Using GIS to Enhance Municipal Electric Operations and Meet the Requirements of GASB34

Brian M. Frantz, AICP
Monica A. Day
Howard Luxhoj, P.E.

October 13, 2004
Initial GIS Development

- City contracted with M&E to perform a sewer infiltration and inflow (I/I) study
- City acquired ESRI Software for GIS development
- Project included survey location of:
  - sewer manholes
  - roadway infrastructure
  - utility poles
  - roadway limits, signs and pavement markings
  - fire hydrants
- Project completed in 1999
Release of GASB 34

- Governmental Accounting Standards Board (GASB) Statement Number 34 released in June 1999
- Requires infrastructure inventory for the past 20 years
- Major change in accounting for general fund fixed assets
- Prior to this, most government agencies did not maintain these inventories
- Phase I: inventory and map municipal electric system
City of Painesville
Plan for GIS Implementation

- Developed committee to review requirements of GASB 34
- Requirements prompted development of a fixed asset policy
- GIS was the basis for developing inventories necessary for GASB 34 compliance
- GIS supported a second benefit of asset management for electric operations, system maintenance, and capital improvement planning
Fixed Asset Policy

- Purpose
- Fixed Asset Definitions
- Fixed Asset Classifications
- Networks and Subsystems
- Fixed Asset Valuation
- Fixed Asset Relocations
- Construction in Progress
- Depreciation
- Fixed Asset Verification
Purpose

• Goals of the policy
• Management’s major focus
• City of Painesville’s Policy
  – To facilitate financial statement information
    • Control and accountability
    • Accounting for depreciation
    • Audit compliance
    • Track information technology hardware and software for management purposes
Fixed Asset Definitions

- Define a fixed asset
- Establish reporting thresholds
- Outline reporting policy
- Define an infrastructure asset
Fixed Asset Classifications

- Land
- Buildings
- Improvements other than buildings
- Machinery & equipment
- Construction in progress
- Computer purchases
Networks & Subsystems

- Specify Networks within the entity
- Specify Subsystems within the entity
- Outline relationship between networks and subsystems
- City of Painesville has five networks
  - Roadway
  - Electric Distribution
  - Water Distribution
  - Sanitary Sewer
  - Storm Sewer
Elements of Electric Network

• Distribution
  – System includes infrastructure improvements essential to the safe production and distribution of electricity at the City’s electric generating facility
  – Subsystems of the electric distribution network include:
    • residential transformers
    • industrial transformers
    • poles
    • wires
    • voltage regulators
    • CATV and telecom attachments
Using GIS to Coordinate Information

- Financial Reporting (GASB34)
- Electric Distribution
- Capital Planning
- System Maintenance
- Billing
- Field Coordination

GIS
Building the GIS

- City contracted with M&E to expand the current GIS system
  - Update roadway network
  - Complete utility pole inventory
  - Conduct utility pole connection audit
  - Develop water system network
  - Add the storm sewer system
  - Update the sanitary sewer network
  - Complete traffic signals, signs and marking inventory
City Uses a Phased Approach

- City capitalized on GIS developed in 1999 and 2001 as basis for future GIS
- Phase I (2004)
  - Develop data management system
  - Inventory collection by Transmap
    - Roadway system
    - Traffic signals and signage
    - Field audit of municipal electric system
Utility Pole Inventory

Roadway Mobile Mapping
- Fast & efficient
- Collect basemap data
- GIS data output
- Digital right-of-way images
- Asset Management

Field Walkout Inspections
- Field review of wires and equipment
- Document Telecom and CATV attachments
- Pole tag information
- Communications tag information
Utility Pole Inventory

Pole Inventory Summary
within Municipal Boundary

- No Pole Tag: 397
- Painesville Pole Tag: 1245
- No Communications Tag: 2397

Legend:
- Utility Poles in City Limits
- Painesville Boundary
- PavementILINE
- ROW
- ParcelData
- Building
- Centerline
- Pavement Edge
- Pole Information Analysis
- Pole Information Boundary
- ROW
- ParcelData
- Building
91% of Painesville owned poles have telecom attachments!
Utility Pole Inventory

2,397 Painesville Poles
3,272 Telco attachments

CATV Attachments on Painesville Poles

89% of Painesville owned poles have CATV attachments!
Utility Pole Inventory

Initial Analysis

• Existing pole materials and construction not designed to meet additional attachments
• Additional revenue via increased rental/attachment fees
• Improve safety of pole network for workers and citizens

