



**Transforming the Maricopa County
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
 - Transportation Asset Inventory, System Architecture, Linear Referencing Method,
- Need For Transformation
 - Justification
- Transformation Strategy
 - Business Needs Analysis, Data Governance
- Technology Solution
 - Esri Roads and Highways

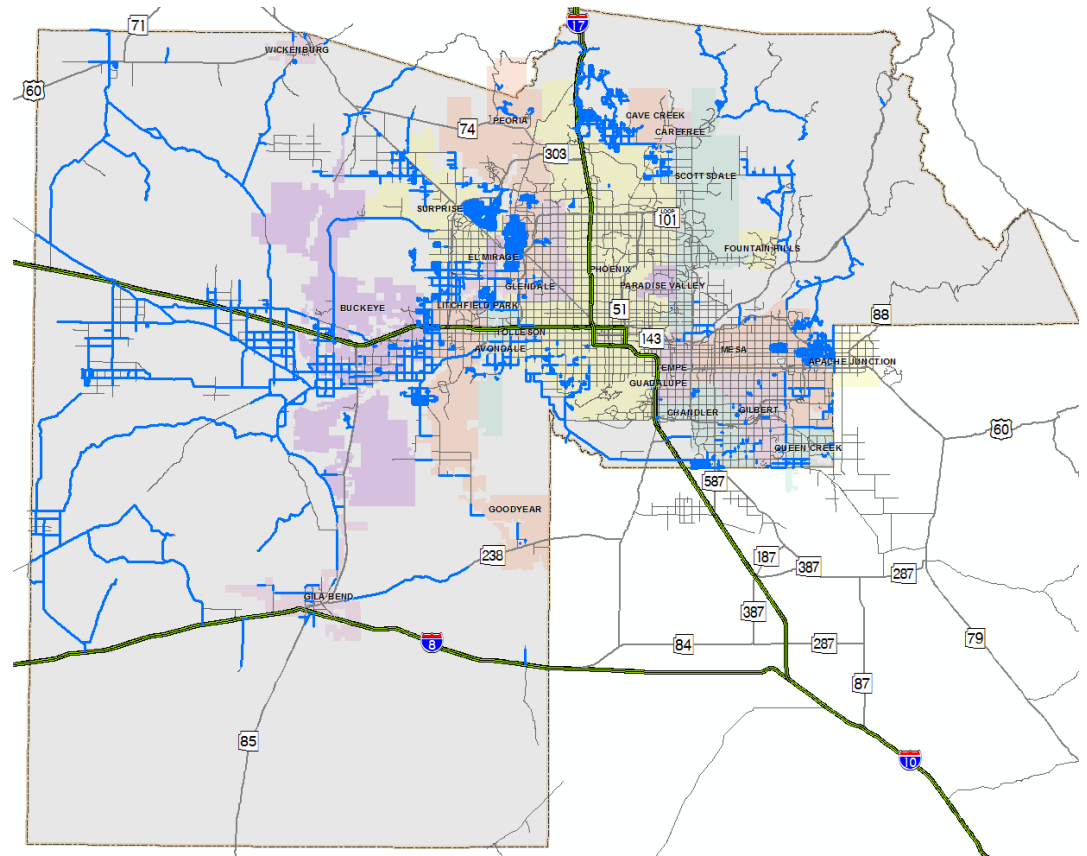
About Maricopa County

- Covers Phoenix Metropolitan Area
- Population of over 4 Million
- Area of over 9,200 square miles



About Maricopa County DOT

- MCDOT maintains over 2,400 miles of roads
 - Only roads in unincorporated county
 - Some roads are “courtesy-maintained”
- MCDOT has over 400 employees and annual budget of \$140M



Transportation Asset Inventory

Breakdown of Roads by Functional Classification

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

Breakdown of Roads by Surface Type

Quantity	Description
1422 miles	Asphalt Concrete
416 miles	Unpaved
544 miles	Chip Seal
100 miles	Other

