



Generalization for Multi-scale Mapping

Edie Punt

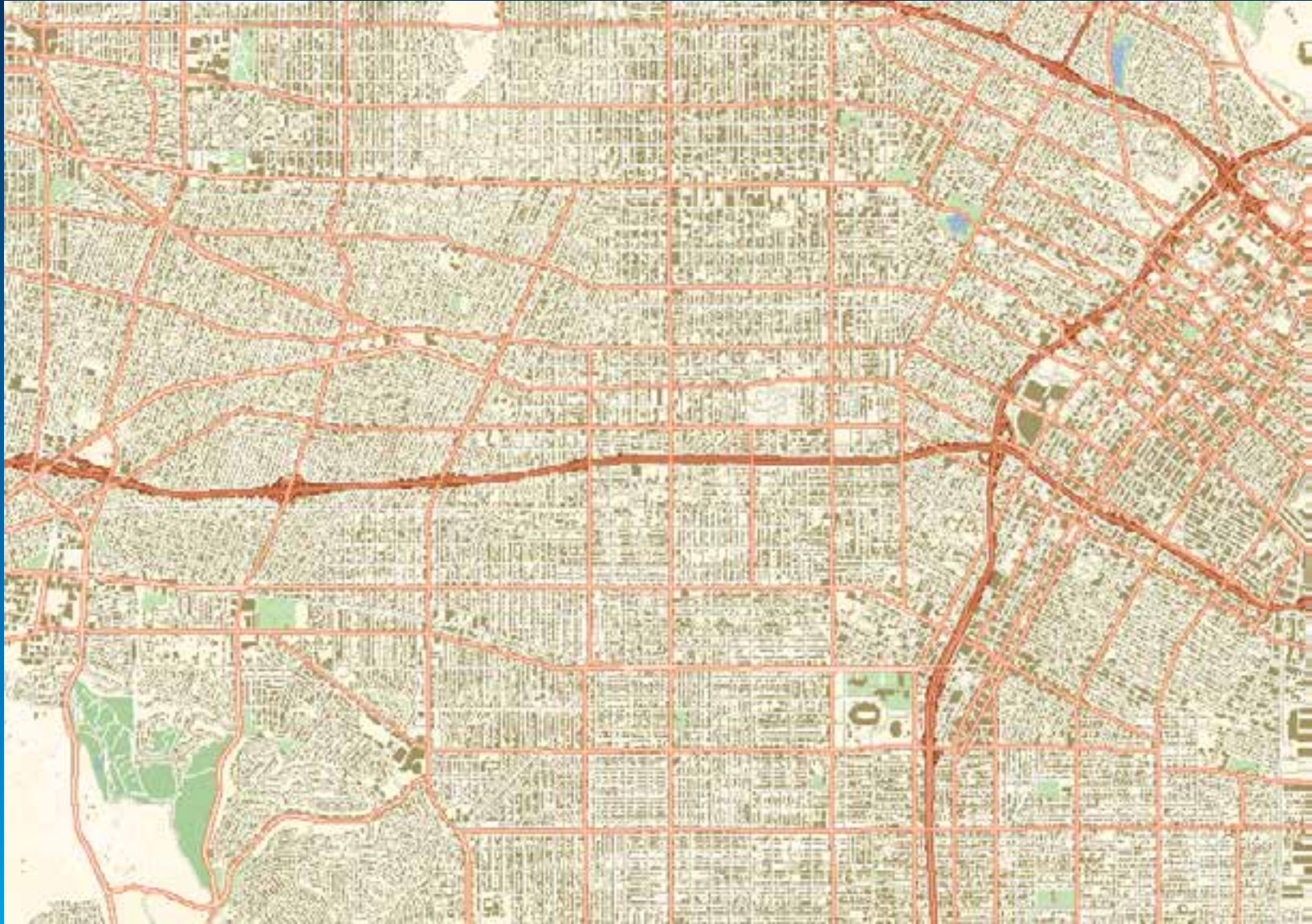
Jamie Conley

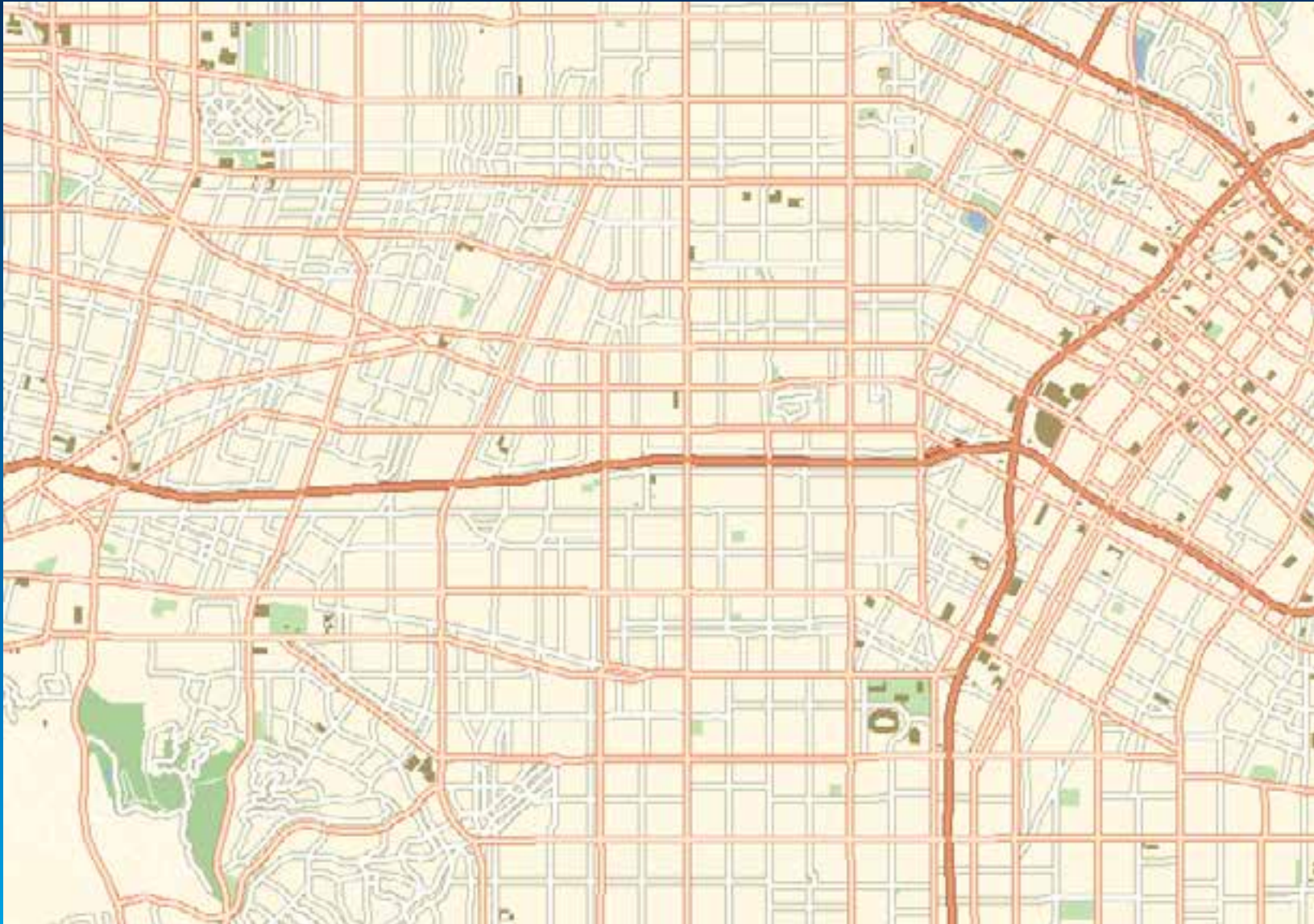
Technical Workshop

Why Generalize?

- **Data is collected and maintained in high detail**
- **When drawn at a smaller scale:**
 - it can be too detailed
 - symbols can conflict
- **Consider:**
 - visual acuity
 - output capabilities









Generalization is Subjective

Traditionally, generalization was performed manually at the discretion of the cartographer

Easy for humans, hard for machines
...generalization is difficult to automate



