

# Street Centerline Stitching and Attribute Standardization for the Bay Area

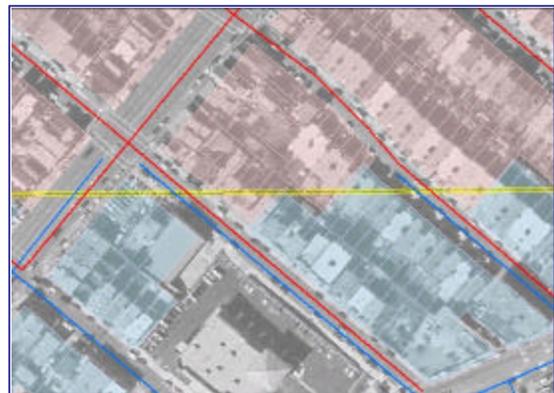
## Executive Summary

Xing Liu & Mike Skowronek

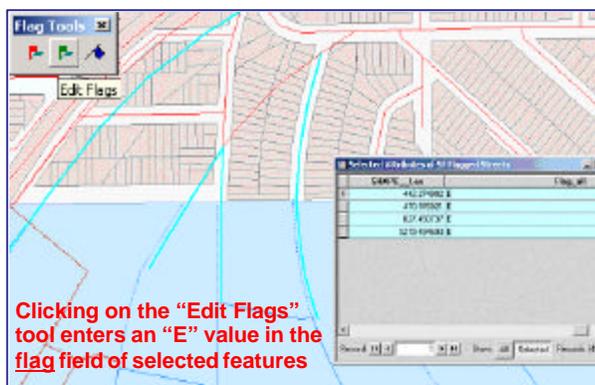
In 2003, the Metropolitan Transportation Commission (MTC) undertook a project on behalf of the Bay Area Regional GIS Council (BAR-GC) to compile an accurate and current GIS layer of street centerlines that could hopefully become a public domain, regional standard for the 9-county Bay Area. The project goals are to (1) make use of the best available data, if available, from each county, (2) develop and implement procedures for edge-matching (i.e. stitching) these data across county boundaries, (3) standardize the attributes of the stitched regional layer, (4) provide the county-specific stitched data back to each county so they could decide whether to incorporate the changes into their source data, and (5) document the procedures and policies to facilitate updating the spatial and attribute data annually or every other year. A critical component of this project has been to pay close attention to each county's data sharing policies/concerns and devise procedures that do not impose a burden on each county's ongoing maintenance of their source data. This document provides a brief summary of the steps involved in the project.

### Preparing the Data

The original street centerline data and supporting data from each county was converted to ESRI shape file format and projected to a common datum/projection to ensure proper alignment with each other. NAD83, UTM, zone 10, meters was chosen because it used by MTC and the Association of Bay Area Governments (ABAG). State Plane was not used because the 9 counties fall into two State Plane zones. Supporting data from each county, where available, included parcel boundaries, county boundaries, and aerial photographs. These data were used to overlay with the street centerline data as spatial references to ensure accuracy of the steps below.



### Flagging Street Centerline Data



To give each county the option of accepting or rejecting edits made to their data and create a system of efficiently tracking edited streets to facilitate future updates, we avoided making direct spatial edits of each county's source street data. Instead, we populated a flag field for each feature in the source data and made edits to a hybrid layer containing only streets that required edits. In the source data, each street segment was assigned 1 of 3 flag values: "Delete"- indicating the street is to be dropped from the original layer for edge-matching purposes, "Edit" – indicating the street's length and/or shape would be modified, and "No Change"- indicating the street remains unchanged. An additional tool

was created to unflag streets that may have been selected and flagged incorrectly. The flagging process was accomplished by panning across the boundary of neighboring counties, viewing streets that come close to or cross the edge, and flagging these streets with either the "Delete" or "Edit" values using single-click flag tools developed in ArcGIS. Once complete, all streets without flag attributes were populated with "No Change".

To prepare for editing, all streets that are flagged for editing were queried and saved to a hybrid data layer.

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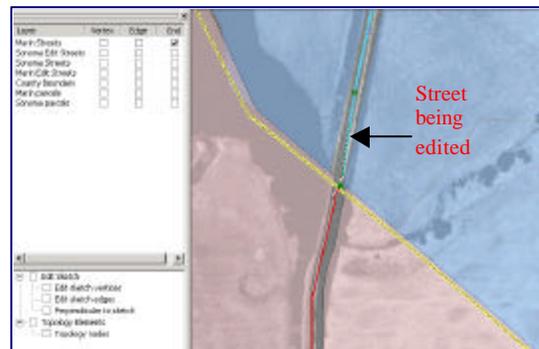
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### Editing Streets

Three criteria dictated how the editing was done:

- The street segments should meet at or near the county boundary line whenever possible
- The edits should make sure the ends of the same street in neighboring counties are topologically connected
- While the edits may have moved street segments, the street should stay within the street right-of-way as determined by each county's parcel boundary and/or aerial photography whenever possible



The parcel data and aerial photos were used as references for the last criterion. The first and second criteria were met by using topological snapping tools to trim or extend existing street features, and to snap features to others. The aerial photos were also used as a guide to ensure spatial accuracy of the edits.

Once the editing process is complete, the source data with the flags and the hybrid layer of edited streets is provided to each county so they could consider whether to incorporate these changes into their source data. If changes are incorporated by each county, the stitching process will be easier in the future.

### Standardizing Data Attributes

Since the street centerline data are all from different sources, it was necessary to develop a standard for the data attributes so that when the edited streets are eventually merged to form a seamless layer, the attributes can also be “seamlessly” joined. We used the following guidelines to develop a standard for the data attributes:

- The National Emergency Number Association (NENA) recommends 17 standard address related attributes, to which we added 8 other important attributes. These key attributes should have common field names and definitions across all 9 counties.
- For attributes that two or more counties share, the field names and definitions should also be standardized.
- The remaining attributes, which are secondary fields unique to each county, do not need to be changed. They will be included in the attribute table of the final merged data layer.
- A field should be added to indicate the source county where the street originally came from. This is to ensure that in the final merged, seamless regional layer, we could still easily separate out streets from any individual county.

Custom tools were developed within ArcGIS 8.3 to update the original street centerline data to the new standard. These tools can be reused to duplicate any of the standardization in the future.

### Merging Data

To merge the data, all streets that are flagged as “Edit” or “Delete” in each county's source data were selected and deleted. Using a basic map-merge function, these 9 datasets for each county are then merged with the hybrid layer that contains only the edited streets at county boundaries. Topology is built and checked for this new layer. Because of the editing and street attribute standardization processes in the previous two steps, the map-merge function should complete successfully. The end result is a seamless, regional street centerline data layer with common attributes for each segment.