

## Party Line Predictor (Water Systems)

- Water System
  - **Water Main:** These are the larger diameter pipes that carry water from the source across the territory that the public water authority serves
  - **Water Service Line:** Usually perpendicular pipes branching off of the mains that carry water to individual homes or businesses
    - **Party Line:** A water service line that branches off of a water main but serves **more than one** home or business

- PROBLEM (**general**):
  - Party lines can cause accountability issues. If entity A pays their water bill and entity B does not, there is no way to shut off water to the line that serves B without cutting A off of water as well.
  - Is there a way to use the spatial relationship of the water mains and service lines in addition to their relationship to the entities (houses, businesses etc.) to logically surmise whether a given line or group of lines is a party line?

## Party Line Predictor (Water Systems)

- PROBLEM (**technical**): The data provided, while useful, had technical challenges that had to be worked around.
  - The service lines themselves in the GIS data were not “continuous”. This meant that a service line could be composed of multiple, broken up “pieces of” line but still only serve one entity and in reality is only one line.
  - Therefore, identifying a party line is not as simple as counting the number of broken up lines that compose a service. Rather, the number of entities that the service serves identifies a positive or negative party line.
  - Because many of the services often consist of broken up lines in the GIS, counting the number of entities that intersect a line is often mistaken as only the piece intersecting the entity would be positive for serving an entity and the other connecting pieces would not.
  - **For these reasons, the following precise logic was used to first identify unique groupings of the pieces of service lines and then, with respect to those groups, count the number of intersecting entities**

## Party Line Predictor (Water Systems)

### Pseudo Code: Part 1

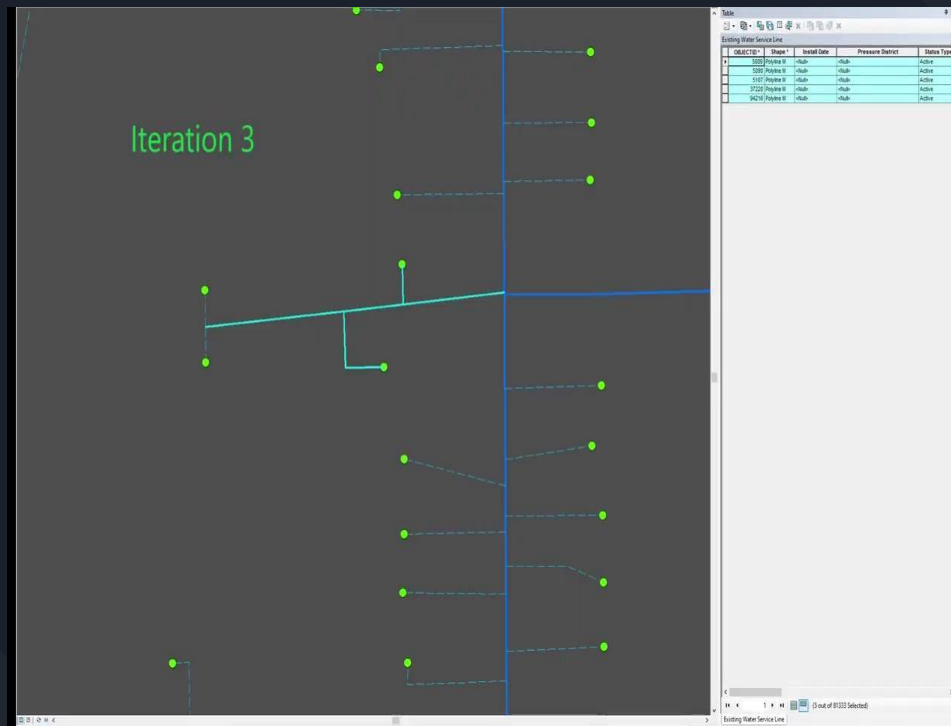
- Identify unique groups of service lines that correlate to a single service line in reality

- Initialize list of group IDs
- For every individual line composing the service lines layer
  - If line group ID is not yet in the list of group IDs
    - Initialize **base\_count** and **current\_count**
    - SELECT service line currently in iteration
    - GET COUNT sets **base\_count** to 1
    - While **TRUE**
      - SELECT the features in service lines layer that intersect with the already selected line
      - GET COUNT sets **current\_count** to either 1 or greater
      - If **current\_count > base\_count**
        - “Additional line selected. Next line”. Set **current\_count = base\_count**
      - Else:
        - “Additional line not selected. This is the end of the spatially intersecting lines. Give all lines the same group ID” **BREAK**

See next slide for animation  
of this process

## Party Line Predictor (Water Systems)

### Pseudo Code: Part 1



- Notice how the number of selected lines continues to increase with each iteration **except** the last iteration # 5. Due to the logic, the selection process runs until it notices no more lines are being selected. This is because there is no way to know apriori how many pieces of line are associated with one group.

