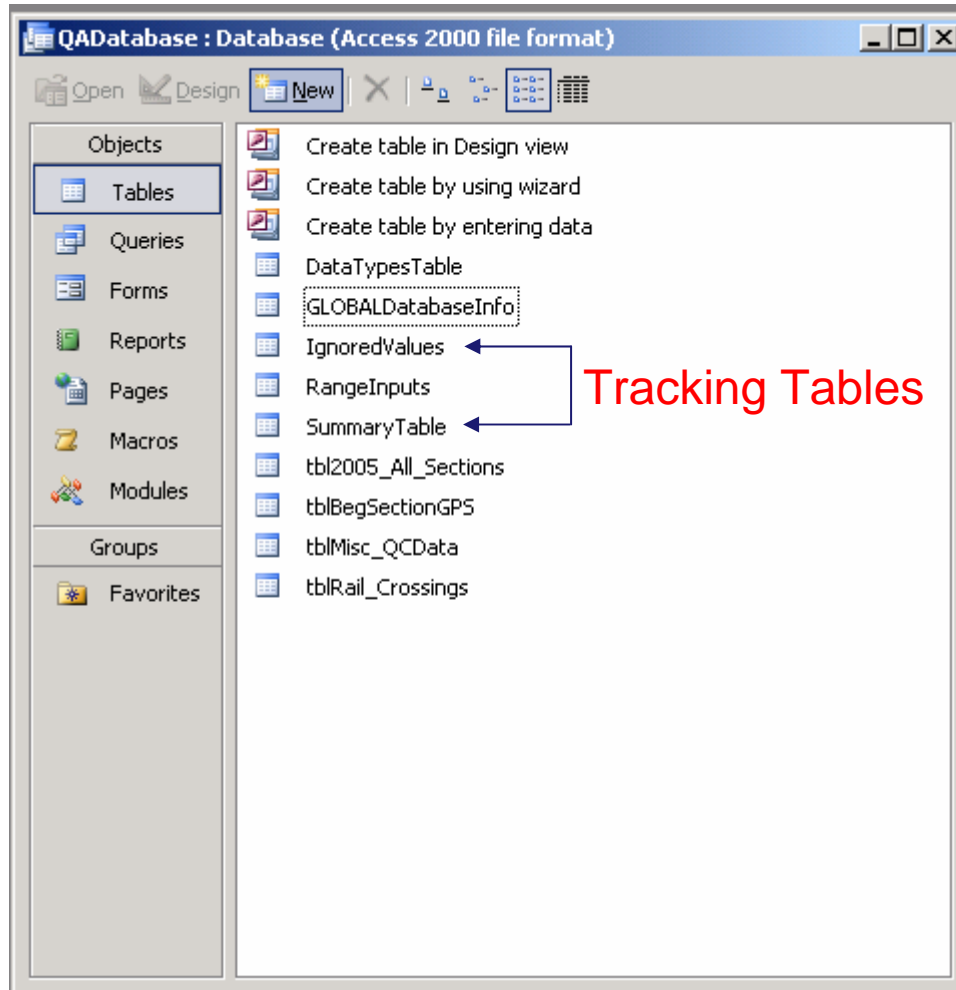


Utilities Tables

- ❖ 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

QA Database

Tracking Tables



❖ Ignored Values

- We investigated and want to ignore an error

❖ Summary Table

- What has passed the checks and what hasn't



Simplified Work Flow

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

Check

Summarize


- Create Ignored

- Preliminary Checks
- Sensor Checks
- Distress Checks
- Misc Checks

- Resolve Data Problems
- Summarize Results in QC/QA Report

QA Tool – Getting Started

ODOT QA Tool: Main Menu



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Establish QA Database Link

QA Database Link: `C:\usr2\Planning\PM5\APTech\QADatabase.mdb`

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

Division:

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
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- Patching

Hide Ignored Values

Status:

Generate Category Report

View Summary 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

ODOT QA Tool: Database Setup Tool

Database Utilities

Step-By-Step Database Setup Procedure

Step 1. Establish the link to the "QA database"

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

Link QA Database

Status **Complete**

'All_Sections' table: 2005_All_Sections
'MiscQCData' table: tblMisc_QCData
'RailCrossings' table: tblRail_Crossings
'BegSectionGPS' table: tblBegSectionGPS
'RangeInputs' table: RangeInputs

Step 2. Establish the link to the condition database

Condition Database Path
C:\usr2\Planning\PMS\APTech\2005_Div8.mdb

Link Condition Database

Status **Complete**

'Condition' table: Div_8

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: "odot"

New password: Re-enter new password:


Save Password

Set Valid Variable Data Ranges

Set Valid Variable Data Ranges

QA Tool – Start the Checks

ODOT QA Tool: Main Menu



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Step 1. Establish Database Link

Establish QA 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\PM5\APTech\QADatabase.mdb`

Step 2. Select Division

Select the division on which to run distress checks.

