TECHNOLOGY GROUP

Implementing a GIS-Based Pavement Assessment and Management System

Candice Ottley-Francois, GISP, CAPM GIS Analyst & Project Manager cottley@jmttg.com

ESRI MUG December 7, 2011



- § Project Overview
- **§ PAMS Components**
- Schallenges Encountered
- § Next Steps



Project Background

Serving Prince George's County DPW&T since 2007

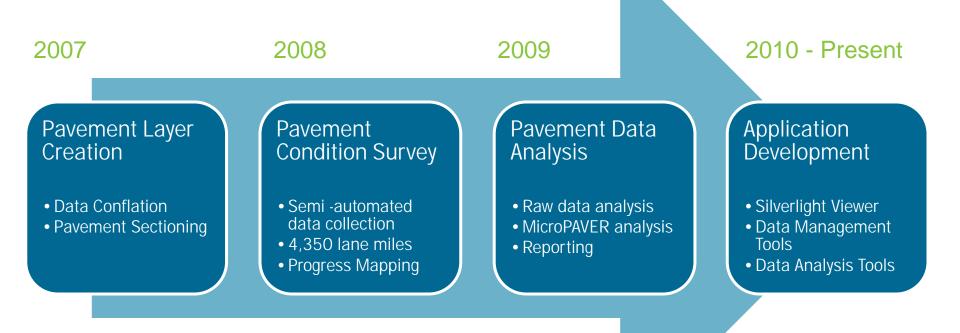
S Utility Division, Office of Highway Maintenance, Engineering Inspections Services Division, Traffic Safety, GIS

§ Project Goals:

- Setermine current condition of County roads
- S Determine immediate and future maintenance & repair requirements of County roads
- S Leverage pavement data to develop roadway projects
- Implement a Pavement Assessment and Management System (PAMS)



Summary of PAMS Services





PAMS Pavement Layer Development

5 Data Conflation

- S Data requirements driven by MicroPAVER
- § ArcGIS Server editing application for attribute conflation
- § 9 datasets in various formats

Sounty Edge of Pavement

§ Pre-sectioned; area readily available

§ Pavement Sectioning

- § Unique Pavement ID
- § Automated section ID assignment



Pavement Condition Survey

§ Data collection in Spring 2008

- Solution 54,350 Iane miles
 - S County Maintained Roadway ONLY
- Substitution States States
 - § Pavement Roughness
 - S Photos Pavement & Right of Way
- § Post Processing
 - S Extract distress data from photos
 - § Import to MicroPAVER for assessment







Pavement Analysis & Reporting

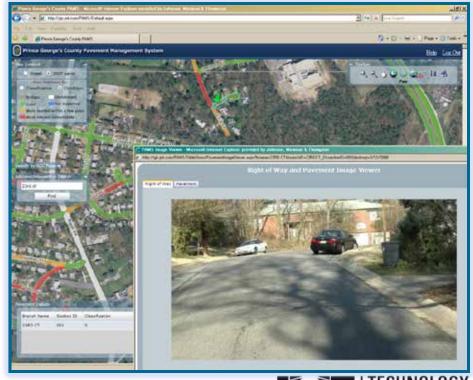
§ MicroPAVER Pavement Management System

- S 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
 - S Identify "Shovel Ready Projects" to receive Stimulus Package funding
- Schallenges:
 - **§** Single user license, Access database, User interface



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
 - S Custom photo viewer
 - S Custom map services





Preserve the Investment

§ Incorporate PAMS into daily business processes

- Schedule A development
- § GIS analysis and reporting
- S Coordination of Utility Activities

§ Maintain pavement data

- § Management changes
- § Roadway additions/annexations
- S Work History records
- § MicroPAVER data

§ Re-inspect pavement network



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
 - S Desktop tools vs. web tools
- § Perform basic condition analysis in GIS
- § Create projects in GIS
 - Scondition
 - § Needs lists