## Party Line Predictor (Water Systems)

### Pseudo Code: Part 2

- **Once the Dissolve tool has been used to dissolve all lines from the Service Lines layer based on the previously generate Group\_ID**
  - For every (now grouped and merged) service line in the Dissolved Service Lines Layer
    - SELECT the line
    - SELECT the **entities** (homes, businesses etc) that intersect this line
    - GET COUNT of the selected **entities**
    - If this count is > 1:
      - Update "Party Line" field to 'YES'

# Party Line Predictor (Water Systems)

## Pseudo Code: Part 2

**Layers**

- 2020\_SDMR\_Contract\_A\_WSL\_Material
- AlleganyCounty\_AddressPoints201608
- PWSA Proposed Extent (to be confirmed)
- ReplaceArea\_end
- ReplaceArea\_start
- Inlet
- Outfall
- Junction
- End Cap
- Hydrant
- Water Fitting
- Pump
- Water Valve
- SL\_Sample\_Dissolve
- Matchlines
- Matchlines
- Proposed Water Line
- Existing Comm Line Digitized
- Affected\_service\_lines
- ServiceLine\_sample
- Existing Water Service Line
- w/pressurizedMains
- Existing Water Main
- Existing Gas Lines Digitized

**Select By Location**

Select features from one or more target layers based on their location in relation to the features in the source layer.

Selection method:  
Select features from:

Target layer(s):

- 2020\_SDMR\_Contract\_A\_WSL\_Material
- AlleganyCounty\_AddressPoints201608
- PWSA Proposed Extent (to be confirmed)
- ReplaceArea\_end
- ReplaceArea\_start
- Inlet
- Outfall
- Junction
- End Cap
- Hydrant
- Water Fitting

☐ Only show selectable layers in this list

Source layer:  
SL\_Sample\_Dissolve (1 features selected)

☒ Use selected features

Spatial selection method for target layer feature(s):  
Intersect the source layer feature

☐ Apply a search distance  
30,000000 Feet

[About select by location](#)

**SL\_Sample\_Dissolve**

FID	Shape	Group_ID	COUNT_Grow	Party_Line
2258	Polyline M	150		7 Yes

**2020\_SDMR\_Contract\_A\_WSL\_Material**

FID	Shape	OBJECTID	LocationID	FinalRepor	FinalDescr	FinalRep_1	FinalRep_1	HouseNumber	StreetName	Address	Public Side
0	Point	1	5059554	NonLead	Service line replaced	NonLead	Service line replaced	46.5	RUTH ST	46.5 RUTH ST	Non-Lead / Non-Lead
59	Point	199	5059556	NonLead	Service line replaced	NonLead	Service line replaced	46	RUTH ST	46 RUTH ST	Non-Lead / Non-Lead
1368	Point	10234	5059555	NonLead	Service line replaced	NonLead	Service line replaced	44	RUTH ST	44 RUTH ST	Non-Lead / Non-Lead
2643	Point	12108	5059553	Lead	Based on available data	Lead	Based on available data	44.5	RUTH ST	44.5 RUTH ST	Lead / Lead

1 (1 out of 11700 Selected)  
Existing Water Service Line SL\_Sample\_Dissolve

4 (4 out of 9439 Selected)  
2020\_SDMR\_Contract\_A\_WSL\_Material

## Party Line Predictor (Water Systems) Results

- This process resulted in populating around **85,000 features** from the Water Service Line data with a simple binary “Yes” or “No” value in the attribute table for whether a line is suspected of being a party line.
- While the script still has potential for efficiency gains, its ability to complete this process in just over **10 hours is still exponentially** less than the amount of time and effort that would be necessary to execute this process manually.