“What is qualitatively the same on the ground is also represented in the same way everywhere on the map.”

Swiss Society of Cartography, 1972

Automated Generalization in ArcGIS



Contextual Generalization

Early automated generalization tools considered the geometry of each feature sequentially without regard to symbology or other feature relationships

Contextual generalization tools assess multiple features from multiple layers simultaneously

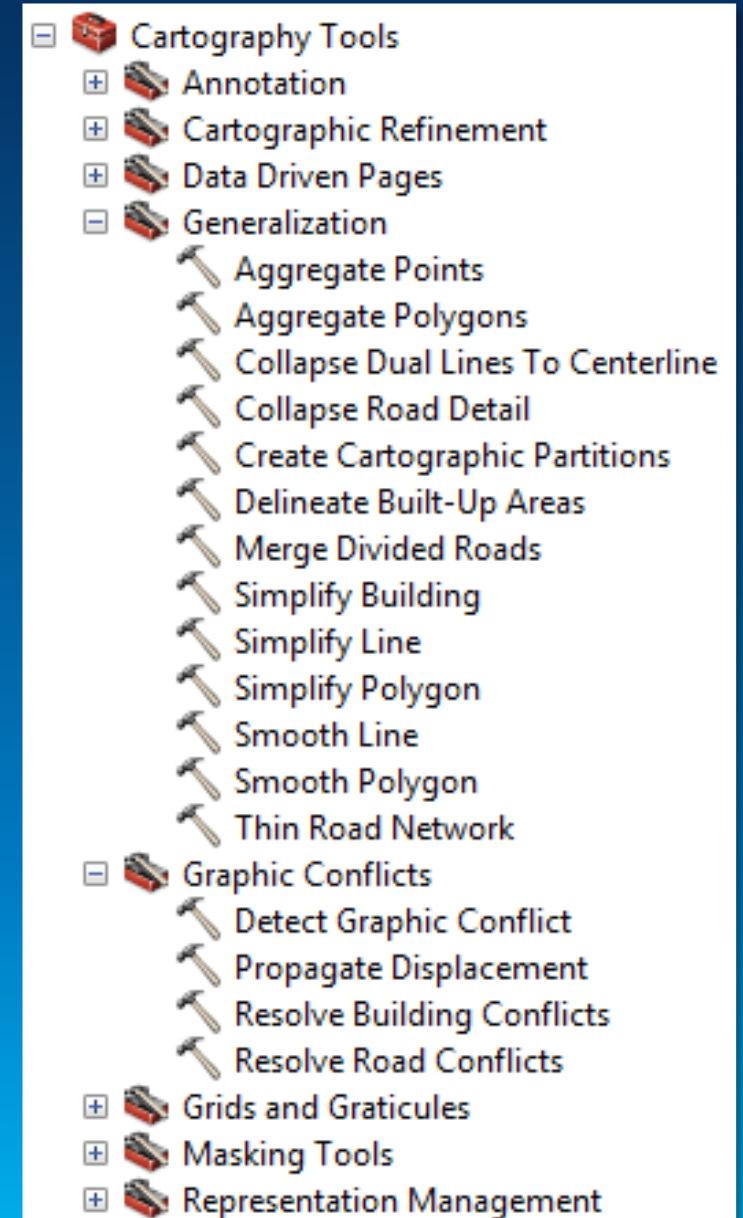
- **Maintain representative pattern, density, and character**
- **Resolve conflicts between symbolized features at scale**



