# Office of Enterprise Technology

# Transforming the Maricopa Department of Transportation (MCDOT) GIS-based Transportation Asset Inventory System

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Presented By

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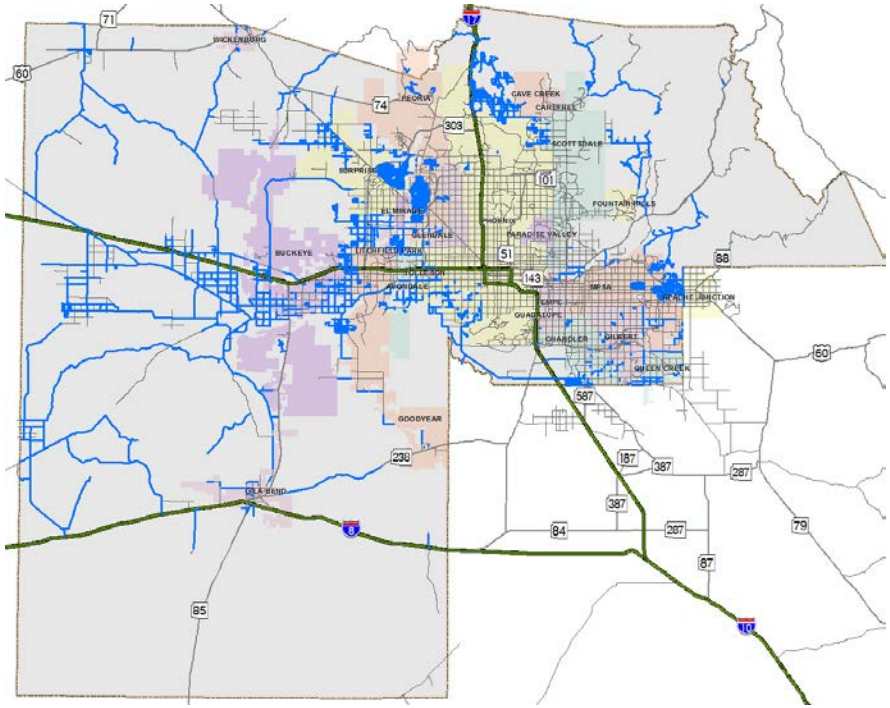
# Introduction

## Topics to be Discussed

- MCDOT's Legacy System
  - System Architecture, Linear Referencing Method, Transportation Asset Inventory
- Need For Transformation
  - Justification
- Transformation Strategy
  - Business Needs Analysis, Data Governance
- Technology Solution
  - Esri Roads and Highways

# About Maricopa County

- Population of over 4 Million
- Area of over 9,200 square miles
- MCDOT maintains over 2,400 miles of roads
- MCDOT has over 400 employees and annual budget of $140M



# Transportation Asset Inventory

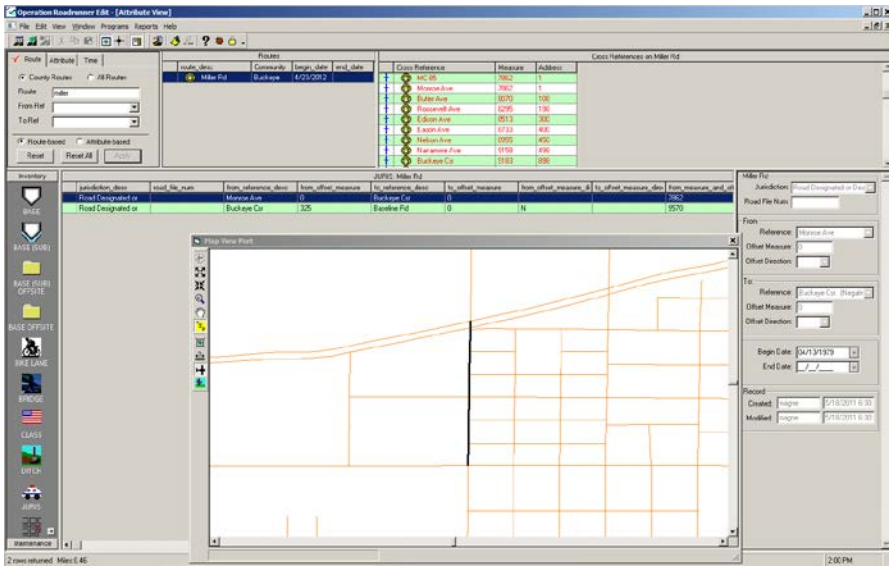
| Quantity | Description |
|---|---|
| 1,251 miles | Local Streets |
| 646 miles | Collector Streets |
| 517 miles | Arterials |
| 67 miles | Park Roads |

| Quantity (Approx.) | Description |
|---|---|
| 50,000 | Signs |
| 11,250 (930 miles) | Curbs |
| 8,200 | ADA Ramps |
| 6,380 (475 miles) | Sidewalks |
| 6,280 | Pipes/Culverts |
| 3,790 | Headwalls |
| 420 | Bridges |
| 200 | Cattle Guards |

