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Implementing a GIS-Based Pavement Assessment and Management System

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ESRI MUG
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Agenda

- Project Overview
- PAMS Components
- Challenges Encountered
- Next Steps

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Project Background

- Serving Prince George's County DPW&T since 2007
  - Utility Division, Office of Highway Maintenance, Engineering Inspections Services Division, Traffic Safety, GIS
- Project Goals:
  - Determine current condition of County roads
  - Determine immediate and future maintenance & repair requirements of County roads
  - Leverage pavement data to develop roadway projects
- Implement a Pavement Assessment and Management System (PAMS)

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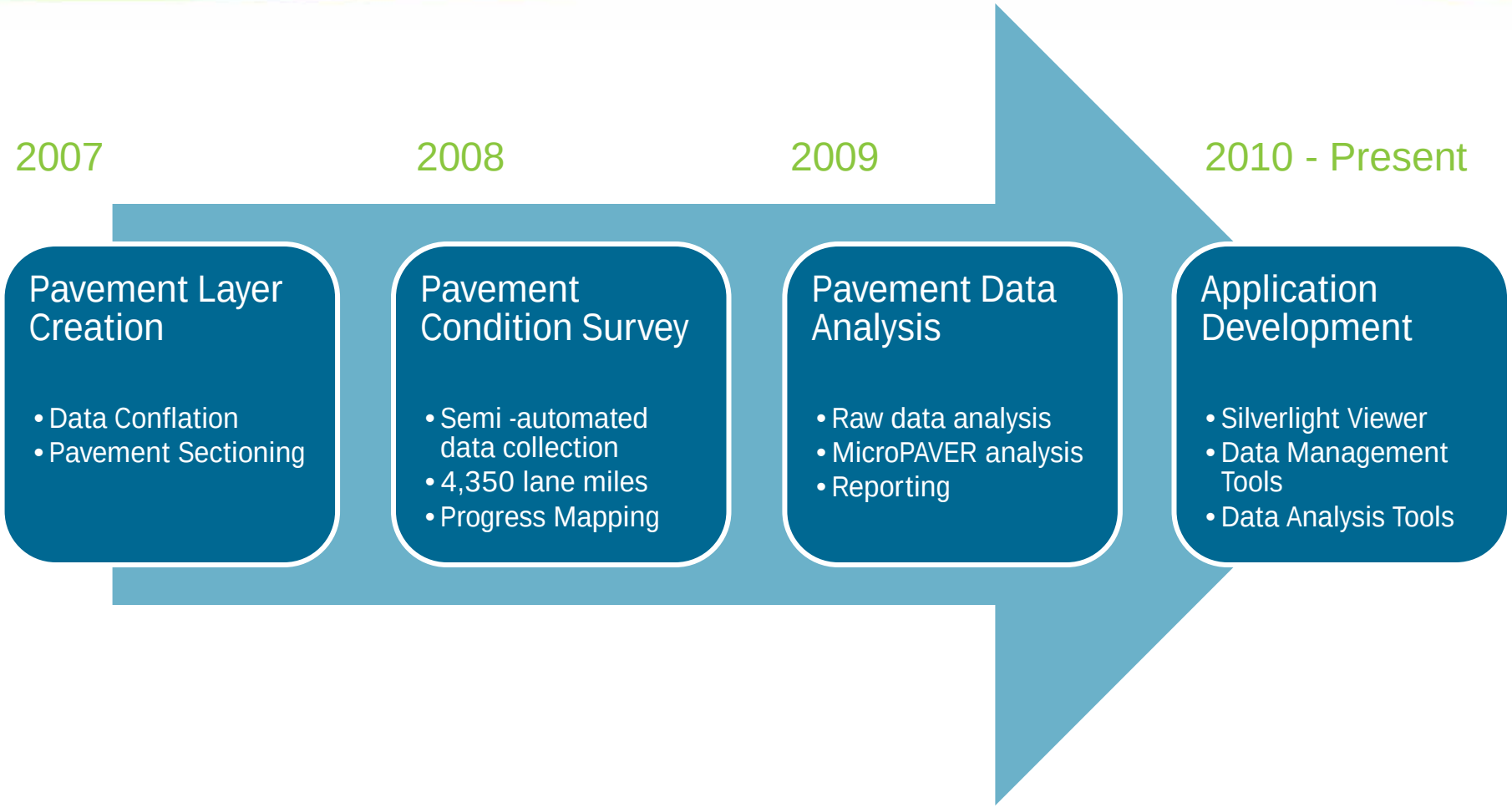
Summary of PAMS Services