Automated Generalization with Geoprocessing

- The Cartography toolbox contains tools for generalization and conflict detection and resolution
- **Generalization** clarifies the display of feature geometry at smaller scales
- **Conflict detection and resolution** manages the extent and placement of symbolized features on maps

Use both to retain characteristic form and pattern

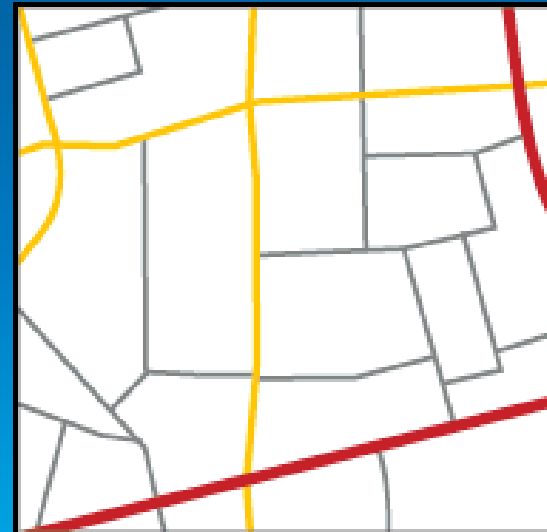


Generalizing Roads



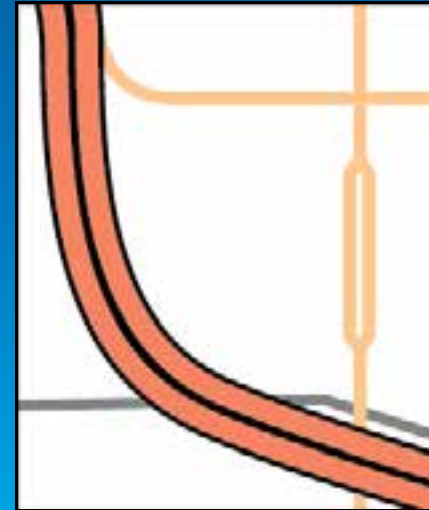
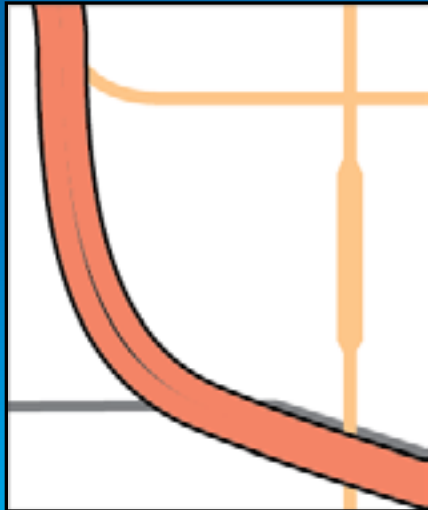
Thin Road Network tool

- Removes less significant roads from display
- Retains representative pattern and connectivity
- Visibility controlled by attribute, easy to modify