# Legacy System: Roadrunner

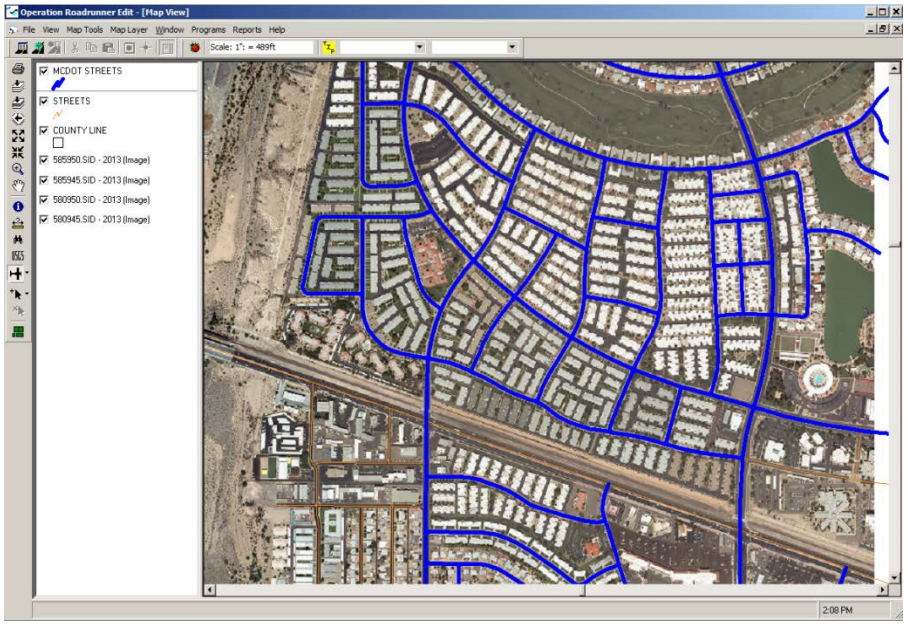
MCDOT "Roadrunner"

- Built in late 1990s
- Manage roadway information (ownership, maintenance district, pavement, structures, etc.)
- Uses a linear referencing system (LRS) to locate roadway data
- 2-Tier System Architecture
  - Desktop Application
  - SQL Server Database



# Legacy System: Roadrunner (cont.)

- Database
  - SQL Server (not a Geodatabase)
  - Role-based Security
  - Shapefiles for viewing
- Desktop Application
  - Very "thick" client
  - Visual Basic 6.0
  - Esri MapObjects 2.4
    for viewing spatial information!
  - Used for viewing & editing
  - Map Viewer supports limited GIS formats (Esri Shapefile and TIFF)



# Linear Referencing System

Event Table -> Feature Class

| Route | Measure | SpeedLimit | *Shape* |
|---|---|---|---|
| Papago St | 350 | 25 | **Point** |
| Papago St | 870 | 35 | **Point** |
| Papago St | 1400 | 45 | **Point** |
| Papago St | 1720 | 40 | **Point** |

