Aligning PPM Edges Data

This is a manual process for creating PPM “edge” data files with improved accuracy.

# Input file is provided:

CO-Motorways.geojson

# Download the following reference data:

Source: City and County of Denver Open Data.

Download in “Esri File Geodatabase” (gdb) format. The download will be a .zip file. Unzip it to get the .gdb file.

* Edge of Pavement Linear (2020): <https://www.denvergov.org/opendata/dataset/city-and-county-of-denver-edge-of-pavement-linear-2020>

# Create a Base Map in QGIS

* Create an empty project in QGIS.
* Set the project CRS to “**WGS 84 / UTM zone 13N (EPSG:32613)**”
* Add the following satellite layers to the map to use as reference data:
  + Bing Virtual Earth (XYZ Tiles)
  + Google Satellite (XYZ Tiles)
  + Mapbox Satellite Streets (WMS/WMTS)
* Add the “edge of pavement (2020)” data set to the map. The .gdb format will be slow to render, so convert it to a geopackage layer to make it render faster. Change the symbology to make it easily visible on top of the satellite maps. Open up the properties of this layer and look at the “information” tab. Note any information about the accuracy of the CRS and the data that is given there.
* Zoom in closely on the Interstates in the Denver area. To get a feeling for the accuracy of this reference data, try switching between the 3 different satellite maps. Notice that their alignment differs, and that none of them are perfectly aligned with the “edge of pavement” layer. Use the measure tool to compare the edge of the highway. Try to come up with number to say how accurate we feel this reference data is: +/- how many meters? Call this number the REF DATA ACCURACY.

# Check and Edit the Centerline Alignment

* Add the input file, CO-Motorways.geojson to the map.
* Convert the CO-Motorways.geojson file to geopackage, and reproject it to WGS 84 / UTM zone 13N (EPSG:32613). Name the layer “CO-Motorways-UTM”.
* Hide the original geojson file and show only CO-Motorways-UTM layer. Symbolize it so it is easy to see.
* Use the “Buffer” tool to create a buffer layer named CO-Motorways-Buffer. Use CO-Motorways-UTM as the input layer. Set the Distance parameter to 11 Meters. Set the output layer to be a geopackage layer named CO-Motorways-Buffer-11. Keep the CRS of the output layer the same as the input layer: WGS 84 / UTM zone 13N (EPSG:32613).
* Create two more buffer layers reflecting the accuracy of the reference data. Choose the “Distance” of the buffers by adding or subtracting the REF DATA ACCURACY from 11:  
   11 + REF DATA ACCURACY  
   11 – REF DATA ACCURACY  
  For example if REF DATA ACCURACY is 2 meters, then create two buffer layers using CO-Motorways-UTM as input, with distances of 9 meters and 13 meters. Name the layers based on the number of meters, for example, CO-Motorways-Buffer-9 and CO-Motorways-Buffer-13.
* Symbolize the buffers so that you can see all three of them at the same time and the satellite layer behind them (make the solid parts transparent and show only their outlines.) Make the buffers symbology distinct from the symbology of the edge of pavement layer. For example, make the “edge of pavement” layer dashed lines and the buffers solid lines.
* Observe I-25, I-80, and the E-470 toll road in detail throughout the state. Note down any locations where the edge of the drivable lanes of the highway lies outside any of the three buffers. Inside the City of Denver, use the “Edges of Pavement” layer as a reference. For the rest of the state, use a satellite map to compare with. These are the locations where the centerline will need to be edited.
* Use the Vertex Edit tool to edit the CO-Motorways-UTM line to be closer to the center of the road for any of the sections noted in the previous step. Save the edits.
* Delete the 3 buffers created above.
* Recreate all three buffers using the edited CO-Motorways-UTM centerline. Make sure to save edits first. Again, check the road edges against the buffers.
* Repeat the process until the drivable highway edges throughout the state are all within all the buffers.
* If there are sections of road that are very wide, it might be impossible to fit the widest point within the buffers. If it is impossible to do this for certain sections of road, note down and take screen shots of the map, and estimate how much wider than 11 meters a buffer would need to be for the highway to fit for these sections.
* Create a polygon layer to indicate the sections that are too wide. Create polygons for each section of the road centerline where the geofence needs to be wider than a standard motorway. Use this polygon layer to snip the CO-Motorways-UTM centerline layer to reflect the polygon layer. Edit the ‘wayType’ attribute for the wide features of the CO-Motorway-UTM centerline layer. Change the ‘wayType’ from ‘motorway’ to a custom type (for example ‘cdot\_custom\_motorways’) for those features. Export Product
* Export the edited CO-Motorways-UTM centerline file to geosjon. Convert the CRS back to WGS 84 (EPSG:4326), and save it as a new Geojson file named “CO-Motorways-Edited-[todays date].geojson.”
* Create a Word document report summarizing the findings, including screenshots and notes. Include an estimate of the reference data accuracy. Note which of the particular satellite maps were used for the process. If you favored one of the satellite maps over the others, note which one. Show screen shots for any locations where the road was wider than 22 meters (where it wouldn’t fit in an 11-meter buffer minus the estimated ref data accuracy).
* Include representative screen shots in a few locations illustrating how well the centerline data (before and after editing) and three buffers fits the road in different regions: downtown Denver, the Mountains, north and south Front Range area. If there were regions where the “before” and “after” edited data was very different, show those.