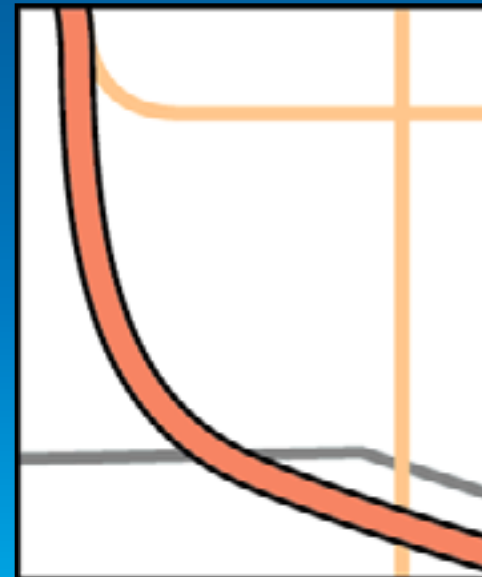
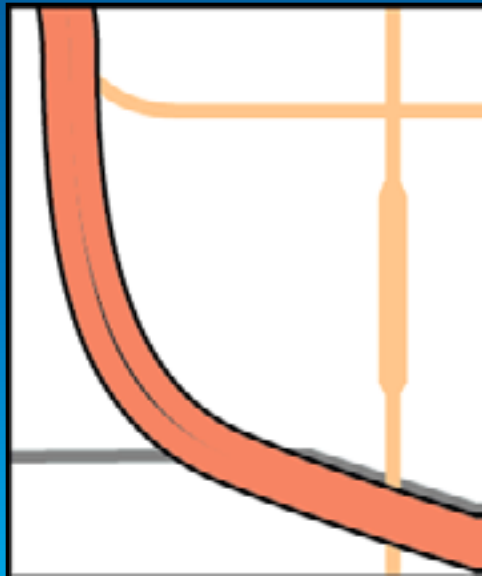
Resolve Road Conflicts tool

- **Adjust roads to show visual separation**
 - highways, boulevards, dead-ends, roundabouts
- **Less significant roads move to accommodate more significant roads**



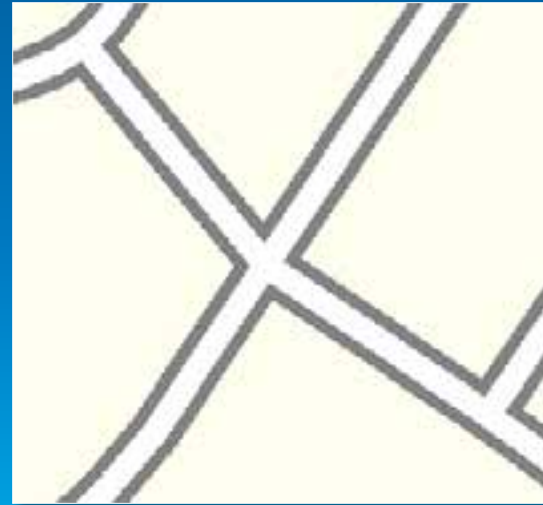
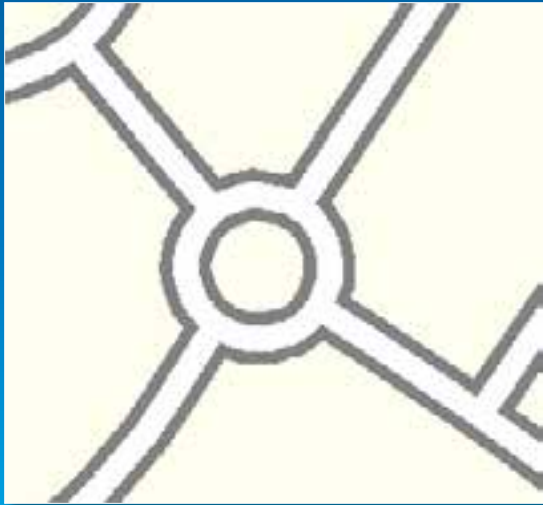
Merge Divided Roads tool

- Create a single road feature from 'parallel' pairs
- Merge only equal-class roads together