Next Steps – ‘05

• Document and develop permit process
• National Electric Safety Code compliance
• Construction standards
Data Management System

- A series of tables containing information that describes the infrastructure systems
  - Controlled by a database (SQL Server 2000)
  - Tables are related to each other using common factors
- Tables are connected to maps of the infrastructure system (GIS)
## The Bottom Line

### Identify the HISTORIC value for the infrastructure networks

Historic value: Cost to purchase and install infrastructure network components at the time of construction

<table>
<thead>
<tr>
<th>Road ID</th>
<th>Segment ID</th>
<th>Name</th>
<th>From</th>
<th>To</th>
<th>Total Fixed Asset Value</th>
<th>Roadway Network</th>
<th>Electric Network</th>
<th>Water Network</th>
<th>Sanitary Sewer Network</th>
<th>Storm Sewer Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>10010</td>
<td>280</td>
<td>Richmond St</td>
<td>Axtell Av</td>
<td>Kerr Av</td>
<td>$102,000</td>
<td>$60,000</td>
<td>$13,000</td>
<td>$15,000</td>
<td>$9,500</td>
<td>$4,500</td>
</tr>
<tr>
<td>10010</td>
<td>340</td>
<td>Richmond St</td>
<td>Park Pl</td>
<td>Mentor Av</td>
<td>$58,500</td>
<td>$18,000</td>
<td>-</td>
<td>$4,000</td>
<td>$1,500</td>
<td>$35,000</td>
</tr>
<tr>
<td>10010</td>
<td>310</td>
<td>Richmond St</td>
<td>Jackson St</td>
<td>Erie St</td>
<td>$73,000</td>
<td>$35,000</td>
<td>$10,000</td>
<td>$18,000</td>
<td>$4,500</td>
<td>$5,500</td>
</tr>
<tr>
<td>10010</td>
<td>300</td>
<td>Richmond St</td>
<td>Nebraska St</td>
<td>Jackson St</td>
<td>$75,200</td>
<td>$40,000</td>
<td>$15,000</td>
<td>$10,000</td>
<td>$9,000</td>
<td>$1,200</td>
</tr>
<tr>
<td>10010</td>
<td>290</td>
<td>Richmond St</td>
<td>Kerr Av</td>
<td>Nebraska St</td>
<td>$34,000</td>
<td>$15,000</td>
<td>$8,000</td>
<td>$8,000</td>
<td>$1,500</td>
<td>$1,500</td>
</tr>
<tr>
<td>10010</td>
<td>270</td>
<td>Richmond St</td>
<td>Prospect St</td>
<td>Axtell Av</td>
<td>$41,500</td>
<td>$18,000</td>
<td>$13,000</td>
<td>$9,000</td>
<td>$600</td>
<td>$900</td>
</tr>
<tr>
<td>10010</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$384,200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## How it all Relates

<table>
<thead>
<tr>
<th>Road ID</th>
<th>Segment ID</th>
<th>Name</th>
<th>From</th>
<th>To</th>
<th>Total Fixed Asset Value</th>
<th>Roadway Network</th>
<th>Electric Network</th>
<th>Water Network</th>
<th>Sanitary Sewer Network</th>
<th>Storm Sewer Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>10010</td>
<td>280</td>
<td>Richmond St</td>
<td>Axtell Av</td>
<td>Kerr Av</td>
<td>$ 102,000</td>
<td>$ 60,000</td>
<td>$ 13,000</td>
<td>$ 15,000</td>
<td>$ 9,500</td>
<td>$ 4,500</td>
</tr>
<tr>
<td>10010</td>
<td>340</td>
<td>Richmond St</td>
<td>Park Pl</td>
<td>Mentor Av</td>
<td>$ 58,500</td>
<td>$ 18,000</td>
<td>$ -</td>
<td>$ 4,000</td>
<td>$ 1,500</td>
<td>$ 35,000</td>
</tr>
<tr>
<td>10010</td>
<td>310</td>
<td>Richmond St</td>
<td>Jackson St</td>
<td>Erie St</td>
<td>$ 73,000</td>
<td>$ 35,000</td>
<td>$ 10,000</td>
<td>$ 18,000</td>
<td>$ 4,500</td>
<td>$ 5,500</td>
</tr>
<tr>
<td>10010</td>
<td>300</td>
<td>Richmond St</td>
<td>Nebraska St</td>
<td>Jackson St</td>
<td>$ 75,200</td>
<td>$ 40,000</td>
<td>$ 15,000</td>
<td>$ 10,000</td>
<td>$ 9,000</td>
<td>$ 1,200</td>
</tr>
<tr>
<td>10010</td>
<td>290</td>
<td>Richmond St</td>
<td>Kerr Av</td>
<td>Nebraska St</td>
<td>$ 34,000</td>
<td>$ 15,000</td>
<td>$ 8,000</td>
<td>$ 8,000</td>
<td>$ 1,500</td>
<td>$ 1,500</td>
</tr>
<tr>
<td>10010</td>
<td>270</td>
<td>Richmond St</td>
<td>Prospect St</td>
<td>Axtell Av</td>
<td>$ 41,500</td>
<td>$ 18,000</td>
<td>$ 13,000</td>
<td>$ 9,000</td>
<td>$ 600</td>
<td>$ 900</td>
</tr>
</tbody>
</table>