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PAMS Pavement Layer Development

- Data Conflation
  - Data requirements driven by MicroPAVER
  - ArcGIS Server editing application for attribute conflation
  - 9 datasets in various formats
- County Edge of Pavement
  - Pre-sectioned; area readily available
- Pavement Sectioning
  - Unique Pavement ID
  - Automated section ID assignment

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Pavement Condition Survey

- Data collection in Spring 2008
- Over 4,350 lane miles
  - County Maintained Roadway ONLY
- Dynatest's Multi-Function Vehicle
  - Pavement Roughness
  - Photos – Pavement & Right of Way
- Post Processing
  - Extract distress data from photos
  - Import to MicroPAVER for assessment

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Pavement Analysis & Reporting

- MicroPAVER Pavement Management System
  - Developed by US Army Corps of Engineers
  - Used by over 600 cities, counties, airports and private consulting firms
  - PAMS Applications:
    - Pavement Condition Index (PCI) determination
    - Budget analysis for State of the Streets Report
    - Identify “Shovel Ready Projects” to receive Stimulus Package funding
  - Challenges:
    - Single user license, Access database, User interface

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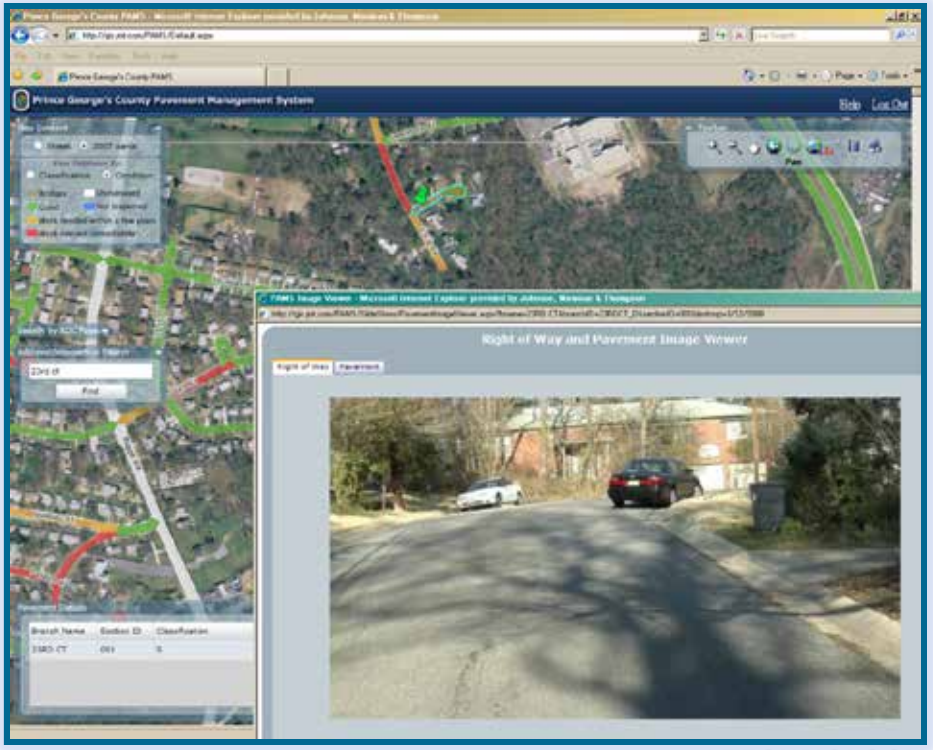
PAMS Web Viewer

- Provides broad access and print functionality of road network data including PCI scores and photos
  - ArcGIS Server
  - Microsoft .NET framework
  - Silverlight API
  - Custom photo viewer
  - Custom map services