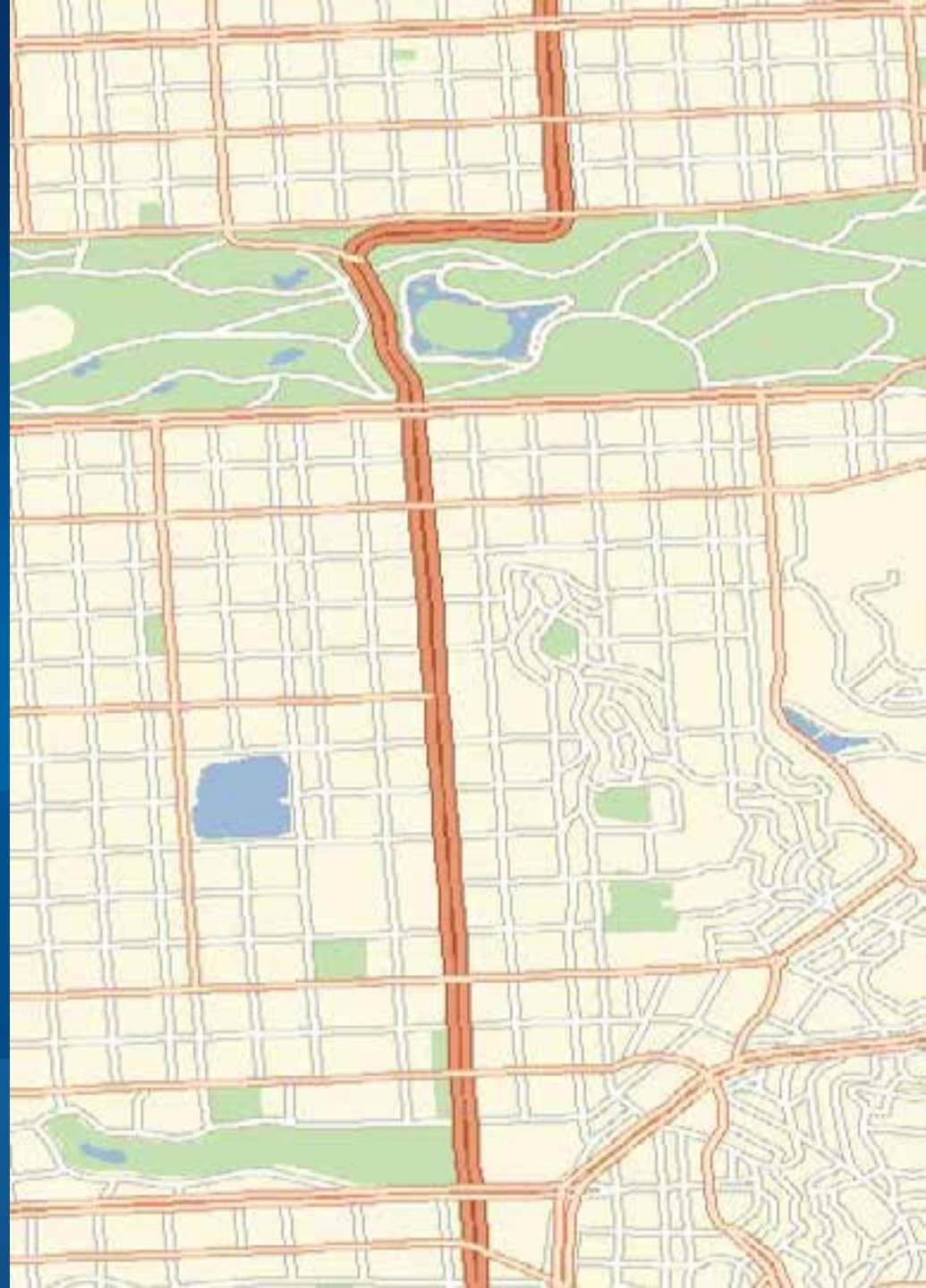
Collapse Road Detail tool

- Remove details or open interruptions at intersections



Generalizing Roads Demo

1:50,000 and 1:100,000 scale

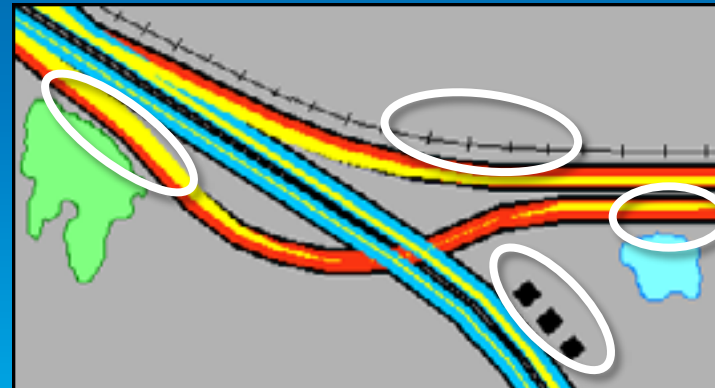
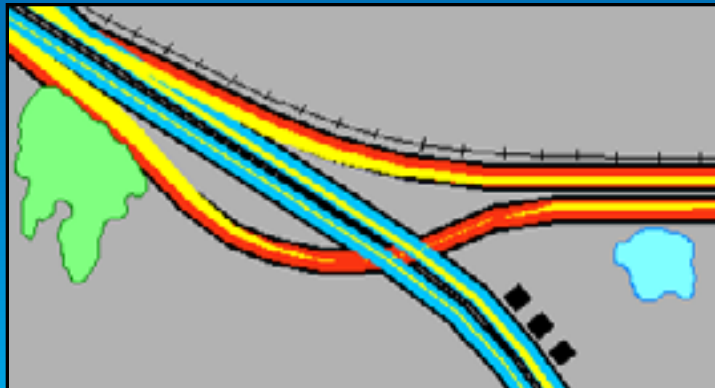