Division:

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
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AC/Composite Pavement Distress Category

- ALL AC/COMP DISTRESS GROUPS
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Hide Ignored Values

Status:

Generate Category Report

View Summary Report

Compact Database

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

Preliminary Checks

ODOT QA Tool: Preliminary Checks

Preliminary Checks

[Return to Main Page](#)

'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.

Division Check

Status: **Passed**

Checks the data types of the fields in the distress table.

Data Types Check

Status: **Passed**

Preliminary Checks By Division

Current Division: **8**

Status of Check By Division

Check Type	1	2	3	4	5	6	7	8
ODOT Supplied Fields								Passed

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

GPS Blanks								
Long/Lat Difference								
GPS Duplicates								
Pavetype/Surface								
Events								
Geometric Values								
CtlSect Grade								
Visidata Fields								
Export GPS								

ODOT-Supplied Fields

Preliminary Check - ODOT Supplied Fields

Preliminary Checks of ODOT Supplied Fields

Close

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

Current Division: **8**

Status of Check By Division

Check Type	1	2	3	4	5	6	7	8
NLF_ID Check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Passed
Checks 'NLF_ID' values in the distress table against the acceptable list of 'NLF_ID' values in the 'tblAll_Sections' table.								
CtlSect Check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Passed
Checks 'CtlSect' values in the distress table against the acceptable list of 'CtlSect' values in the 'tblBegSectionGPS' table.								
Direction Check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Passed
Checks that the 'Direction' values in the distress table are equal to '5' or '6'.								
Chainage Check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Passed
Checks that 'Chainage' values in the distress table are > '0' and less than the maximum chainage value for the 'CtlSect'.								
GRP Check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Passed
Checks that the 'GRP' values in the distress table are equal to 'I', 'N', 'O', 'TI', or 'TN'.								

Preliminary Checks

ODOT QA Tool: Preliminary Checks

Preliminary Checks

[Return to Main Page](#)

'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.

Division Check

Status: **Passed**

Checks the data types of the fields in the distress table.

Data Types Check

Status: **Passed**

Preliminary Checks By Division

Current Division: **8**

Status of Check By Division

Check Type

ODOT Supplied Fields

	1	2	3	4	5	6	7	8
ODOT Supplied Fields								Passed

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

GPS Blanks								
Long/Lat Difference								
GPS Duplicates								
Pavetype/Surface								
Events								
Geometric Values								
CtlSect Grade								
Visidata Fields								
Export GPS								

Most Critical

Where are we?

What kind of pavement is it?

Check Beginning Point

Preliminary Check - Longitude/Latitude Difference Check

Preliminary Check - Longitude and Latitude Checks Close

Section ID Information
Division CtlSect Direction Chainage NLF_ID

GPS Checks

LONGITUDE

Value	ODOT Control Section Value	Computed Difference	Valid Difference	Status	Ignore?
<input type="text" value="-94.6758"/>	<input type="text" value="0"/>	<input type="text" value="94.675842"/>	<input type="text" value="± 0.0005* of ODOT Value"/>	Out of Range	<input type="checkbox"/>

LATITUDE

Value	ODOT Control Section Value	Computed Difference	Valid Ranges	Status	Ignore?
<input type="text" value="35.64063"/>	<input type="text" value="0"/>	<input type="text" value="35.640633"/>	<input type="text" value="± 0.0005* of ODOT Value"/>	Out of Range	<input type="checkbox"/>

Note: This check only checks records with a Chainage = 0.

Record: of 45

❖ Start with location

- Check their beginning GPS vs. ours
- Flag if off by more than 0.05 mi

What Type of Pavement?

Preliminary Check - Surface Type Check

Preliminary Check - "Surface" vs. "PaveType" Close

Section ID Information

Division CtlSect Direction Chainage

PaveType Provided by ODOT **Ignore ODOT PaveType**

Surface Entered by RoadWare

Expected Surface Expected Surface Type

Events No records with 'Events' codes of '##1', '##2', or '#3#' should be visible.

Record: of 64

- ❖ Check Surface (theirs) vs. Pavetype (ours)
 - Resolve discrepancies with video

Sensor Data Checks

ODOT QA Tool: Sensor Data Checks

Sensor Data Checks

[Return to Main Page](#)

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.

Current Division: 3

Control of Ignored IRI Values
Click the included check box if you want the -1 IRI values to be excluded from the 'Data Range Checks' below.

Ignore -1 IRI Values

Sensor Data Checks

	Status of Check By Division							
	1	2	3	4	5	6	7	8
IRI Triplicate Check			Errors					
Data Range Checks			Errors					



Sensor Data Checks

Sensor Data Check - Data Range Checks

Sensor Data Check Close

Section ID Information

Division CtlSect Direction Chainage

Date

Var	Value	Valid Range	Status	Ignore?
DATE	<input type="text" value="10/20/2005"/>	3/1/2002 to 1/2/2006	Passed	<input type="checkbox"/>

Number of Sensors

Variable	Value	Valid Value	Status	Ignore?
SENSORS	<input type="text" value="31"/>	25	Ignored	<input checked="" type="checkbox"/>