PAMS Database Design

§ Versioned ArcSDE Oracle database

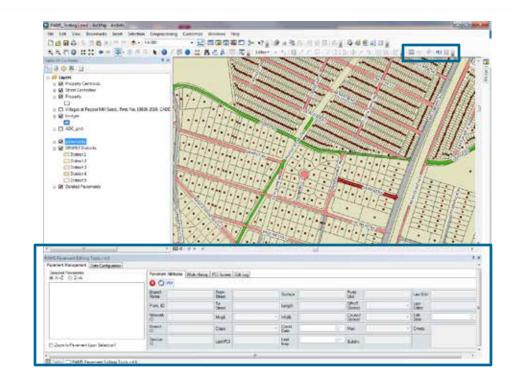
§ Related Tables

- S Work History: Many-to-Many
- S Condition (PCI): One-to-Many
- Sedit log: One-to-Many
- S Complaints: Many-to-Many
- Inspections: One-to-Many
- Projects: Many-to-Many
- § Unit costs look up table



PAMS Desktop Tools

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





Pavement ID Management

Second Payement ID is the unique identifier for MicroPAVER

- § Alpha-numeric
- S Network ID, Branch ID and Section ID
- Sounty managed segments only

| Enter Road Name: | |
|--------------------------------|---------------|
| Select Road Type | - |
| Select Roadway Orientation: | East-Viet |
| | C North-South |

- § 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
 - S Manage related records during splits



Work History Management

Second Se

- Single or multiple segments
- Managed or unmanaged segments
- § Edit existing work history
- § Related data management
 - § Many to Many relationship
 - Series Propagate data due to pavement edits
 - S Trigger updates to pavement condition (PCI)
 - § Update construction/inspection dates

| Project 1 | | Usionh Typer | | Thickness | 2 | 3 |
|---------------|----|-------------------|---|--------------------|----------|---|
| Project | | Major MR* | | Thickness Units | es/fame: | |
| Job Namber | | Voork Statue* | | LATEL | 0 | |
| Work Coet | | Contractor | | | | |
| Work Date | G* | Manucial Type" | - | | | |







Solution States Maintain related tables when changes are made to pavement segment

| svement Management Data Configuration | | | | | | | | | |
|---|-----------------------|------------------------|----------|----------------|----|--------------------|---|----------------|---|
| Selected Pavements | Payement Attributes W | ork History PCI Scores | Edt Log | | | | | | |
| 26377 Offer 26375 Offer 26377 Offer 36371 Offer 36301 Offer | | | | | | | | | |
| | Branch Name | From Street | | Surface | | Pvint. Use | | Last Edit | |
| | Pvmt. ID | To Street | | Length | | DPWT District | • | Lest Editor | |
| | Network ID | Mngd | County + | Width . | | Council Diabiot | • | Edit Date | 1 |
| | Branch ID | Class | | Const. Date | 0. | Mar. | • | Crets | |
| Zoom to Pavement Upon Selection? | Section ID | Last PCI | | Last insp | Q• | Subdiv. | | | |
| 7 | 1 | | | | | | | | |

§ Track changes for MicroPAVER

| Selected Pavements | Payament Athibutes Work Hatory PCI Scores | Edt Log | | | | | |
|--|---|---|--|---------------------|---------------------------|----|--|
| PG RHODE ISAV 033 From WICOMICO AV to HOWARI PG HOWARDAV 004 From HOWARD CT to GUEEN AP PG CAROLIAV, E.001 From HOWARD AV to RHODE IS | Edit Actions | Edit Action Type | | Edit Action Date | Monday , October 17, 2011 | ۵. | |
| PG RHODE ISÄV 035 Frem HOWARD AV to CAROLINE VERVER V SAV 031 Frem HOWARD AV to CAROLINE PG JRIODE ISÄV 031 Frem HOWARD AV to CAROLINE RG HOWARDAY 001 Frem POWDER MILL RD to RHO. PG JARRETAX, JOD2 Frem RHODE ISLAND AV to CAR PG JARRETAX, JOD2 Frem RHODE ISLAND AV to CAR PG JARRETAX, JOD2 Frem RHODE ISLAND AV to CAR | | Management Overge Galasification Change Splt Segnent Old Managed Value | | | | | |
| PG HOWARDAY 503 From CAROLINE AV to HOWARD | | New Manaped V | | | | | |



