GIS Mapping & Documentation of Ancillary Structures

Mack Tozier, PE – AI Engineers
Peter Andrews, PE – AI Engineers
Sam Langeleh - MassDOT
Introduction to Ancillary Structures

- Highway signs, lighting structures, traffic signals, and Intelligent Transportation System (ITS) structures
- MassDOT owns and maintains 32,000+ structures along highway, state, and local roadways
- Inspection program has been rapidly expanded since its inception in late 2012/early 2013
Why Innovate?

TOO SLOW!

Inventory December 2022

REPORT WRITING

FIELD INSPECTION

REP AIR

4D DATABASE

80%

20%

5,600 +/-
Why Innovate? Because you have to.

FIELD MAP APP

REAL TIME

INSPECTION UPDATE MAP

REPORT WRITING

4D DATABASE

REPAIRS
Logistical Challenges

• As of January 2023: ~5600 structures remained for Initial Inspection
  • 6 months to complete inspections
  • High priority put on inspection
  • May cause a delay in report writing and routine maintenance
  • Critical Findings still reported ASAP
  • Impacts owner ability to evaluate & program widespread needs
  • Owner unable to accurately track “real time” progress – relies on monthly progress meetings for updates
How It’s Done Now

Inventory Route → Plan Inspection → Conduct Inspection → Write Report

QA/QC → Submission → Client Comments → Final Submission
<table>
<thead>
<tr>
<th>Structure Type</th>
<th>Route ID</th>
<th>Mile Point</th>
<th>Inspection Status</th>
<th>Inspection Date</th>
<th>Maintenance Needed</th>
<th>Owner</th>
<th>Notes</th>
<th>Created By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double</td>
<td>SR28 NB</td>
<td>124.4</td>
<td>completed</td>
<td>1/17/2023, 12:00 AM</td>
<td>No</td>
<td>MassDOT</td>
<td>Post missing, Transformer style base plate and foundation only visible</td>
<td>Collins Engineers Inc.</td>
</tr>
<tr>
<td>Full span</td>
<td>SR28 SB</td>
<td>125.23</td>
<td>completed</td>
<td>1/17/2023, 12:00 AM</td>
<td>Yes</td>
<td>MassDOT</td>
<td></td>
<td>Collins Engineers Inc.</td>
</tr>
<tr>
<td>Single</td>
<td>SR28 SB</td>
<td>126.05</td>
<td>completed</td>
<td>1/5/2023, 12:00 AM</td>
<td>No</td>
<td>MassDOT</td>
<td></td>
<td>Collins Engineers Inc.</td>
</tr>
<tr>
<td>Other</td>
<td>SR28 SB</td>
<td>126.05</td>
<td>completed</td>
<td>1/5/2023, 12:00 AM</td>
<td>No</td>
<td>MassDOT</td>
<td></td>
<td>Collins Engineers Inc.</td>
</tr>
</tbody>
</table>

**Beginning Efforts**

- Data collection
- Consultant map creation
- Field Maps App (cellphone use)
“Surge” Solution – Digital Field Form

- MassDOT implemented a digital field form for inspection consultants to complete on-site per structure
  - Utilized ArcGIS Field Maps
  - Enable real-time progress tracking
    - Inspection progress
    - Notable Findings
  - Documented GPS coordinate, structure type, District, town, date, firm, etc. (inventory information)
Integration with ArcGIS

• Field Maps directly integrates into ArcGIS
• Leverage power and tools offered by ArcGIS
  • Spatially locate and visualize data
  • Run various analyses
  • Filter, query, and export data
  • Run reports and more!

massDOT
Massachusetts Department of Transportation

Federal Highway Administration
U.S. Department of Transportation
Integration with ArcGIS

Benefits to Consultants/Inspection Crews:

- Improve inspection planning efficiency
- Additional method to track progress and findings, run reports, and isolate target data ahead of the inspection report being submitted
- Instantaneous data collection
- Most up-to-date data available anytime anywhere
- Alleviates the need for physical inventory and identifies proposed and newly constructed structures
Integration with ArcGIS

Benefits to Owner/MassDOT:

• Allows tracking of progress and findings, run reports, and isolate target data ahead of the inspection report being submitted
• Allows for immediate notification of notable findings
• Allows for isolation of critical structures (based on material type, condition rating, specific deficiencies, etc.) to be targeted
Success! – But Room for Improvement

<table>
<thead>
<tr>
<th>PROS</th>
<th>CONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proved viable alternative</td>
<td>Learning curve</td>
</tr>
<tr>
<td>Real-time data collection/tracking</td>
<td>Limited functionality</td>
</tr>
<tr>
<td>Leverages power of ArcGIS</td>
<td></td>
</tr>
<tr>
<td>Improved workflows</td>
<td></td>
</tr>
</tbody>
</table>
Where It’s Going

In-Development
- D-Meter
- Ultrasonic Testing
- Inventory Photos
- Condition Ratings
- Accessibility/Equipment
- Clearance Information

Future
- Complete Virtual Data Collection
- Integration with 4D BMS
In-progress Development – Survey123