Generalizing Buildings



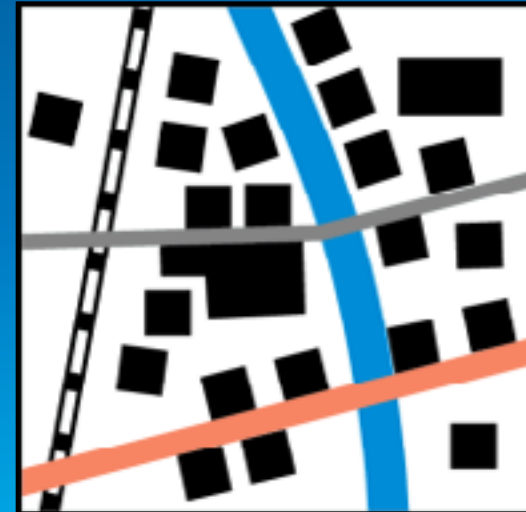
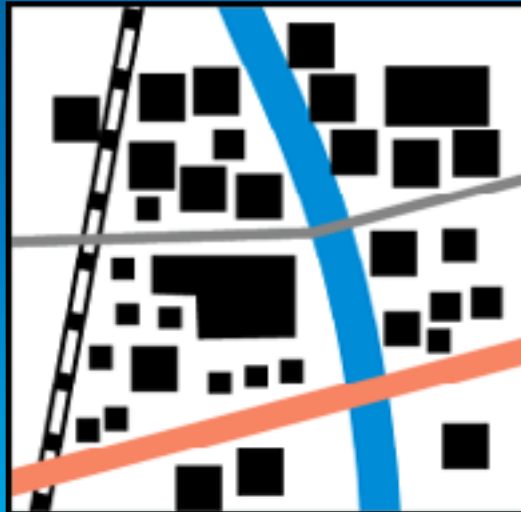
Propagate Displacement tool

- Adjust adjacent features to reestablish relationships after conflict resolution
- Use displacement output from other tools
 - *Merge Divided Roads tool*
 - *Resolve Road Conflicts tool*



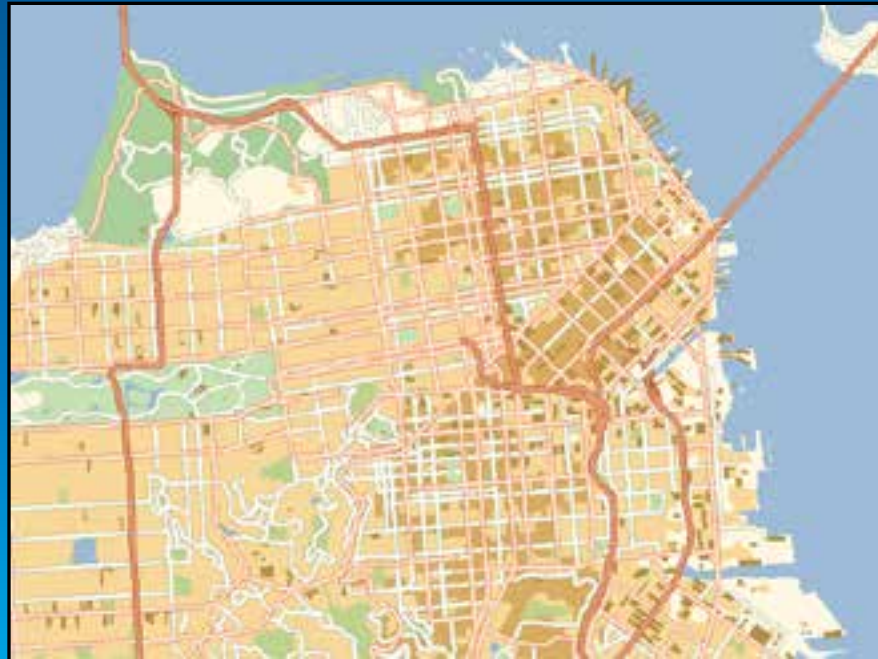
Resolve Building Conflicts tool

- **Separate buildings from each other and from barriers**
 - Retain relative density and pattern
 - Adjust visibility, size, and spacing, orientation