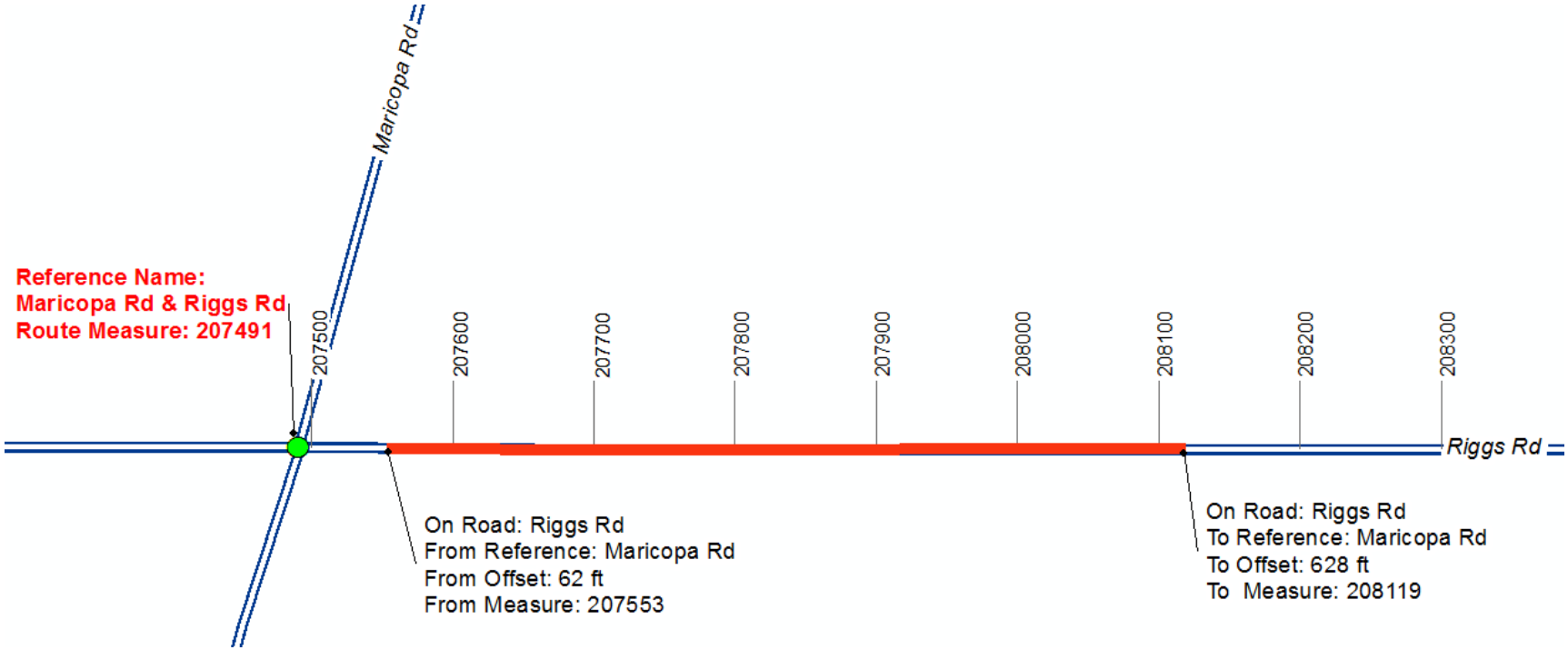
# MCDOT: Linear Referencing Method

- Route Feature Class
  - Each route is a collection of street centerline segments with a common name
  - Measures in linear feet
  - Measures start at 0 going north or east to length of the route shape.
- Reference Locations
  - Commonly known locations along a route
    - Intersections (99%)
    - Mileposts
- Event Tables
  - Point Events are Located by Route and Linear Offset from Reference
  - Linear Events are located by begin and end locations along a route and offset from Reference
  - **Transportation Asset Locations are Represented as Events!**

# Linear Referencing Method (cont.)

Linear Event Table: Roadway Shoulder Type

| Shoulder Type | On Road | From Ref | From Offset | To Ref | To Offset | Begin Measure | End Measure |
|---|---|---|---|---|---|---|---|
| Asphaltic Concrete | Riggs Rd | Maricopa Rd | 62 ft | Maricopa Rd | 628 ft | 207491 + 62 = 207553 | 207491 + 628 = 208119 |



# Need for Transformation

- Outdated Technology
- Cumbersome Data Management
- These issues lead to data integrity issues
- "State of the System" report identified many technical and business issues

# Tipping Point for Transformation

- Aware of the limitations of our legacy system
  - Had presented a State of the System Report to leadership
- Then, in Nov. 2014, we got a new Director of MCDOT – Jennifer Toth.

# Tipping Point for Transformation

- Ms. Toth asked some basic questions:

  What do we own?

  What do we maintain?

  How many "courtesy grades" do we do?

  Where are the primitive roads?

  What is maintained by Inter-Governmental Agreements?

- AND where can she see it?

# Tipping Point for Transformation

The Road Data team addressed each of the key scenarios and determined our ability to identify and view that information.

The team also needed to address the accuracy of Roadrunner data.