IRI Data

Variable	Value	Valid Range	Status	Ignore?
IRI_RT	<input type="text" value="87"/>	30 to 600; -1	Passed	<input type="checkbox"/>
IRI_LT	<input type="text" value="99"/>	30 to 600; -1	Passed	<input type="checkbox"/>
IRI_AVG	<input type="text" value="93"/>	30 to 600; -1	Passed	<input type="checkbox"/>

Faulting Data

Variable	Value	Valid Range	Status	Ignore?
FAULT_AVG	<input type="text" value="0"/>	0 to 0.8	Ignored	<input checked="" type="checkbox"/>
FAULT_MAX	<input type="text" value="0"/>	0 to 1	Ignored	<input checked="" type="checkbox"/>
FAULT_DEV	<input type="text" value="0"/>	0 to 0.4	Ignored	<input checked="" type="checkbox"/>
FAULT_CNT	<input type="text" value="0"/>	0 to 5	Ignored	<input checked="" type="checkbox"/>

Rutting Data

Variable	Value	Valid Range	Status	Ignore?
RUT_AVG	<input type="text" value="0.21"/>	0 to 1.25	Passed	<input type="checkbox"/>
RUT_MAX	<input type="text" value="0.31"/>	0 to 2	Passed	<input type="checkbox"/>
RUT_1	<input type="text" value="100"/>	0 to 100	Passed	<input type="checkbox"/>
RUT_2	<input type="text" value="0"/>	0 to 100	Passed	<input type="checkbox"/>


Macrotecture Data

Variable	Value	Valid Range	Status	Ignore?
TEXTURE	<input type="text" value="2.681"/>	0 to 2.5	Out of Range	<input type="checkbox"/>

Record: of 39

Distress Data Checks

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AC/Composite Pavement Distress Category

- ALL AC/COMP DISTRESS GROUPS
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Hide Ignored Values Status:

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Distress Data Checks

Distress Data - ALL AC and Composite Pavement Distress

Category Check - AC and Composite Pavement Distress [Return to Main Page](#)

Section ID Information

Division CTSect Direction Chainage

Transverse Cracking					Miscellaneous Cracking				
Variable	Value	Valid Range	Status	Ignore?	Variable	Value	Valid Range	Status	Ignore?
TRANSV_1	9	0 to 8	Out of Range	<input type="checkbox"/>	MISC_1	52	0 to 53	Passed	<input type="checkbox"/>
TRANSV_2	0	0 to 8	Passed	<input type="checkbox"/>	MISC_2	0	0 to 53	Passed	<input type="checkbox"/>
TRANSV_3	0	0 to 6	Passed	<input type="checkbox"/>	MISC_3	0	0 to 53	Passed	<input type="checkbox"/>
TRANSV_4	0	0 to 3	Passed	<input type="checkbox"/>	Total MISC	52	0 to 53	Passed	<input type="checkbox"/>

Alligator Cracking					AC Patching				
Variable	Value	Valid Range	Status	Ignore?	Variable	Value	Valid Range	Status	Ignore?
ALLIG_1	0	0 to 53	Passed	<input type="checkbox"/>	ACPATCH	0	0 to 636	Passed	<input type="checkbox"/>
ALLIG_2	53	0 to 53	Passed	<input type="checkbox"/>					
ALLIG_3	0	0 to 53	Passed	<input type="checkbox"/>					
Total ALLIG	53	0 to 53	Passed	<input type="checkbox"/>					

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.

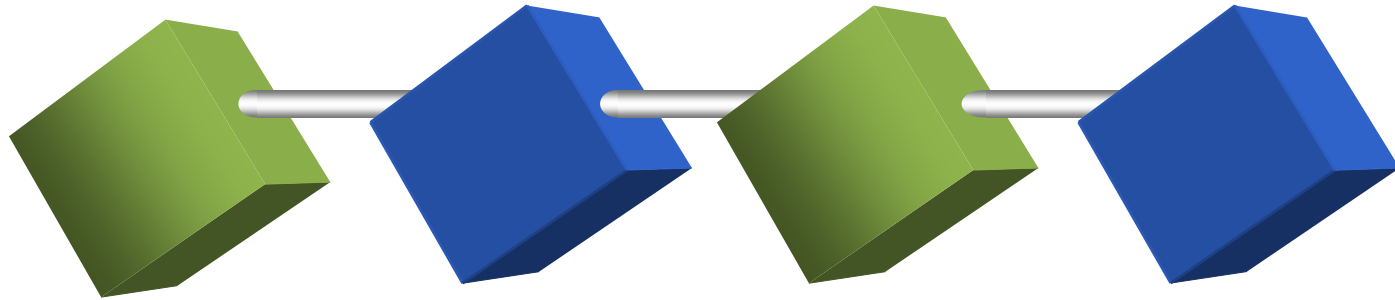
When 'TEXTURE' < 0.75, valid value for 'RAVEL' = 0
 When 'TEXTURE' >= 0.75, valid range for 'RAVEL' = 0 to 53

Raveling				
Variable	Value	Valid Range	Status	Ignore?
RAVEL	0	0	Passed	<input type="checkbox"/>

TEXTURE (for the current section)

Record: of 46

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