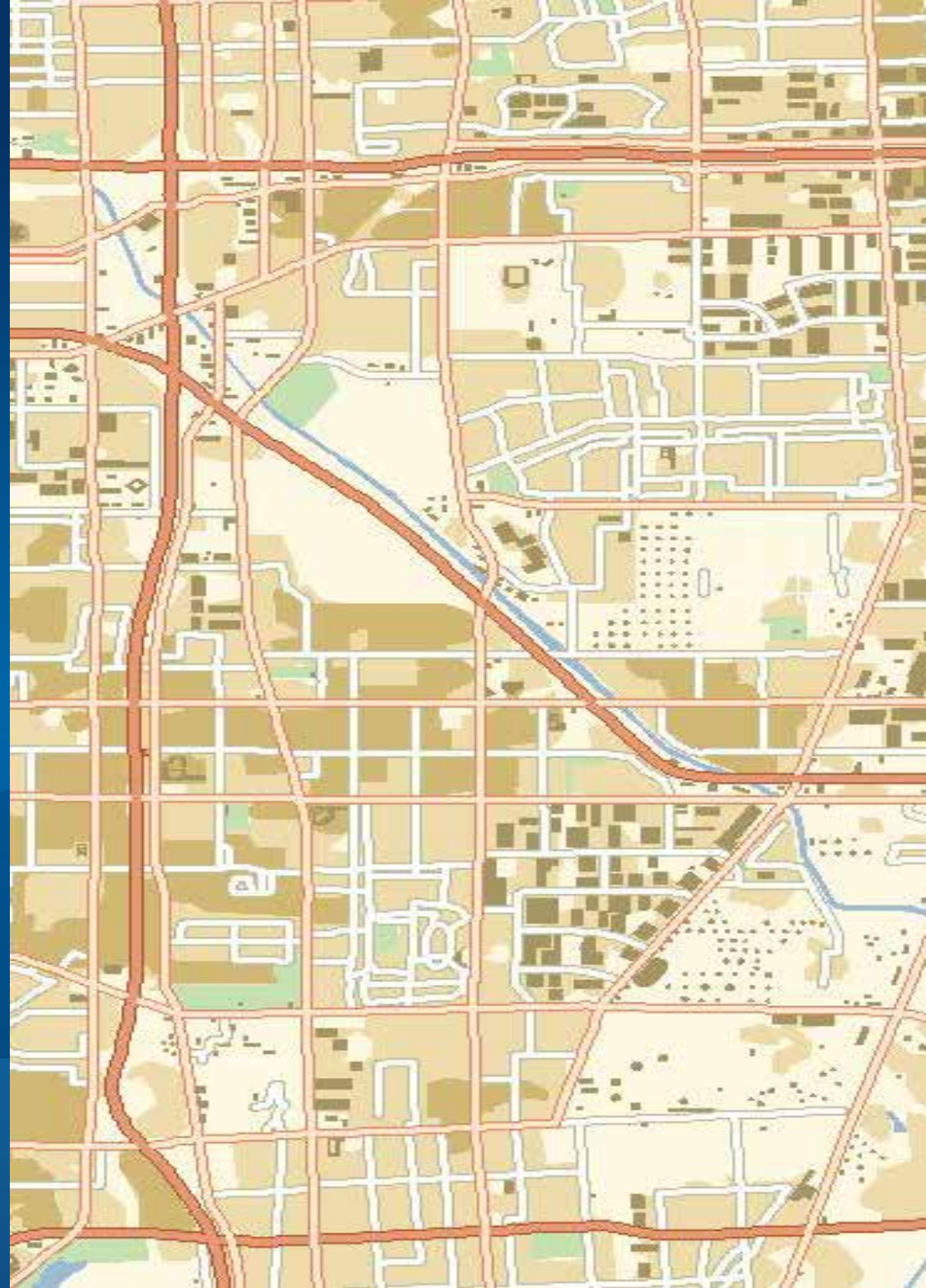
Delineate Built-up Areas tool

- Use dense groups of buildings to define built-up area polygons using edge features