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Preserve the Investment

- Incorporate PAMS into daily business processes
  - Schedule A development
  - GIS analysis and reporting
  - Coordination of Utility Activities
- Maintain pavement data
  - Management changes
  - Roadway additions/annexations
  - Work History records
  - MicroPAVER data
- Re-inspect pavement network

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Phase II Objectives

- Maintain pavement data in a central location
  - GIS vs. MicroPAVER
- Upgrade to ArcGIS 10
- Facilitate data management across multiple divisions
  - File geodatabase vs. SDE
  - Desktop tools vs. web tools
- Perform basic condition analysis in GIS
- Create projects in GIS
  - Condition
  - Needs lists

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PAMS Database Design

- Versioned ArcSDE Oracle database
- Related Tables
  - Work History: Many-to-Many
  - Condition (PCI): One-to-Many
  - Edit log: One-to-Many
  - Complaints: Many-to-Many
  - Inspections: One-to-Many
  - Projects: Many-to-Many
- Unit costs look up table

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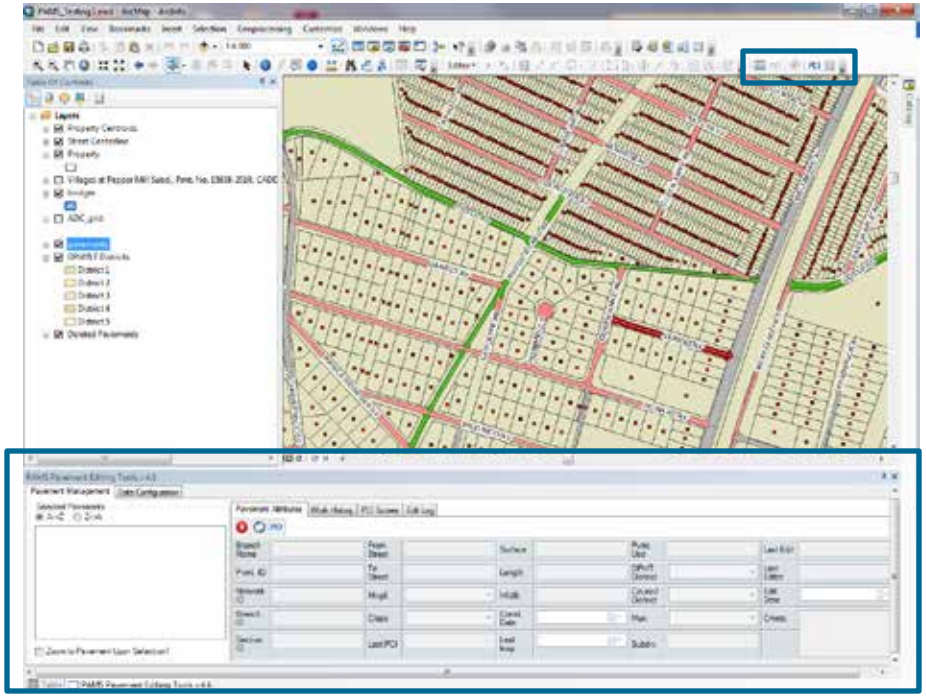
PAMS Desktop Tools

- ESRI Add-In and Extension
- Built with ArcObjects
- Toolbar and PAMS Window
- Data Maintenance Tools
  - Pavement ID Management
  - Work History Management
  - Edit Tracking Capabilities
- Data Analysis Tools
  - PCI Management
  - Complaints and Field Inspections
  - Project Formulation



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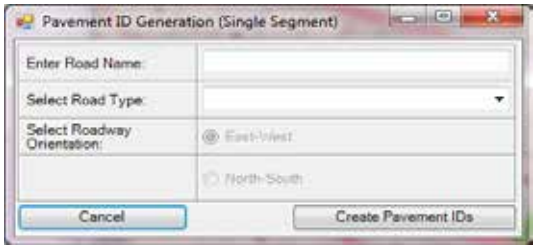
Pavement ID Management

- Pavement ID is the unique identifier for MicroPAVER
  - Alpha-numeric
  - Network ID, Branch ID and Section ID
  - County managed segments only