Infrastructure networks are broken down by intersection

Road ID and Segment ID developed by the Fire Department
Infrastructure Segments

Legend
- Fire Hydrant
- Storm Inlet
- Traffic Signal
- Tree
- Utility Pole
- Electrical
- Sanitary Manhole
- Roads
The value of each individual network is calculated for each segment.
## Network Components

<table>
<thead>
<tr>
<th>Road ID</th>
<th>Segment ID</th>
<th>Length</th>
<th>Installation Date</th>
<th>Valuation Method</th>
<th>Watermain Diameter</th>
<th>Number of Fire Hydrants</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>10010</td>
<td>280</td>
<td>368</td>
<td>1990</td>
<td>H</td>
<td>4</td>
<td>2</td>
<td>$15,000</td>
</tr>
<tr>
<td>10010</td>
<td>340</td>
<td>92</td>
<td>1955</td>
<td>E</td>
<td>6</td>
<td>0</td>
<td>$2,000</td>
</tr>
<tr>
<td>10010</td>
<td>310</td>
<td>322</td>
<td>1965</td>
<td>E</td>
<td>4</td>
<td>1</td>
<td>$7,000</td>
</tr>
<tr>
<td>10010</td>
<td>310</td>
<td>200</td>
<td>1965</td>
<td>E</td>
<td>6</td>
<td>2</td>
<td>$12,000</td>
</tr>
<tr>
<td>10010</td>
<td>300</td>
<td>419</td>
<td>2001</td>
<td>H</td>
<td>8</td>
<td>3</td>
<td>$25,000</td>
</tr>
<tr>
<td>10010</td>
<td>290</td>
<td>107</td>
<td>1983</td>
<td>E</td>
<td>6</td>
<td>1</td>
<td>$8,000</td>
</tr>
<tr>
<td>10010</td>
<td>270</td>
<td>358</td>
<td>1974</td>
<td>E</td>
<td>6</td>
<td>2</td>
<td>$9,000</td>
</tr>
</tbody>
</table>

All network components are identified by Road ID and Segment ID. Length associated with the network are based on the segments - not the individual network. Historic cost or an estimated cost based on the segments is listed.
Future Phases

• Phase II (2005)
  – Complete inventory of the sanitary sewer system
  – Develop an inventory of the storm sewer system
  – Develop an inventory of the municipal water system
Final Phase

• Phase III (2006 and beyond)
  – Train users on the asset management database
  – Implement an automated work order system
  – Evaluate potential GIS applications
    • Web-based mapping
    • Automated GASB34 reporting
    • Spatial analysis for Public Safety
    • Land use and environmental planning
    • Economic Development
    • Capital planning for infrastructure maintenance
Web-based Mapping

- Provide interactive connection between residents and City
- Increase staff efficiency—electric crews have access to real-time data
- Creates “one-stop shopping” for residents to access City data
Automatic Work Order System

- Plan to purchase software to automate work order reporting for GASB34 reporting
- Requires tracking changes to the inventory lists
  - Expansions
  - Repairs
  - Maintenance
  - Replacements
  - Disposals
Infrastructure Planning

• Tracking fixed assets will assist in capital improvement planning
• Analyze aging infrastructure to prioritize repairs
  – Track chronic maintenance problem locations
  – Identifying electric infrastructure outside of the road right-of-way
    • Pole relocation
    • Line burial
Conclusion

• GIS facilitates many city functions
• Requires coordination between multiple agencies
• Initial development requires driving force
  – Compliance with the National Electric Safety Code
  – Sanitary sewer projects
  – GASB34 compliance
• Formation of a GIS takes time and dedicated effort
Questions