Generalizing Buildings Demo

1:50,000 and 1:100,000 scale

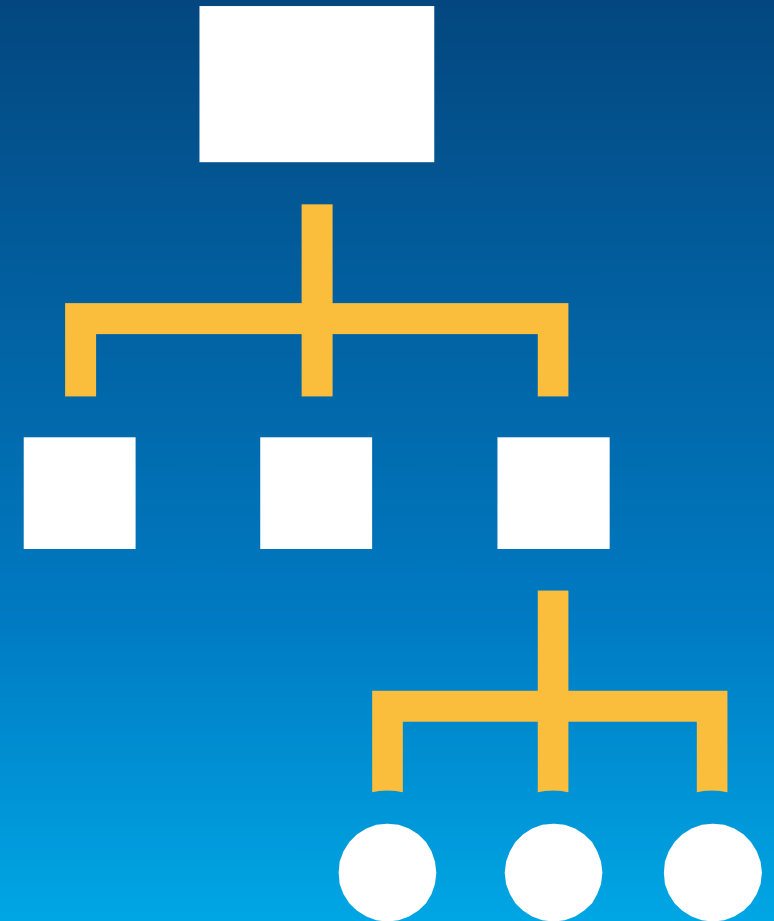


Generalization Workflows



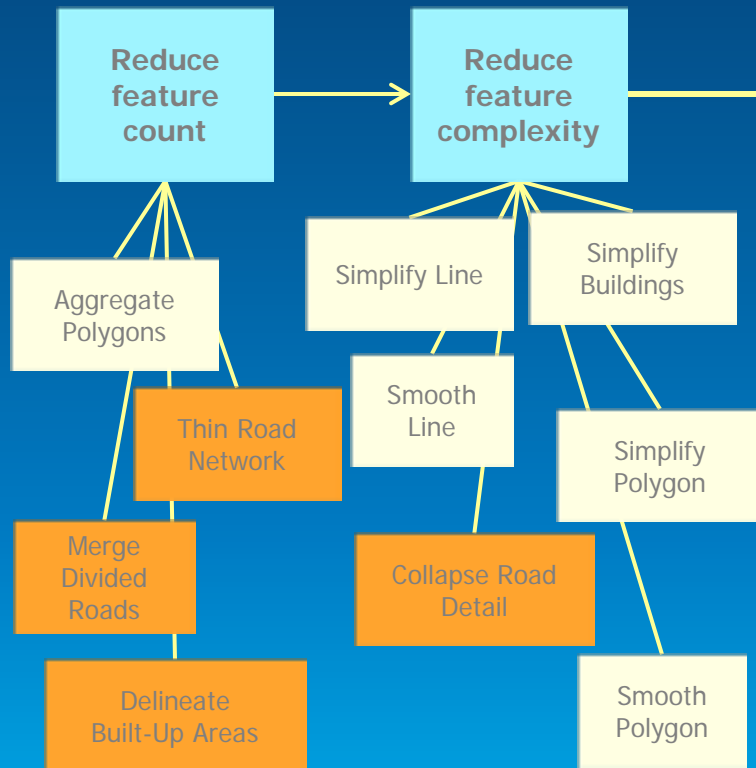
Geoprocessing Workflows

- **Transform data in scale-specific steps**
 - Chain steps in scripts or models
 - Automate entire workflow, or subdivide with manual editing and verification steps in between
- **Some tools modify inputs; new data not created**
 - Use representations to store changes as overrides
 - Original geometry is left intact for visual comparison or even reversion

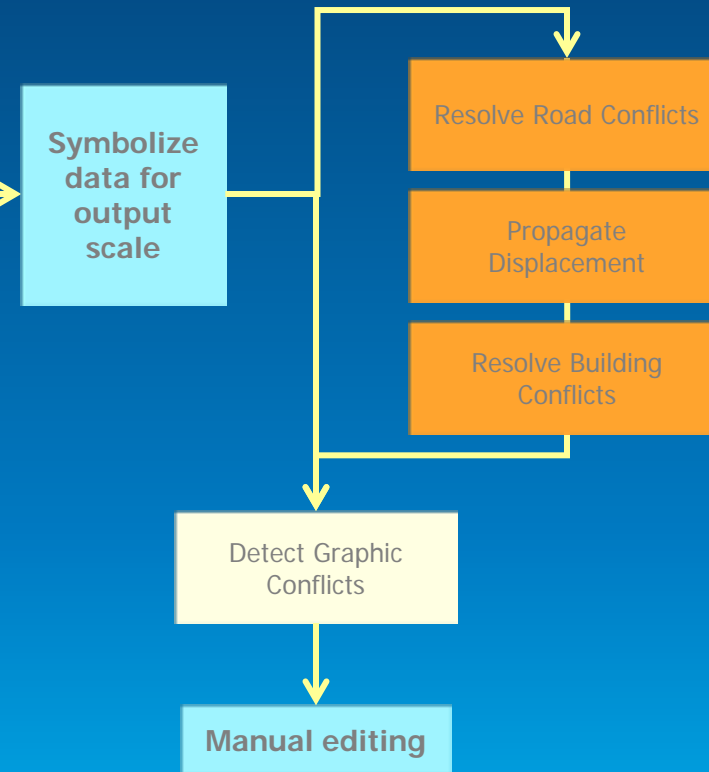


Multi-scale Mapping Workflow

Data Generalization (Generalization toolset)

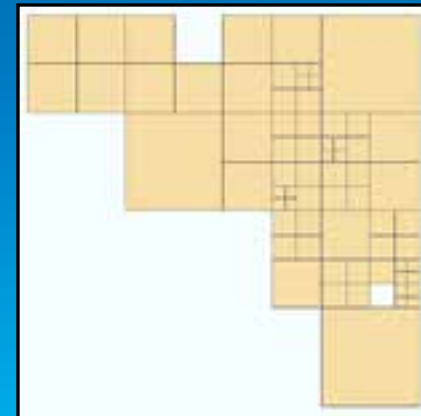


Conflict Resolution (Graphic Conflicts toolset)



Partitioning Large Datasets

- **Establish partitions for data**
 - Feature layers, map sheet boundaries, or
 - use **Create Cartographic Partitions** tool
- **Set the Cartographic Partitions geoprocessing environment variable to this partitions layer**
 - Each partition processed independently
 - Edge matching handled



Large Dataset Workflow Demo

Multiple scales



Related Technical Workshops

- **Working with Cartographic Representations**
 - 3:15 - 4:30 pm today, in room 32A

Thank you...

Generalization for Multiscale Mapping

- Please fill out the session survey:

Offering ID: 1401

Online – www.esri.com/ucsessionsurveys

Paper – pick up and put in drop box



Understanding our world.