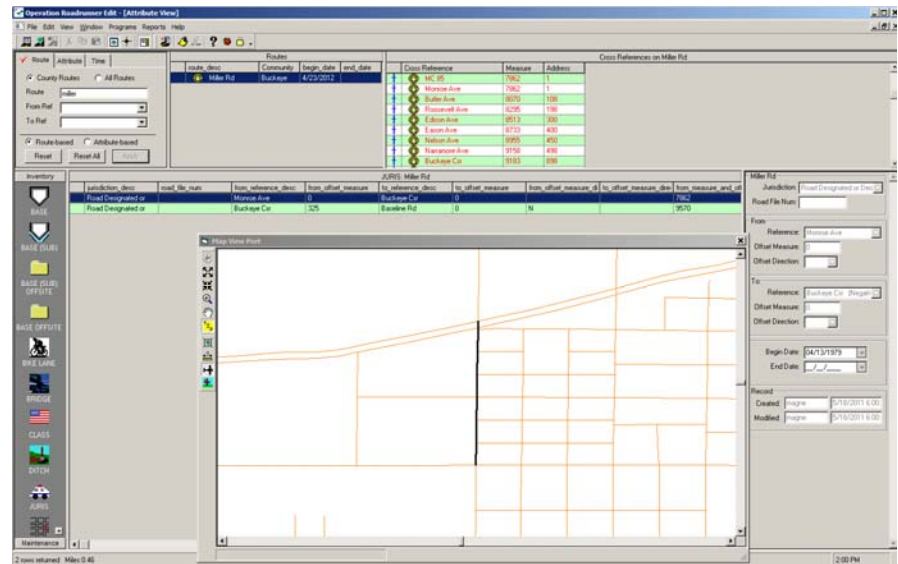
List of Some Transportation Assets

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

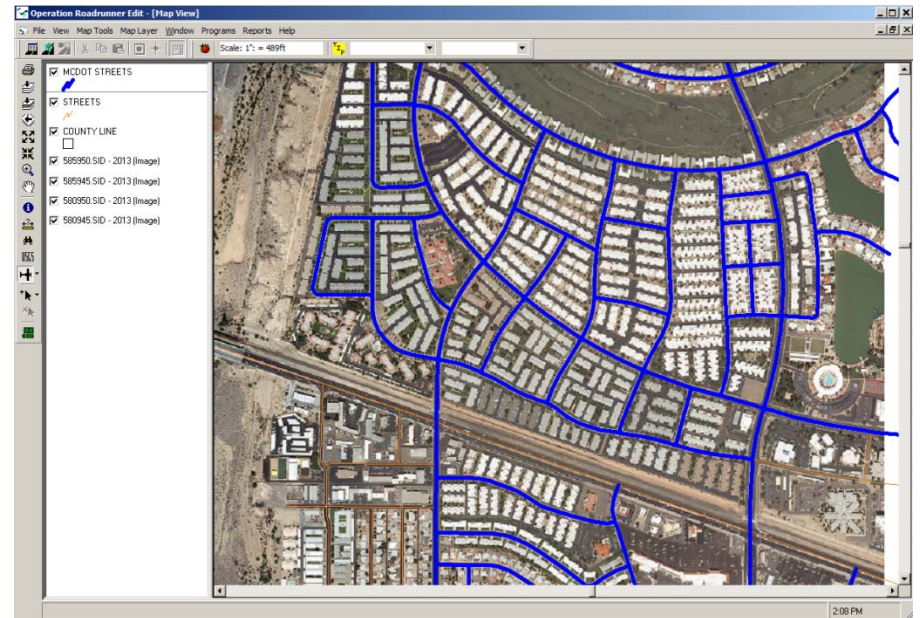
MCDOT “Roadrunner”

- 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)



