Benefits of Mobile GIS for Public Works

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NCAFPM 2013
Agenda

- General GIS Concepts
- Mobile GIS Overview
- Benefits of Mobile GIS
- Mobile GIS Project Examples
- Questions
What is GIS?

Geographic Information Systems (GIS):
A computer system capable of capturing, storing, analyzing, and displaying geographically referenced information.
What is GIS?

The goal of GIS is to help people and companies do their work **better, faster** and **cheaper** through:

- **Database Management**
- **Spatial Analysis**
- **Visualization**
Why is GIS Important for Communities?

- Allows organizations to integrate multiple types of data into one master GIS database available to all users

ESRI.com (2009)
What is Mobile GIS?

- Mobile GIS is the combination of GIS software, GPS and mobile computing devices.

- GPS Positioning
- Laser Rangefinder
- ESRI ArcPad Software
- ESRI iPad App
- GPS Enabled Mobile Devices
- Digital Camera
Mobile GIS Software

ESRI ArcPad

ESRI iPAD App

- Mobile version of ArcMap Desktop
- Create, edit, analyze and display GIS data
- External hardware integration
  - Camera
  - Rangefinder
  - GPS receiver
Mobile GIS Hardware

- **Trimble GeoXT**
  - Sub-Meter Accuracy
  - Serves as Data Collector and GPS receiver
  - Windows Mobile Technology
  - Bluetooth capabilities
  - Rugged design
- **iPad/iPhone**
- **Ricoh 500SE Digital Camera**
  - GPS Enabled
  - Bluetooth Enabled
Manual Data Collection Workflow

1. Print:
   - Paper Workmaps
   - Empty Data Input Forms

2. Perform Visual Survey

3. Manually Record:
   - Assessment Data
   - Photo Numbers
   - GPS Location

4. Data Post-Processing
   - Scan Field Sheets
   - Upload Photo Files
   - Decipher Field Notes
   - Input Field Data into Database
   - Create Work Orders

OFFICE      FIELD      OFFICE
Mobile GIS Workflow

1. Check-out data from ArcMap

2. Display, locate and query your data on mobile device

3. Edit and create data with custom forms

4. Enhance data entry with auto-referenced images

5. Check the edits back in to ArcMap

6. Auto-create work orders if needed

Editable layers:
- Inlets
- Manholes
- Outfalls

Reference layers:
- Roads
- Subbasins
- Parcels
- Aerial
- Floodplains
# Collection Time Comparison

<table>
<thead>
<tr>
<th>Manual</th>
<th>Mobile GIS</th>
</tr>
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<tbody>
<tr>
<td><strong>Tasks</strong></td>
<td><strong>Time</strong></td>
</tr>
<tr>
<td><strong>OFFICE</strong></td>
<td></td>
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<tr>
<td>Prepare and Print:</td>
<td>1 hour</td>
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<tr>
<td>• Workmaps</td>
<td></td>
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<tr>
<td>• Empty Datasheets</td>
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<tr>
<td><strong>FIELD</strong></td>
<td>4 hours</td>
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<tr>
<td>Assess and Manually Document:</td>
<td></td>
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<tr>
<td>• Redundant info (worker ID, date, project, problem)</td>
<td>3 hours</td>
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<tr>
<td>• Assessment Data</td>
<td></td>
</tr>
<tr>
<td>• Spatial Location (road, address, subbasin ID, XY)</td>
<td>3 hours</td>
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<tr>
<td>• Photo reference</td>
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<tr>
<td><strong>OFFICE</strong></td>
<td></td>
</tr>
<tr>
<td>Post-Process Field Data:</td>
<td>3 hours</td>
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<tr>
<td>• Scan paper data sheets</td>
<td></td>
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<tr>
<td>• Upload and organize photos</td>
<td></td>
</tr>
<tr>
<td>• Decipher field notes &amp; input data into master database</td>
<td>3 hours</td>
</tr>
<tr>
<td>• Create work orders</td>
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**Total Time:**
- **Manual:** 8 hours
- **Mobile GIS:** 4.5 hours
Benefits of Mobile GIS

• Increases Efficiency
  – Simplify the data collection workflow
  – Decrease hardcopy map production (GREEN!)
  – Minimize data entry time and post processing

• Improves Accuracy
  – Reduce data entry errors
  – Spatially references each data entry point

• Lowers Data Collection and Maintenance Costs
  – Provides link between feature data & service/maintenance/cost histories
  – Automates service request/work order creation

• Completely Customizable for Any Application
Mobile GIS Applications

- Mobile GIS is great for routine tasks and complex projects including:
  - Asset Inventories
  - Asset Management
  - Inspections
  - Incident Reporting
  - Emergency Response

