Updating a mature enterprise collection system GIS while business continues

Jeffrey Duke, P.E. – Northeast Ohio Regional Sewer District (NEORSD)
Ryan Pulis – Brown and Caldwell
• Formed in 1972
• Serves 62 communities in the Greater Cleveland Metropolitan Area
• 3 WWTP Facilities
• Over 250 miles of interceptor sewers
• 1+ million customers
• Do not own, operate or maintain local sewers - 4,800 miles of sanitary/combined sewer pipes
History of GIS at NEORSD

1996-2000
- Project GIS datasets
- 1st ArcSDE geodatabase (shapefile container)
- 1st web GIS (ArcIMS)

2004-2007
- Enterprise GIS Implementation
- 1st designed geodatabase
- 2nd iteration of web GIS (ArcGIS Server Web ADF)

2007 - 2010
- Evolution
- Geodatabase redesigned
- Significant QAQC

2012
- 3rd iteration of web GIS (AGS & Geocortex Silverlight)
- Interceptor Surveying & Mapping Project (ISM)
Interceptor Surveying and Mapping (ISM) Project – Guiding Principles

Improve spatial accuracy of the GIS
Correct network connectivity
Engage NEORSD staff in resolving problems
Keep GIS up & running
No data merging hassles
ISM - The Work

- GPS Survey
- Connectivity Verification Inspections
- Update the GIS
- Update Plans

ISM
The Challenge – Complex Reality

- Unique Infrastructure – Common Trench/Dividing Wall Manholes
  - Present loops in the geometric network if drawn correctly.
  - Present viewing issues if drawn correctly.

Sanitary / Storm Two Separate Manholes
Sanitary / Storm Dividing Wall Manhole
Storm Over / Sanitary Under Manhole
Complex Reality

- “Blind Junctions”
- Outside drops
- Doghouse drops
- Vortex drops

Field crews’ maps just show 2 dots and a line
ISM – The Technology

**Android Tablets**
- Connectivity Inspection data
- Photos

**Internet Data Services**
- SugarSync
- 4G WiFi Hot-Spot = tablet stays in field

**Esri Geodatabase Replication**
- Multiple editors at multiple agencies
- GIS stays up & running
Android Tablets

• Cheap ($250), easy to use hardware
  • Samsung Galaxy Tab 7.0 Plus tablets

• Digital inspection forms

• GPS-tagged photos
  • Location
  • Connectivity
  • Invert
Durability of Android Tablets

- Same basic hardware and operating system used in millions of cell phone handsets
- Waterproof pouch that fits around the neck
  - Virtually eliminates exposure to moisture
  - Minimizes likelihood of being dropped
  - Touch screen still works well behind plastic
- It passed the 5 year-old daughter durability test
- Waterproof pouch with neck strap provides protection in the field
Field Data
Inspection app – main screen
Choosing a manhole (auto-completes)
Manhole / Inspection details

- Manhole Number: BCA00395
- Inspected By: Kate
- MH Use: STANDARD
- Rim to Invert (ft.): 21.4
- Location Code: Easement/Right of Way
- Comments: 

Pipe Connections | Photos | Done

- Current Time: 12:31 PM
Taking photos (auto-named to include Asset ID and photo type)
Entering pipe connection details

- Clock Position: 3
- Direction: In
- Shape: Circular
- Height (in.): 24
- Width (in.):
- Material: Reinforced Concr
- Flow Type: COMBINED
- Pipe Type: GRAVITY
- Rim To Invert (ft.): 21.4
- Upstream MH ID: BCA00330
- MH ID: BCA00330

Done
Internet Data Syncing Services

• SugarSync.com
  • Cheap - $10/user/month
  • Native app
  • 2-way auto-sync

• Data comes to the data manager

• With 4G Wi-Fi hotspot, tablets stay in the field
Esri Geodatabase Replication

• NEORSD’s GIS has 50+ daily users
• GIS needs to stay in service
• GIS is edited daily
• ISM Team’s edits needed ASAP

Geodatabase replication is the key
Complex Research – Many Sources

- Current GIS
- Plans
- Current inspections
- Past pipe inspections – CCTV lengths
- Past manhole inspections
- Location photos vs. orthos
- Current vs. historic GPS survey
How do you teach new people about this 120-year old system and the history of its data?
ISM – The Challenges

- Geometric network errors
  - Lurking hidden errors prevent synchronization and reconcile/post
- Negates the advantages of replication
- Get your network in order!
ISM – The pay-off

GIS accuracy improved in only 9 months

Eliminated paper-to-digital data conversion

Drastically reduced traditional hardware costs

NEORSD GIS staff engaged throughout

No file exchange/ versioning mayhem

NEORSD Enterprise GIS stays up & running
Any questions?