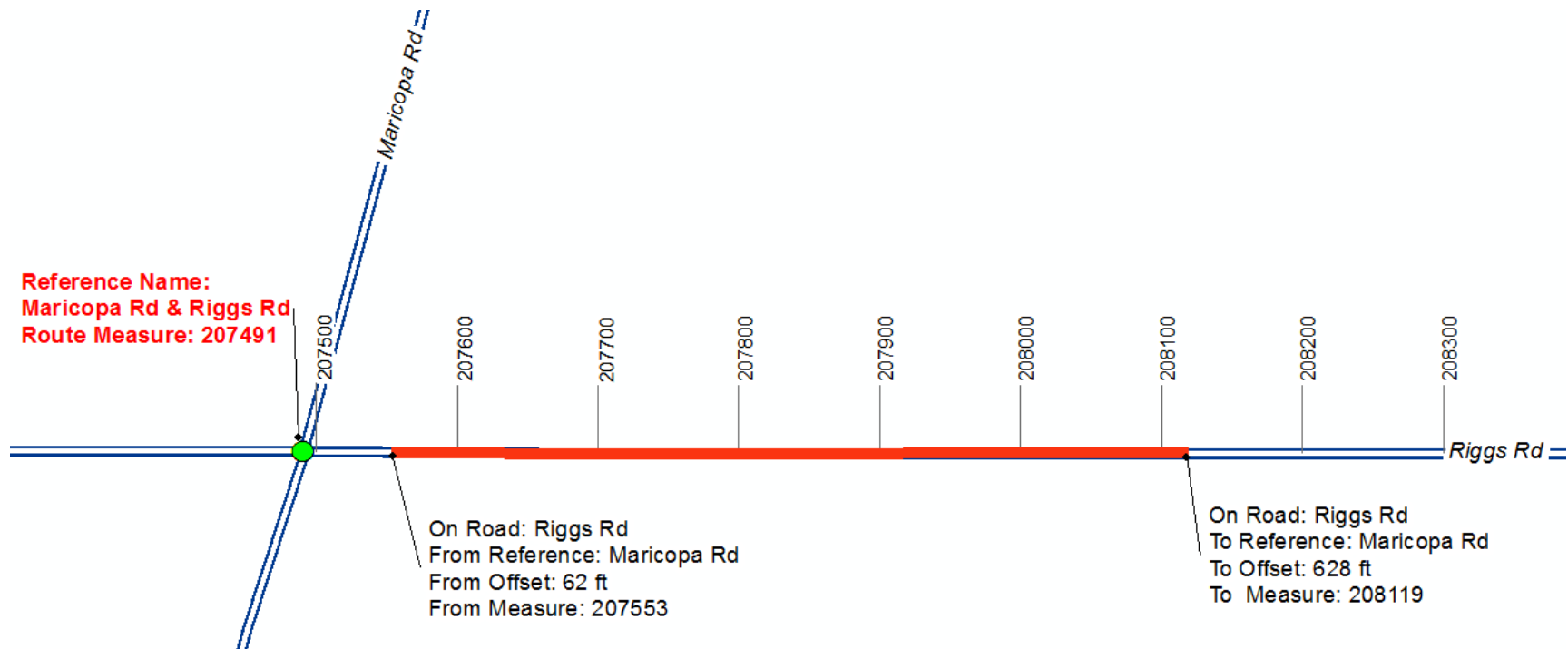
MCDOT: Linear Referencing Method

- 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
- Lack of Integration with Other Systems
- 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
- Mandates from the Director of MCDOT
 - Requested a web-based viewer
 - Chartered a “Road Data Team” with members from MCDOT and GIS

Tipping Point for Transformation

- The Road Data Team worked with GIS to develop a web-based viewer based on ArcGIS technology.
- We gained the support we needed to investigate Esri Roads and Highways
- Determine a retirement date for Roadrunner

Road Information Tool

Road Information Department of Transportation Maricopa Maps

Address or Intersection

Operational Layers

- Primitive Roads
- Right-of-Way (Unverified)
- Right-of-Way (Verified)
- Subdivisions
- Parcels
- Supervisor Districts
- Courtesy-Maintained Roads
- Public Land Ownership
- Public Land Survey System
- Maintained Roads
- All Streets
- Municipal Annexations

Maintained Road

Road Name	Belfair Wy
Maintenance District	1
Maintenance District	Northeast
Description	
Width of Maintenance (ft)	28
No of Maintained Lanes	2
Roadway Orientation Code	C
Centerline Offset	0.0
Partial Width (L or R)	
Area CD Left	AN
Area CD Right	AN
Route CD	13030
From Direction	
Zoom to	

Options Filter by Map Extent Zoom to Clear Selection Refresh

Road Name	Maintenance District	Maintenance District Description	Width of Maintenance (ft)	No of Maintained Lanes	Roadway Orientation Code	Centerline Offset	Partial Width (L or R)	Area CD Left	Area CD Right	Route CD	From Direction	From Offset	To Direction	To Offset
Clearview Tr	1	Northeast	28	2	C	0		AN	AN	17,490		0		0
Patagonia Wy	1	Northeast	28	2	C	0		AN	AN	17,481		0		0
Liberty Bell Wy	1	Northeast	48	2	C	0		AN	AN	17,537		0		0

94 features: 0 selected

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**
- Install on Development Environment – **DONE**
- Esri Knowledge Transfer Workshop - **DONE**
- Design: Data Model, Data Governance, Workflows, Data Migration – Now through July 2016
- Staging and Testing – July through December 2016
- Complete Implementation – January 2017

Questions?



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