Mapping TV Inspection Observations using Linear Referencing

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Tualatin River Watershed
Tualatin River Facts

• Among the first watersheds in the nation with a TMDL—1988, revised in 2001

• 712-square mile basin, 80-mile river

• Only source is rainfall

• Cleaned wastewater & release of stored water is nearly 70% of summer flow

• Water quality is better than it’s been in decades
Clean Water Services

- County service district established in 1970 as the Unified Sewerage Agency (USA)
- Water resources management utility serving more than 560,000 residents inside the urban growth boundary of Washington County
- 12 Partner Cities
- Budget: $59.3M Operating/$57.3M Capital
- Close working relationship with Washington County, but a separately managed and financed public utility
Core Business Areas

- Wastewater Collection and Treatment
- Surface Water Management
- River Flow Management
- Regional Water Supply Planning
TV Inspections

• Done to assess condition of sanitary and SWM pipes

• Defects, laterals, and other observations noted by:
  ▪ Observation code
  ▪ Footage
  ▪ Clock reference
  ▪ Severity, if applicable

• Imported to maintenance management system (MMIS)
Observations Feature Class

• Point geometry

• Observations from last TV inspection

• Defects categorized by District and department standards
  ▪ Structural, inflow, grease, roots, laterals

• Larger symbol size indicates higher severity
Observations
Why GIS?

- TV inspection reports are available in both the MMIS and from GIS for specific lines.

- GIS allows users to:
  - See the condition of lines in an area at a glance.
  - Easily query & display only layers of interest.

- Advantages of an observations feature class:
  - Novice GIS users do not have to use linear referencing & joins.
  - Allows observations to be categorized by business need.
# Inspection Report

**Inspection Details**

Sanitary Line: 9608 (US) - 9607 (DS)

Inspection Date: 3/29/2013

**TV Direction: Downstream to Upstream**

<table>
<thead>
<tr>
<th>Footage</th>
<th>Reference</th>
<th>Notation</th>
<th>Severity</th>
<th>Start Clock</th>
<th>End Clock</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>111.60</td>
<td></td>
<td>General Observation</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>111.60</td>
<td></td>
<td>Manhole</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>108.10</td>
<td>2 O'Clock</td>
<td>Roots Medium Joint</td>
<td>3</td>
<td>8</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>102.70</td>
<td></td>
<td>Tap Factory Active</td>
<td>0</td>
<td>9</td>
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<td></td>
</tr>
<tr>
<td>99.50</td>
<td></td>
<td>Tap Factory Capped</td>
<td>0</td>
<td>3</td>
<td></td>
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<tr>
<td>79.90</td>
<td></td>
<td>Tap Saddle Active</td>
<td>0</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70.10</td>
<td></td>
<td>Roots Fine Barrel</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>0.00</td>
<td></td>
<td>Manhole</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.00</td>
<td></td>
<td>Water Level</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Linear Referencing

• For TV inspection purposes:
  - Location expressed as distance along a line

• Examples include:
  - Flow gauges on a river
  - Mileposts on a highway
  - Footage on a sewer line
Required Inputs

- **Event table**
  - TV observations from MMIS

- **Route class**
  - Derived from Sanitary Gravity Mains
Observations Event Table

- Get most recent inspection from MMIS
- Get observations and footage using upstream to downstream direction (with flow)
- Calculate the footage and reverse clock direction for inspections done against flow
- Clock references between 1-5 & 7-11 will have an offset to help with visuals
- Map to custom defect categories and populate table in geodatabase
Route Feature Class

• A route feature class is required

• Python script creates route class from Sanitary Gravity Mains feature class periodically
  ▪ Sanitary line unique ID is route identifier
  ▪ From/To fields are shape length
Route Event Class

- Python script calls Make Route Event Layer tool
  - Use route feature class created from Sanitary Gravity Mains
  - Use table of observations as event table
  - TV inspection events are points as opposed to lines
- Empty & append to observations feature class in geodatabase
- Automated process
Business Applications

- Field Operations supervisors:
  - Root control program
  - Evaluating possible point repairs

- Engineers:
  - Part of rehab project prioritization
  - Identifying inflow & infiltration priorities
In Conclusion

Questions?

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