- Tool derives Branch ID, Section ID and Pavement ID
- Initiate pavement ID generation for new segments
  - Single or multiple segments
- Automate pavement ID generation for split segments
  - Manage related records during splits

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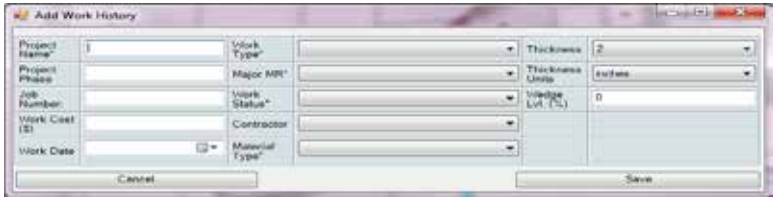
Work History Management

- Add new work history
  - Single or multiple segments
  - Managed or unmanaged segments



- Edit existing work history
- Related data management
  - Many to Many relationship
  - Propagate data due to pavement edits
  - Trigger updates to pavement condition (PCI)
  - Update construction/inspection dates

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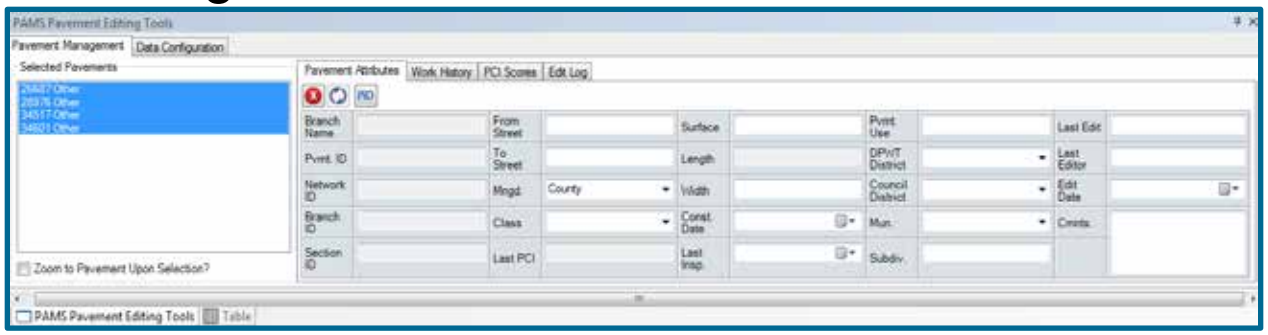
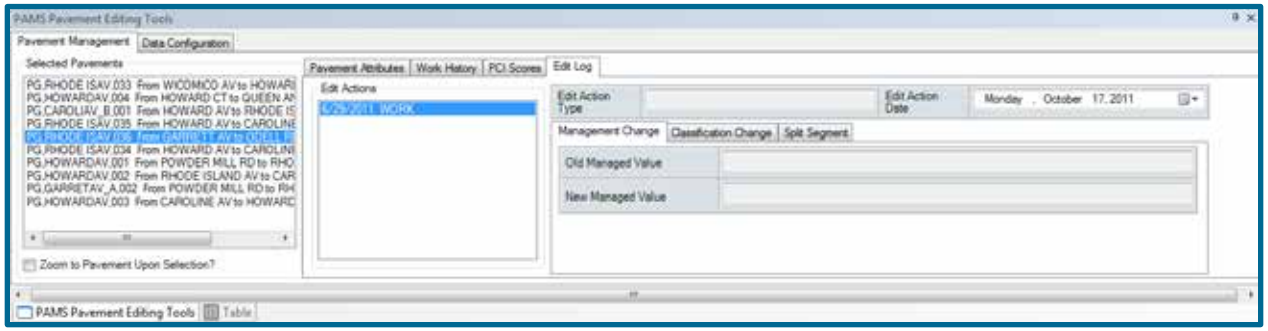
Edit Tracking