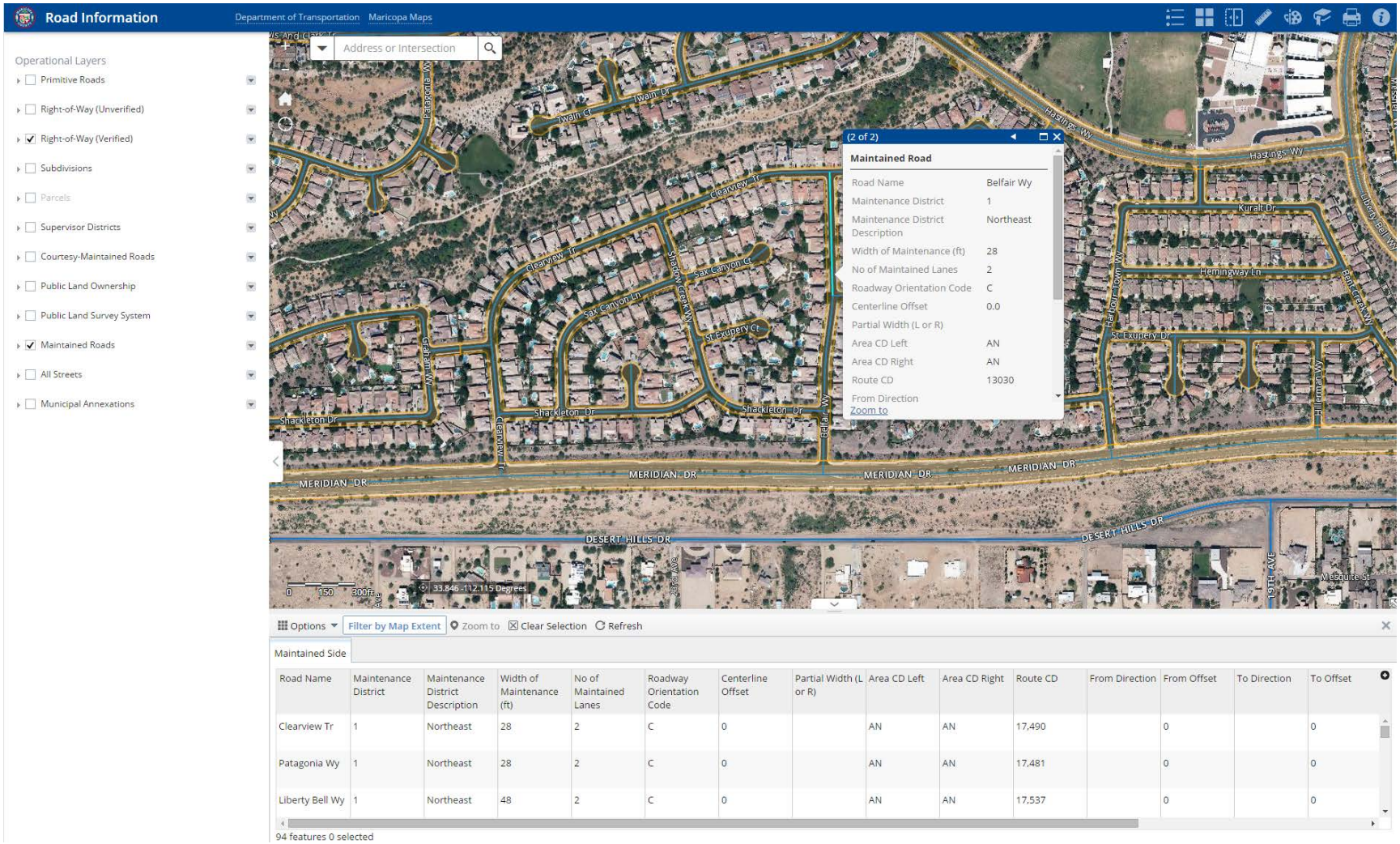
# Tipping Point for Transformation

The Road Data Team worked with GIS to develop a web-based viewer based on ArcGIS technology.

People are now asking when Roadrunner will be retired.

We gained the support we needed for Esri Roads and Highways as critical to making that happen

# Road Information Tool



# Esri Roads and Highways

Investigate Esri Roads Highways Extension to Replace Legacy System

- Robust linear referencing solution that extends the ArcGIS platform
- Manage
  - LRS Network (Street Centerlines, Routes, "Referent" locations
  - Event data (Transportation Assets)
- Reviewed ADOT's Implementation
- Worked with Esri for Proof of Concept

# Esri Roads and Highways

## Key Implementation Tasks

### Database Design

- Migrate existing Event Tables in Legacy that can work in the new system
- Redesign Event Tables to better support business requirements
- Design new Event Tables to support business requirements

### Data Governance

- For every Event Table
  - What does it represent?
  - What business process does it support?
  - Who is responsible for maintaining it?

# Benefits of Roads and Highways

- Spatial information updated instantaneously
- Manage Route system within R&H without breaking Events
- Everything managed in Esri Framework and Geodatabase
- Easily integrated with several Asset Management Systems

# Timeline for Roads and Highways Implementation

- Evaluation and Proof of Concept - **DONE**
- Purchase License - Soon
- Install on Development Environment – February
- Design: Data Model, Data Governance, Workflows, Data Migration – February through July 2016
- Staging and Testing – July through December 2016
- Implementation – January 2017

# Questions?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