<table>
<thead>
<tr>
<th>Field Mapping</th>
<th>Utility and Infrastructure</th>
<th>Environment</th>
<th>Public Safety</th>
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<tr>
<td>Recording Building Footprints</td>
<td>Centerline Review and Mapping</td>
<td>Forest Boundary Mapping</td>
<td>911 Address Mapping</td>
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<td>Right-of-Way Mapping</td>
<td>Facility Mapping</td>
<td>Trail Mapping</td>
<td>Minefield Mapping</td>
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<td>Based mapping</td>
<td>Volcanic Deposit Mapping</td>
<td>Geochemical Mapping</td>
<td>Military Fieldwork and Mapping</td>
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<td>Street Sign Inventory</td>
<td>Wetlands Delineation</td>
<td>Volcanic Deposit Mapping</td>
<td>Underground Utility Mapping</td>
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<td>Municipal Assets Inventory (GASB 34)</td>
<td>Wetlands Delineation</td>
<td>Volcanic Deposit Mapping</td>
<td>Underground Utility Mapping</td>
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<td>Tree Survey</td>
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<td>Census Data Collection</td>
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<td>Housing Condition Survey</td>
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<td>Cemetery Inventory</td>
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<td>Power Pole Maintenance</td>
<td>Vacant Land Condition Management</td>
<td>911 Address Mapping</td>
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<td>New Equipment Installation</td>
<td>Timber Harvest Management</td>
<td>Minefield Mapping</td>
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<td>Patient Registration</td>
<td>Pavement Condition Assessment</td>
<td>Drainage System Management</td>
<td>Military Fieldwork and Mapping</td>
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<td>Asset Inventory</td>
<td>Task Maintenance</td>
<td>Inspections</td>
<td>Incident Reporting</td>
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<tr>
<td>Recording Installations</td>
<td>Meter Reading</td>
<td>Habitat Studies</td>
<td>West Nile Virus Incidents</td>
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<td>Septic System Inspection</td>
<td>Weed Abatement</td>
<td>Public Nuisance Surveys</td>
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<td>Storage Tank MAPPING</td>
<td>Documentation</td>
<td>Well Sampling</td>
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<td>Wildfire Sightings</td>
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<td>Field Mapping</td>
<td>GIS Analysis</td>
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<td>GIS Data Validation</td>
<td>Route to Locations</td>
<td>Property Damage Assessment</td>
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<td>Property Records Management</td>
<td>Accident Reporting</td>
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<td>Tracing Network Outages</td>
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ESRI.com (2009)
Mobile GIS Applications

• City of Allen Erosion Control Site Inspections
• Incident Reporting & Emergency Response
• Asset Inventory & Assessment
  – City of Dallas Stream Assessments
  – City of Allen Stormwater Inventory
  – Town of Flower Mound Stormwater Inventory
Mobile GIS Applications

Allen Erosion Control Site Inspections

- Easy to fill out digital inspection forms
- Spatial reference for each inspection location
- Reference past inspection histories while in the field
- Fast upload into database
- Auto-email copy to builder/contractor

Convert Paper Forms to Digital Format
Mobile GIS Applications
Allen Erosion Control Site Inspections
After a significant flooding event, there is a large amount of data to be collected in a short amount of time.

- High Water Marks
- Flooded Structures
Mobile GIS Applications
Incident Reporting & Emergency Response
Mobile GIS Applications
Incident Reporting & Emergency Response

FEMA Damage Assessment Forms

Housing Damage
Business Damage
Public Facilities Damage
Mobile GIS Applications
City of Dallas Stream Assessments

- Outfalls
- Channel Modification
- Severe Erosion
- Impacted Buffer
- Stream Crossing
- Trash & Debris
- Utilities in Stream Corridor
- Reach Level Assessment

Stream Assessment Toolbar

[Image of a mobile GIS application interface with various tools and markers]
Mobile GIS Applications
City of Dallas Stream Assessments

Customized data entry forms for each stream condition
Mobile GIS Applications
City of Dallas Stream Assessments

Photos added at each assessment location
Mobile GIS Applications
City of Allen Stormwater Mobile GIS

Allen Mobile GIS Program – Phase 1

Program Goal: Inventory stormwater system and validate spatial location of GIS assets (inlets, manholes, outfalls)

- Comply with NPDES Phase II Stormwater Program Requirements
  - Map stormwater system and catch basins
  - Detect and remove Illicit connections to stormwater system
- Improve Field Data Collection Procedures
Mobile GIS Applications
City of Allen Stormwater Inventory

- Convert City’s NPDES Dry Weather Inspection Form to mobile format
Mobile GIS Applications
City of Allen Stormwater Inventory

- Design custom forms, toolbars and workflows using ArcPad and programming
Mobile GIS Applications
City of Allen Stormwater Inventory

– Provide training and technical support to City staff
Other Mobile GIS Applications

- Tree survey
- Pavement assessment
- Sign inventory
- Sidewalk inventory
- Code compliance
- Violation tracking
Future of Mobile GIS
Smartphone Integration

- Smartphone Integration
  - Bexar County YourGov App

- iPad integration
  - Allow communities to deploy assessment and inspection forms to field crews
ESRI Online

Smartphones

Tablets

Social media

Websites

Browsers

ArcGIS Online

Desktop
Mobile GIS Program Benefits

- Increase Efficiency of Field Data Collection
- Minimize Data Entry Time & Reduce Mistakes
- Simplify Common Workflows
- Requires Minimal Field Training
- Customizable for Specific Tasks
Questions?