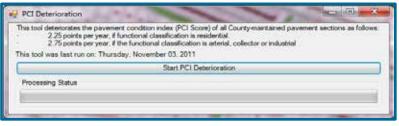
PCI Management

§ PCI scores were previously derived from MicroPAVER

- Update PCI when work history is added or modified
 - Seset to 100 if Major Work is completed

| RAAD Yalaman Editing Toolo | | | | | | | |
|--|---|---|--|--------------|------------------|----|--|
| Farament Management (Dess Carrigantion) | | | | | | | |
| Selected Perments ICO RECOST UNIX 2015 New YORKING AFVe YORKING RELOKATION AND THE NEW YORKING AFVE YORKING RELOKATION AND THE INFORMATION AVVE THEORY IS RELOKATION AND THE INFORMATION AVVE CAROLINE TO RECOST SAVOTE Free YORKING AVVE CAROLINE TO RECOST SAVOTE Free YORKING AVVE CAROLINE RELOKATION AND THE YORKING AVVECTOR AND AVVECTOR RELOKATION AND THE YORKING AVVECTOR AND AVVECTOR RELOKATION AND THE YORKING AVVECTOR AVVECTOR RELOKATION AND THE YORKING AVVECTOR AVVECTOR RELOKATION AND AVVECTOR AVVECTOR AVVECTOR AVVECTOR RELOKATION AND AVVECTOR AVVECTOR AVVECTOR AVVECTOR RELOKATION AND AVVECTOR AVVECTOR AVVECTOR AVVECTOR RELOKATION AVVECTOR AVVECTOR AVVECTOR AVVECTOR RELOKATION AVVECTOR AVVECTOR AVVECTOR AVVECTOR RELOKATION AVVECTOR AVVECTOR AVVECTOR AVVECTOR RELOKATION AVVECTOR AVVECTOR AVVECTOR RELOKATIONAL AVVECTOR AVVECTOR AVVECTOR RELOKATIONAL AVVECTOR AVVECTOR AVVECTOR RELOKATIONAL AVVECTOR AVVECTOR AVVECTOR RELOKATIONAL AVVECTOR AVVECTOR RELOKATIONAL AVVECTOR AVVECTOR RELOKATIONAL AVVECTOR AVVECTOR RELOKATIONAL AVVECTOR AVVECTOR RELOKATIONAL AVV | Parameti Abilistes Work Halpsy PO Science Parameti PO Science | | | | | | |
| | Date: 3/1 V-2008 Soore: 14 Method: Canada Date: 13/2/1876 Soore: 132 Method: Rate: 2 | Paramanto PULINCOE SAV.036 | | PCI statisti | Condition Survey | | |
| | | PC Dave 1:11/2210 III PCL 100 Note: PCI boars can set be updated by 8 campleted work taking recent to the potential or with the PCI determination tool. | | | | | |
| (*) * + | | | | | | | |
| * | | | | | | 11 | |

- § Update PCI when changes are made to management
- Solution State PCI annually





Complaints and Inspections

§ Log citizen complaints/requests for work

Surrently logged in a spreadsheet and manually correlated with pavement data

| Pavement Management Data Configuration Proje | ect Formulation | | | | | | | | |
|--|--|---|--------------------|----------|-----------------|--|--|--|--|
| Selected Pavements @ A->Z © Z->A | Pavement Attributes Work History F | CI Scores Edit Log Com | plants inspections | | | | | | |
| | Selected Complaints | anta Complant Distalis Associated Inspections | | | | | | | |
| | | 000 | | | | | | | |
| | | Date Received | * | Nome | Description | | | | |
| | | Source | | Address | | | | | |
| | | Number | | Phone | Field Review | | | | |
| | | Type | | Email | Priority | | | | |
| 200m to Pavement Upon Selection? | E Show All Complaints? | 1. Second | | divers 1 | 107/0226 TO 10- | | | | |

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





Solution Section Se

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





Solution Strategies
Solution Strategies

- § Perform pavement re-inspection
 - Sobtain updated pavement distress data
 - § Track pavement conditions over time
 - Sefine deterioration formula to better predict future pavement conditions
 - Setter assess future funding needs
 - S Assess performance of maintenance and rehabilitation activities





§ End user buy-in

- S Lack of familiarity with GIS and its applications
- § Budget constraints
- Integrating with MicroPAVER
- § Version 9.3.1/Version 10
- § Data and process modeling







Connect with us...



Web | www.jmttg.com



Twitter | @JMTTG



LinkedIn | JMT Technology Group



Phone | (410) 316-2280



Email | info@jmttg.com