- Maintain related tables when changes are made to pavement segment



- Track changes for MicroPAVER



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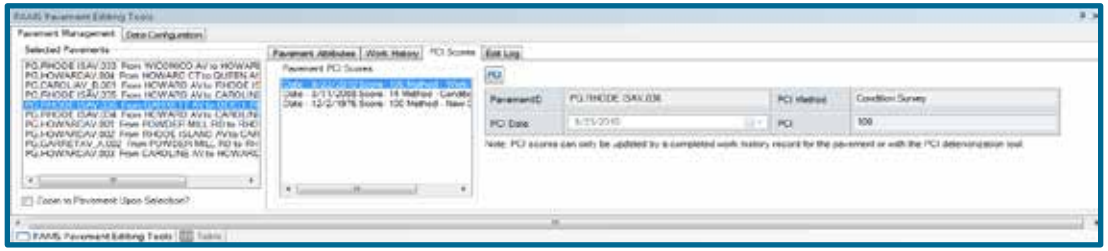
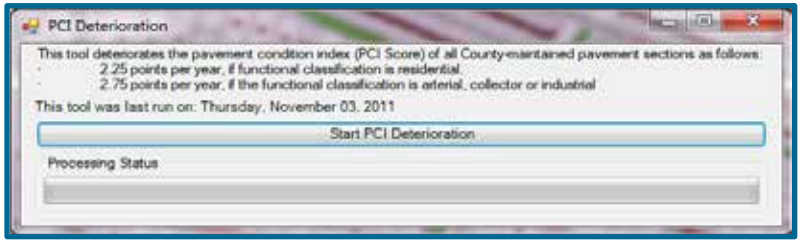
PCI Management

- PCI scores were previously derived from MicroPAVER
- Update PCI when work history is added or modified
  - Reset to 100 if Major Work is completed



- Update PCI when changes are made to management
- Deteriorate PCI annually



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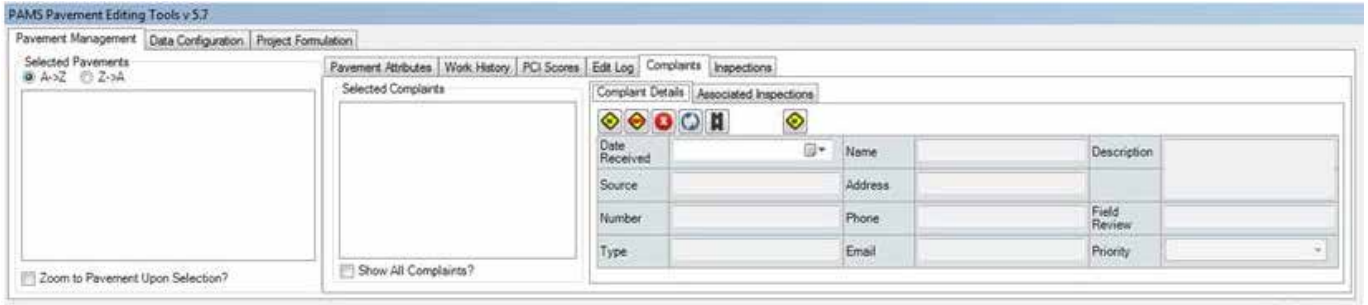
Complaints and Inspections

- Log citizen complaints/requests for work
  - Currently logged in a spreadsheet and manually correlated with pavement data



- Log Field Visit results due to work request
  - Assume field visit/inspection is related to one complaint

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Next Steps

- Develop Project Formulation tools
  - Based on condition (PCI) or complaints
  - Provide recommendations of segments for projects
    - Residential – Assume segments within the same subdivision
    - Non-Residential – connect sections along length of arterial/collector
  - Dynamically calculate the cost of projects
    - Algorithm based on unit costs for rehabilitative processes, area, percentages for contingencies etc.
  - Assign fiscal year budget to projects
    - Cap recommendations
    - Track budgets

Next Steps

- Develop maintenance and rehabilitation strategies
- Perform pavement re-inspection
  - Obtain updated pavement distress data
  - Track pavement conditions over time
  - Refine deterioration formula to better predict future pavement conditions
  - Better assess future funding needs
  - Assess performance of maintenance and rehabilitation activities

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Challenges

- End user buy-in
  - Lack of familiarity with GIS and its applications
  - Budget constraints
- Integrating with MicroPAVER
- Version 9.3.1 / Version 10
- Data and process modeling

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Questions?

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